# Parrillo Sports Nutrition Guide

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Glossary
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Gaining Muscle and Staying Lean

Update 2:  
Diet to Lose Fat and Stay Lean

Update 3:  
Ultra High Energy Diets For Athletes

RESULTS . . . THAT'S WHAT YOU GET FROM PARRILLO PRODUCTS
Gaining Muscle and Staying Lean: A Common Sense Approach
by John Parrillo

Are you training hard but not putting on enough muscle? The answer is simple: eat more calories. The problem is how do you eat plenty of calories to make muscle without getting fat at the same time?

Whether you gain muscle or fat depends largely on what foods you eat. While too many calories from any food can make you fat, some foods have much more tendency to make you fat than others. To prove it to yourself, just pull out 1000 calories of rice and chicken from your diet and replace it with 1000 calories of cheese burgers and french fries and see what happens. You have to learn to structure your diet so that you supply calories from foods that don’t make you fat.

There are different kinds of calories. Some foods make you fat and others make you lean and muscular. Your worst enemies are fatty foods and simple sugars. Conventional dietary fats are very prone to be stored as body fat. After being digested, these fats are transported to fat depots and stored. Simple sugars and other refined carbohydrates are released into the bloodstream more rapidly than they can be used for energy or converted to glycogen. This elicits a large insulin release which in turn causes the excess sugar to be converted to fat. On the other hand, excess calories from protein and unrefined complex carbohydrates have less tendency to be stored as fat. Good lean protein sources include skinless chicken breast, skinless turkey breast, fish, and egg whites. Good sources of starchy carbs are beans, rice, potatoes, peas, corn, and oatmeal. We also recommend you eat a lot of fibrous vegetables such as spinach, lettuce, carrots, broccoli, green beans, and asparagus.

And here’s where CapTri® fits in. CapTri® provides 8.3 calories per gram - twice the caloric density of protein or carbohydrates. But instead of being stored as body fat CapTri® is immediately burned to release energy (1). Whereas conventional fats are stored in body fat depots, CapTri® is transported directly to the liver where it is converted into energy (1). If eating regular food is like throwing a log on the fire, then eating CapTri® is like pouring gasoline on the fire. This makes CapTri® an ideal energy source for bodybuilders and other athletes - it allows you to consume a ton of calories without getting fat.

The replacement of conventional dietary fats with lipids like CapTri® results in much less body fat (2,3). This is not so surprising since CapTri® is immediately burned for energy while regular fats are just stored as body fat. The amazing
thing is that diets containing lipids like CapTri® result in less fat gain than even low-fat diets (2,3). In other words, CapTri® results in less fat gain than carbohydrates. And if your weight goes up, and it’s not fat, then it must be lean mass.

To understand this you have to know something about carbohydrate metabolism. Carbohydrates are released into the bloodstream as glucose and this stimulates the pancreas to release insulin. Insulin in turn causes cells to absorb glucose and amino acids, supporting growth. For this reason many people consider insulin to be the most powerful anabolic (growth-promoting) hormone. However, insulin and glucose also promote fat accumulation by increasing storage of fatty acids in fat cells. So the same hormone which promotes growth also promotes fat storage. If carbohydrates are released into the bloodstream faster than they can be used for energy and to replace glycogen, the excess will be stored as fat.

The enzymes that make new body fat and convert glucose into fat are less active if lipids like CapTri® are included in the diet. Insulin normally stimulates these fat-storing enzymes to store any excess calories as fat. The amazing thing is that when lipids like CapTri® are included in the diet these fat-making enzymes are less active—even in the presence of insulin (2). This suggests that CapTri® may permit you to derive the anabolic effect of insulin while avoiding its fat-promoting effects. Could this be the reason athletes on our diet experience increased muscleascularity with decreased body fat?

The anti-catabolic properties of CapTri® are another good reason to include it in your mass building diet. Studies show that lipids like CapTri® spare body protein (7). Structured lipids, which contain medium chain fatty acids, improve nitrogen balance and are believed to increase weight by protein retention whereas conventional fats contribute to weight gain by increasing body fat (7, 8). Medium chain triglycerides like CapTri® increase protein synthesis in the liver more than conventional fats or glucose (7). Also, after glycogen stores have been depleted the branched chain amino acids leucine, isoleucine, and valine are oxidized as fuel in the muscles. In the liver, CapTri® is converted into ketone bodies which are released into the bloodstream and used as fuel (1). “Skeletal muscle can readily burn ketone bodies for fuel and may spare the oxidation of branched chain amino acids and reduce skeletal muscle protein catabolism,” (6). The sparing of BCAA would leave these amino acids available to build muscles in-

If eating food is like throwing a log on the fire, then eating CapTri® is like pouring gasoline on the fire. This makes CapTri® an ideal energy source for bodybuilders and other athletes because it allows you to consume a ton of calories without getting fat.
stead of being burned as fuel.

CapTri® is a special lipid called a medium chain triglyceride which is purified from coconut oil by fractional distillation. This is the same way that jet fuel is purified from crude oil. CapTri® has a different molecular structure than regular fats and this results in it being immediately burned for energy instead of being stored as body fat (1). In CapTri®, all of the harmful long chain fats have been removed, leaving only a pure energy source which is absorbed and metabolized as rapidly as glucose (1). CapTri® is burned so fast that it doesn’t have a chance to be stored as fat.

To derive the maximum benefit from CapTri®, or any other supplement, use it in conjunction with the proper diet. The Parrillo Performance Nutrition Program, by John Parrillo, describes the ultimate diet for bodybuilders. How to eat to gain muscle and lose fat. Proper nutrition is the foundation of body-building success. We provide the information you need to make your effort in the gym pay off - big time. What sets us apart is our program is based on sound, basic principles of healthy nutrition. With Parrillo, food comes first, then supplements. We find that basic nutrition gets better results than high-tech hype. We’re here to show you how to get big. Now.

CapTri® is the most highly refined, ultrapurified MCT on the market. The formulation of CapTri® was specifically designed for people who want to be as lean as possible. CapTri® is available exclusively from Parrillo Performance. If you need to go up in calories to put on more muscle, try CapTri®.

References

Just one tablespoon of CapTri® with each meal provides the quality calories your body needs for adding lean body mass and keeping bodyfat to a minimum.
Diet to Lose Fat and Stay Lean

by John Parrillo

People used to believe that the way to lose weight is just to eat less. And sure enough, if you consume less calories than you expend then you’ll lose weight. But whether the weight you lose is muscle or fat depends on how you do it. Just like a certain diet helps you stay lean while you’re gaining muscle, the proper diet will help you hold onto your muscle while you’re losing fat.

We believe that proper nutrition is the foundation of bodybuilding success. When it comes to fat loss, there are no miracles or shortcuts. It takes a good lean diet and plenty of aerobic exercise. We’ve developed an approach to dieting we call “building your metabolism.” Instead of starving yourself, give your body all the nutrients and calories it needs to be healthy.

Your metabolic rate is your body’s rate of energy expenditure, in calories per hour (1). Your body is constantly consuming energy to maintain itself and fuel activities. When you drastically reduce calories your body thinks it’s starving, so it slows down your metabolic rate to save fuel. You actually lose more muscle than fat during low calorie diets. And since muscular tissue burns more calories per hour than fat tissue, if you lose muscle mass your metabolic rate automatically slows down.

Paradoxically, drastically cutting calories actually promotes fat storage by increasing the activity of a fat storage enzyme called lipoprotein lipase (2). When your body’s starving it wants to hold on to all the fat it can, to try and ensure its survival. Your body fat stores represent an energy reserve to keep you alive until the famine passes. So during a low calorie diet you do lose weight, but most of it is muscle and water. And in the process your metabolism slows down and your fat storage systems are cranked up. So when you resume normal caloric consumption you gain back the weight you lost, if not more. The difference is you lost mostly muscle and you gain back mostly fat, so the net result of your diet is that you’re fatter than when you started. This is why low calorie diets are not effective.

So what do you do? How can you achieve an energy deficit without losing muscle and activating your fat storage systems? By feeding your body the right combinations of foods, at the right times, you can shift your metabolism into an anabolic, fat-burning mode. That’s what the Parrillo Performance Nutrition Program is all about. By speeding up your metabolism you can achieve an energy deficit without cutting calories.

As you know, different foods have different effects on your body. Foods like cheese burgers and french fries tend to make you fat. On the other hand, it’s hard to get fat eating rice and fish. Scientists call this “food efficiency” - the calories consumed of a particular food divided by the resulting weight gain (3). The higher the food efficiency, the more that food contributes to weight gain. Foods with a low food efficiency are more prone to be burned for energy instead of being converted to body weight.
CapTri® is a special kind of fat called a medium chain triglyceride. CapTri® harnesses the energy density of fat but is not stored as body fat (4). The molecular structure of CapTri® results in it being metabolized differently than conventional fats. Instead of being transported to fat depots like regular fats, CapTri® is transported directly to the liver and is immediately burned to produce energy (4, 5). As a result, CapTri® has a lower food efficiency than regular fats (3, 5). When conventional dietary fats are replaced with lipids like CapTri®, test animals stay much leaner (6, 7). Probably the most amazing thing is that lipids like CapTri® also have a lower food efficiency than carbohydrates (3, 8). This means that it’s harder for your body to convert CapTri® into fat than it is to store excess carbohydrates as fat.

Bodybuilders use CapTri® while dieting because it has a lower food efficiency than carbohydrates and conventional fats (3, 6, 7, 8). CapTri® is burned rapidly in the liver (4, 5) and some of the energy is released as body heat in a process known as thermogenesis. The thermogenic effect is probably the most important reason why CapTri® has such a low food efficiency (5, 7, 9, 10). Instead of being stored as fat, excess calories from CapTri® are converted to body heat, and this means you burn more calories per hour. This explains why calories from CapTri® contribute less to fat stores than an equivalent number of calories from conventional fats or carbohydrates (3, 6, 7, 8).

Scientific studies have shown that when lipids like CapTri® are used in place of carbohydrates, body fat stores are lower (3, 8). And less carbohydrates are converted into fat, even in the presence of insulin (8). Insulin is an anabolic hormone which is released from the pancreas in response to an increase in blood glucose (sugar). Insulin causes cells to absorb glucose and amino acids, thereby stimulating growth. Unfortunately, insulin also causes fat cells to absorb glucose and fatty acids, stimulating fat storage. Fat storage enzymes are less active when lipids like CapTri® are added to the diet, even under conditions of insulin stimulation (8).

Bodybuilders have used low-carb diets for years. When you reduce carbs you in turn reduce insulin (remember, insulin promotes fat storage) and activate the carnitine shuttle. The carnitine shuttle is a transport system which moves fatty acids inside mitochondria - the furnaces inside cells where foods are burned for energy. Carbohydrate metabolism generates a by-product called malonyl-CoA, which inhibits the carnitine shuttle. This is why not much body fat is burned for energy as long as carbohydrate fuel is available. During low carb diets no malonyl-CoA is produced so the carnitine shuttle is activated. The body shifts into a fat-burning mode. Glucagon is another hormone, also produced by the

Metabolic rate for the six hour period following MCT- or LCT-containing meals. The thermic effect of feeding (TEF) was calculated as the metabolic rate following feeding minus the fasting metabolic rate, in Calories per hour. The area between the curves (shaded represents the difference in TEF for MCT and LCT. The bar graph at right expresses TEF as percent of total ingested energy (1,000 Calories). Since CapTri is more efficiently converted to energy, it has less tendency to store as body fat.
Diet to Lose Fat and Stay Lean

pancreas, but with the opposite actions of insulin. After you eat a big carbohydrate meal your body releases insulin which causes cells to absorb glucose. Some of the glucose is used for energy and the excess is stored as glycogen and fat. As the blood glucose level goes down, the insulin level goes down too. After your cells run out of glucose, glucagon is released as a signal to begin burning fat.

The problem with the old low-carb diets is that you don’t have much energy and your metabolism slows down because you’re not consuming enough calories. You’re really not consuming any fuels that your body likes to use for energy. In the new low-carb strategy, you use CapTri® in place of starchy carbs. This results in decreased insulin production and increased glucagon release. The carnitine shuttle is active and fat metabolism proceeds at a maximal rate. The calories from CapTri® provide the energy you need to keep training hard. Also, by substituting CapTri® for an equivalent number of calories from carbohydrates you avoid the slow-down in metabolic rate which inevitably results from calorie-restricted diets. Since Cap-

CapTri®, as a regular supplement to your nutrition program, gives you the calories to stay lean and maintain energy while cutting carbohydrates.

CapTri® has a lower food efficiency than carbohydrates, this means your calories will be burned instead of being stored as fat.

CapTri® is the most highly refined, ultrapurified MCT on the market. The formulation of CapTri® was specifically designed for people who want to be as lean as possible. CapTri® is available exclusively from Parrillo Performance. So if you’re looking for a good source of calories to provide energy while dieting, try Cap-

References


Ultra High Energy Diets for Athletes

by John Parrillo

Athletes and other extremely active people have an increased need for energy. Some bodybuilders and endurance athletes consume 8,000 to 10,000 calories a day to fuel their activities and support growth. That’s about five times as much energy as sedentary people. Fat is nature’s most concentrated energy source, providing 9 calories per gram - twice the caloric density of protein or carbohydrate. The liver and muscles are capable of metabolizing large amounts of fat for energy. So fat should be a great source of energy for athletes, right?

Not quite. As you know, bodybuilders avoid fat like the plague. Most bodybuilders these days try to limit fat consumption to as low as 5% of calories. What’s the problem with using fat as an energy source?

The main thing is that dietary fat has a very strong tendency to deposit as body fat instead of being burned for energy. Here’s why: Conventional dietary fats are not soluble in water and this makes them very hard for your body to digest and absorb. In fact, the fat molecules can’t even get into the capillary beds of the small intestine. Inside intestinal cells these fats are incorporated into carrier particles called chylomicrons (1). The chylomicrons are released from the small intestine into the lymphatic system, a network of vessels throughout the body for transporting large particles. The chylomicrons are released from the lymphatic system into the bloodstream through the thoracic duct, in the neck. Once in the general circulation the chylomicrons are transported throughout the body - including to fat stores. The presence of glucose and insulin stimulates fat cells to store the fat molecules as body fat. So most of the fat on your plate is going to end up on your waist or hips.

Why doesn’t your body just go ahead and burn the fat as fuel instead of storing it? There are two primary forms of fuel your body uses for energy: fat and carbohydrate. Carbohydrate is your body’s favorite. It burns the carbs first and saves the fat for later. Why? Because fat is twice as concentrated in calories as carbs, your body reserves fat for its storage form of energy. By storing energy as fat it can compact more energy into a smaller space.

Fats are converted into energy in the mitochondria - little furnaces inside cells where foods are burned. The problem is regular fats can’t make it into the mitochondria by themselves - they have to be carried inside by a transport system called the carnitine shuttle (1). And the carnitine shuttle isn’t very active as long as carbohydrate fuels are available. Carbohydrate metabolism generates a by-product called malonyl-CoA, which inhibits the carnitine shuttle (1). This is the reason your body doesn’t burn much fat for energy until the carbs are used up.

CapTri® is a member of a class of lipids called medium chain triglycerides. CapTri® has a different molecular structure than body fat, so your body doesn’t just automatically store it in fat depots. In fact, your body treats it more like a carbohydrate (2). Remember how regular fats are incorporated into chylomicrons, transported via the lymphatic system, and are ultimately delivered to fat cells? CapTri® is a much smaller molecule and is more soluble in water, and this results in it following a different metabolic pathway.

CapTri® is transported directly from the small intestine to the liver, where it is immediately incorporated into the liver’s blood supply. The liver then sends the CapTri® directly to the mitochondria for energy. This is why CapTri® is a powerful energy source for athletes.
liver by the portal vein (1,2). In the liver CapTri® is immediately burned to produce energy (3). In contrast to conventional fats, CapTri® can get into the mitochondria by itself and doesn’t require the carnitine shuttle (1,2). Therefore, CapTri® is burned at the same time as carbohydrates (4). Inside mitochondria, CapTri® is burned in a process called beta-oxidation. Blocks of two carbon atoms are removed from the fatty acid chain, generating a metabolic intermediate called acetyl-CoA. The acetyl-CoA can then experience various metabolic fates, including ATP production via the Krebs cycle and oxidative phosphorylation, fatty acid synthesis or elongation, and formation of ketone bodies (2).

How does the energy from CapTri® get to my muscles? Since CapTri® does not require the carnitine shuttle for entry into mitochondria, it bypasses the rate limiting step in fatty acid oxidation. Medium chain fatty acids are thus burned much more rapidly and extensively than conventional fats (2). In the liver CapTri® is metabolized so rapidly that the capacity of the Krebs cycle can be overwhelmed (2). A major portion of the acetyl-CoA is then directed toward the synthesis of ketone bodies (2). The ketone bodies are released into the bloodstream and are taken up by muscles and used as fuel (3). Ketone bodies are a fast burning fuel and are used quite efficiently by muscles (3). Ketone bodies have been observed to decrease glucose uptake and utilization (5). An added benefit is that the ketones produced from CapTri® also spare the oxidation of branched chain amino acids, leaving them available for use as protein in the muscles instead of being burned as fuel (3).

Bodybuilders and endurance athletes know all too well that when you run out of glycogen, you run out of energy. Your body can store a very limited amount of carbohydrate, in the form of glycogen, in the liver and muscles. Scientists have shown that depletion of a muscle’s glycogen reserve coincides with the onset of fatigue (6). It’s especially noticeable when you’re on a low-carb diet getting ready for a show. Lipids like CapTri® have been shown to decrease glucose uptake and utilization (5) resulting in a glucose-sparing effect (7). Unlike conventional fats, CapTri® can be burned for energy even while there are still plenty of carbohydrate fuels available (4). This additional energy source makes the glycogen last longer. And if your glycogen reserves last longer you’ll have longer, more intense workouts.

Bodybuilders use CapTri® to provide energy for long hard workouts. Endurance athletes mix CapTri® into drinks so that they can go farther before running out of glycogen. CapTri® is the most highly refined, ultrapurified MCT on the market. The formulation of CapTri® was specifically designed for people who want to be as lean as possible. CapTri® is available exclusively from Parrillo Performance. If you’re

The mitochondrion. Entry of conventional fats is limited by the activity of the carnitine shuttle. Since CapTri® can enter by itself, it is immediately burned for energy.
looking for a concentrated source of calories which can readily be used for energy, try CapTri®.

**References**


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One tablespoon of CapTri® is loaded with 114 calories, as many as a 6.5 ounce baked potato. CapTri® provides bodybuilders and endurance athletes a high-density energy source immediately available to be used as fuel.
Q. We’ve been getting a barrage of calls and questions lately about protein. “Can’t the body only digest 50 grams of protein a day? Isn’t too much protein bad for you? Can too many amino acids be harmful?”

To address these questions, let’s take a look at what science says.

The amount of protein actually required by bodybuilders is as hotly debated as the entire subject of nutrition. The National Research Council sets the recommended daily allowance (RDA) at 0.8 grams per kilograms of body weight a day — the equivalent of 0.36 grams per pound of body weight a day. Based on the RDA, a 200-pound bodybuilder would require 73 grams of protein a day. Unfortunately the RDA was established with average people in mind — not athletes.

Protein supplies nutrients called amino acids which are required for every metabolic process. All muscles and organs, in fact, are made from amino acids. Like most athletes, bodybuilders have higher requirements for protein than the average person. Without enough protein, you cannot build muscle, repair its breakdown after training, or drive your metabolism.

Various studies indicate that weight training athletes need greater amounts of protein. In one study, for example, ten weight lifters trained intensely and consumed 0.9 grams of protein per pound of body weight a day. Four of these athletes were found to be in negative nitrogen balance.

In another study, weight lifters who increased their protein intake from 1.0 to 1.6 grams per pound of body weight a day were able to increase both strength and lean mass.

Serious bodybuilders train aerobically as well, and this places some particular demands on the protein needs of the body. Prolonged aerobic exercise, for example, can burn amino acids, after the body uses up its stored carbohydrate for energy, thus elevating protein requirements.

Aerobic training in a protein-deficient state can lead to a condition called “sports anemia,” in which red blood cells and serum iron levels are reduced. During training muscle fibers are damaged and must be repaired following the exercise period. If your protein intake is low, the body draws on red blood cells, hemoglobin, and plasma proteins as a source of protein for muscular repair. When this happens, little protein is left to rebuild red blood cells at the normal rate, and sports anemia can be the result.

Clearly, bodybuilders must include ample protein in their diets to promote muscular fitness. Individual protein needs vary and depend on a number of factors, including a bodybuilder’s training intensity and level of conditioning. I have seen many bodybuilders improve their physiques by increasing their protein intake to as high as 2.5 grams per pound of body weight a day — nearly seven times the RDA.

Based on our experience at Parrillo Performance, hard training bodybuilders can achieve excellent results by consuming 1.25 to 1.5 grams of protein per pound of body weight a day. On our program, one gram of your protein intake per pound of body weight should come from lean protein sources such as lean white meat poultry, fish, and egg whites; The other .25 to .5 per pound of body weight should come from vegetables, particularly beans, corn and legumes. Avoid red meats and egg yolks. These are high in fat which easily converts to body fat.

Now about amino acids. These provide another way
to take in additional protein. Amino acid formulations are especially beneficial during periods of intense training and strict dieting. To protect lean body mass, many competitive bodybuilders increase their usage several months before competition.

The branched chain amino acids leucine, isoleucine and valine are directly involved in building muscle tissue. By carrying nitrogen, they assist the muscles in synthesizing other amino acids to promote growth and repair.

People consuming a high-protein diet should be sure to drink plenty of water and to get enough calcium. Protein metabolism generates ammonia, which is converted to urea and excreted in the urine and sweat. Drinking plenty of water aids the kidneys in removing this nitrogenous waste and dilutes calcium salts which could form kidney stones.

Notably, there is no evidence suggesting that strength athletes consuming a high-protein diet have an increased incidence of kidney disease. The data suggesting that a high-protein diet contributes to the progressive nature of disease come from people with pre-existing kidney problems. Many studies have demonstrated a positive correlation between protein intake and urinary calcium excretion. Results are equivocal regarding protein intake and calcium absorption. Some studies show that protein improves calcium absorption while others show the opposite. Calcium balance can be maintained during high protein diets by assuring adequate calcium and phosphorus intake (at least the RDA, 800-1200 mg/day) from both diet and supplementation.
Q. I’ve read a lot about using powdered supplements as meal replacements, either to lose body fat or put on mass. Are they effective or is this just hype?

A. To get the results you want, food will always work the most effectively. In years of working with bodybuilders and athletes, we have found that food is superior to all-supplement diets. Food provides something that all-supplement diets do not: the raw materials your body needs for growth or for stimulating chemical processes involved in the breakdown, absorption, and assimilation of nutrients. The digestive process, for example, requires “real” food — complete with its balance of nutrients and fiber — to do the job for which it was designed. The presence of food, acids, and enzymes in the duodenum (the first section of the small intestine) and the jejunum (the second section of the small intestine) stimulates the production of hormones required for the absorption of nutrients. Without food, these processes are interrupted, and the proper assimilation of nutrients is hindered.

Other important issues are involved as well. Foods such as legumes and other starchy carbohydrates contain special complex sugars called “oligosaccharides.” These sugars exert a healthful effect on the growth of beneficial bacteria in the gastro-intestinal (gi) tract. One family of these bacteria is called bifidobacterium. Because of the oligosaccharides’ effect on this type of bacteria, the sugars have been called “bifidus factors.” When bifidobacterium and other helpful bacteria are present in the gi tract, they prevent dangerous and sometimes deadly bacteria such as salmonella and E.coli from colonizing.

Human milk is another food that contains oligosaccharides, and it is well known that breast-fed infants quickly develop a protective population of bifidobacteria. Oligosaccharides have also been shown to protect cells from the invasion of the bacteria responsible for certain types of pneumonia, influenza, and other serious respiratory tract infections.

The bacterial population of the gi tract obviously plays an important role in nutrition and health. Scientists are now exploring the use of oligosaccharides in the treatment of digestive disorders, elevated blood fats, and other health problems. The ability of oligosaccharides to promote healthy bacterial growth underlines the importance of food as the source for these protective factors. In other words, you cannot obtain such factors from supplements.

In the Parrillo Performance Nutrition Program, we state that “food is the cornerstone of nutrition.” If you do not eat the proper foods – lean proteins, starchy carbohydrates, and fibrous carbohydrates, nothing else matters. No supplement can ever provide all the benefits that food supplies. We were built to process food, proteins, carbohydrates, and fats – not powdered or liquid supplements alone.

That’s not to say certain types of supplements are not effective. They are — but only when taken with food and at the proper time and in the proper combinations. The Parrillo Performance Nutrition Program tells you exactly how to do this.

If you want to make the best possible progress with your physique, I suggest that you forget the hype (and that’s what it is) surrounding all-supplement diets or meal replacement programs and get back to basics. And that means food.
Q. Does weight training have any direct effect on fat-burning?

A. Definitely. And the reason has to do with the muscle fibers, the basic element of the muscle. Muscle fibers are divided into three types: slow-twitch (also called slow-oxidative (SO) or Type I), fast-twitch oxidative-glycolytic (FOG or Type IIA) and pure fast-twitch (FT or Type IIB).

The slow-twitch fibers contract slowly. But they can sustain their contractions for long periods without fatigue. These fibers are used more in endurance activities such as long-distance running or swimming. Genetically, athletes with a predominance of slow-twitch fibers perform well in endurance competition.

Slow-twitch fibers get most of their energy from burning fat, a process that requires oxygen. This is further kindled by the fibers’ ample supply of blood vessels, mitochondria (cellular furnaces where fat and other nutrients are burned) and glycogen and blood fats inside their cells.

The pure fast-twitch fibers are different. They contract rapidly but fatigue more easily. Their energy comes from burning glycogen. There are fewer mitochondria in the cellular make-up of fast-twitch fibers. Athletes who excel in speed or power events such as sprinting or weight lifting appear to have a higher percentage of fast-twitch fibers.

Fast-twitch oxidative-glycolytic fibers contract quickly too, but they do not fatigue as fast. This may be because they have more mitochondria than the pure fast-twitch type but less than the slow-twitch fibers. But like the slow-twitch variety, fat can be burned by the fast-twitch oxidative-glycolytic variety for energy.

Interestingly, you can change pure fast-twitch fibers into fast-twitch oxidative fibers by high-volume training such as long duration aerobics or intense high-intensity training. Furthermore, this type of training actually increases the number of mitochondria in fast-twitch fibers to levels higher than those found in slow-twitch fibers. With more mitochondria in muscle cells, the fast-twitch muscle fibers burn more fat. Through high-volume training your body literally becomes as fat-burning machine.

If you want to burn more body fat, I suggest that you do high-rep work using heavy poundages. Work out intensely — so that you are breathing hard each time you finish a set. Increase the frequency and duration of your aerobics too.

This regimen is precisely how competitive body-builders train to lose fat before a contest. It’s an all-out approach that verges on over-training. But that’s what you have to do to change the fat-burning capacity of your muscle fibers. Remember too that you must follow a high-calorie, nutrient-dense nutrition program (food and supplements) as outlined in the Parrillo Performance Nutrition Program to fuel this level of intensity.
Like most people these days, I have a busy schedule. Often it’s hard to get my five to six meals every day. Got any suggestions?

Sticking to a multiple-meals nutrition program is easier and more convenient than most people realize. Here are several tips that will help you get all your meals in. First, cook several meals ahead of time each day and pack them in plastic containers until you’re ready to eat them. That way, your food is ready for microwaving. Second, incorporate meal supplements such as the Parrillo Supplement Bar™, ProCarb™, or Hi-Protein Powder™ into your daily nutrition program. An example of an eat-anywhere meal is a Supplement Bar, several rice cakes, a can of tuna, and some fibrous carbs such as raw broccoli or cauliflower. This works well if you can’t prepare a full meal. Another good idea is to put a couple of scoops of ProCarb™ and/or Hi-Protein Powder™ in your water bottle. When you’re ready to eat, fill it with water, and drink it, along with some chicken, tuna, or rice cakes, and some raw fibrous carbs.

I’m glad that you recognize the importance of eating five, six, or more meals a day. This pattern of eating is metabolically beneficial in three ways. To begin with, multiple meals that include starchy carbohydrates help keep insulin constantly present in the body. This powerful, growth-producing hormone helps make amino acids available to muscle tissue for growth and recovery. Insulin’s release is triggered by the conversion of carbohydrate into glucose by the liver.

Frequent meals also increase “thermogenesis,” the production of body heat from the burning of food for energy. Following a meal, your metabolic rate is elevated as a result of thermogenesis. So the more meals you eat, the higher your metabolism stays throughout the day for fat burning and muscle building.

Finally, with a constant nutrient supply, you are never forced into a starvation mode. With meals coming at regular intervals, your body learns to process food more efficiently, and your metabolism is accelerated as a result.

John Parrillo is the creator of the high-calorie approach to losing body fat and burning muscle. In fact, a leading muscle magazine has called him “an exercise and nutrition genius who knows more maximizing muscle mass and losing body fat than anyone else in the world.” John is the author of the new book HIGH PERFORMANCE BODYBUILDING and his best selling manuals, The Parrillo Performance Nutrition Manual™ and The Parrillo Performance Training Manual™.
Q. I’ve heard that doing aerobic exercise is a good way to burn body fat, but won’t it also cause me to lose muscle mass?

A. Never underestimate the power of aerobics in your training program. It has numerous benefits, from fat-burning to cardiovascular health to improved recovery mechanisms.

Many bodybuilders, however, typically shy away from aerobic exercise, particularly in the growth season, fearing that it will cause a loss of muscle mass. This loss, however, has less to do with aerobics and more to do with improper diet. A bodybuilder who loses muscle during a period of aerobic training is simply not eating enough to compensate for the calories spent by the aerobic activity. Take in enough quality calories, and you’ll preserve muscle mass while your body fat drops.

Aerobics forces oxygen through your body, increasing the number and size of your blood vessels. Blood vessels are the “supply routes” that transport oxygen and nutrients to body tissues, including muscles, and carry waste products away for muscular growth, repair and recovery, the expansion of this circulatory network is called “cardiovascular density.”

Your ability to build additional muscle is limited by your degree of cardiovascular density. Without aerobics in your total bodybuilding program, your body can’t create any new supply routes for your newly developed muscles. The more blood vessels you have and the bigger they are, the longer and more intense your workouts can be. In other words, the better your cardiovascular density, the greater potential you have for building bigger muscles.

Do your aerobics in the morning for 45 to 60 minutes — before breakfast. By exercising before your first meal, you begin burning fatty acids for energy in the absence of glycogen. You become leaner as a result. Then later, the carbohydrates you eat are efficiently re-supplied to muscles, without being turned into body fat. Plus, your metabolism is activated for the entire day.

Most people don’t understand the importance of “aerobic intensity.” For a long time now you’ve probably been urged to achieve your “target heart rate” during aerobic activity. This is the elevation of the pulse to approximately 60 to 80 percent of your maximum heart rate (220 minus your age). Reaching target heart rate and keeping it there for at least 20 minutes is supposed to boost general cardiovascular conditioning. Also, it’s always been assumed that if you exercise at your target heart rate long enough, you burn more fat.

Optimal cardiovascular is not achieved by just raising your heart rate, but is rather optimally achieved by increasing “oxygen uptake” or VO2max. This represents your body’s maximum capability to deliver oxygen to the working muscles. So how do you boost your VO2max? By exercising so intensely that you’re breathing hard. The harder you breathe the more energy you expend, and the more fat you burn. Granted, less of a percentage of fat is being burned compared to total calories, but more fat is being burned because more work is being performed.

Train consistently like this, and some important metabolic changes take place inside the body. First, the mitochondria (cellular furnaces where fat and other nutrients are burned) increase in size and total number inside muscle fibers. Second, muscle fibers build up more aerobic enzymes — special chemicals involved in fat-burning. Third, Aerobic exercise appears to increase levels of myoglobin, a muscle compound that...
accelerates the transfer of oxygen from the bloodstream into the muscle fibers. Remember to eat more protein so that you don’t develop sports anemia.

Larger mitochondria and more of them, greater levels of aerobic enzymes, and increased blood flow — these factors all boost the fat-burning capability of muscle fibers. The more aerobically fit you become and the harder you train, the more your body learns to burn fat for energy. So you can see why intense aerobic is so important for leaning out.

Endurance athletes have known these things all along. That’s why bodybuilders can learn a lot from the training regimens of endurance athletes. They train regularly and at long duration at or near their VO2max, and as a result their muscles are conditioned to rely more heavily on fat for energy and less on stored carbohydrate (glycogen). To approach the training level of an endurance athlete, perform aerobics several times a week, at my recommended duration. But don’t “coast.” Work out hard, so that you’re breathing hard. The harder you breathe, the more fat you burn.
Q. Halfway through my workouts. I’m losing energy in the gym. I feel that this is stalling my progress. What’s wrong and what can I do about it?

A. It sounds to me like your might not be taking in enough calories throughout the day. Make sure you’re fueling your body properly by eating five, six or more meals per day with ample calories to fulfill your energy requirements. Your meals should consist of lean proteins, strachy, complex carbs and fibrous carbs. This combination will give you a slow release of glucose for sustained energy levels throughout the day. Also, practice pre-and post-workout supplementation, in addition to regular supplementation of vitamins, minerals, aminos, lipotropics and others. About 30 minutes before training take a supplement such as Max Endurance Formula™. Also, drink a carbohydrate supplement such as Pro-Carb™ while working out. This should help delay the onset of fatigue. To replace glycogen stores (muscle fuel) following your workout, supplement again with Pro-Carb™ or one of our supplement bars.
I’m an active person who works out, either aerobically or with weights, about six times a week. My problem is that I always feel like I’m out of energy. What can I do to keep energy levels high without gaining body fat?

How do you get health and vitality? In a word, calories. You’ve got to eat more of the right kinds of foods to build health. Unfortunately, some people still think that “less is more;” that is, the fewer calories they eat the more body fat they’ll lose. They start subsisting on diets in the 600 to 1000 calories range, most often while trying to follow rigorous aerobics and weight training schedules. These sub-calorie regimens don’t provide enough food to fuel their energy requirements. Their bodies go into a breakdown mode, in which muscle tissue (including heart muscle tissue) is lost. Not only that, vital nutrients are pulled from tissues to fuel the body, depleting nutritional reservoirs. The consequence is exactly the opposite of what is desired: poor health, sickness, injury.

Sub-calorie diets also slow the metabolism, the body’s food-to-fuel process, making it easier for the body to store fat. Nor can muscle be built if the metabolism isn’t running up to speed.

The answer to getting lean, muscular, and healthy is increasing calories. On the Parrillo Performance Nutrition Program, you gradually increase calories to lose body fat and gain muscle. Depending on your sex, size, activity level and present metabolic state, you eat between 2,000 and 10,000 a day, sometimes more.

When people first hear that my Nutrition Program allows up to 10,000 calories a day or more, they are amazed. But not all of those calories come from food. A certain proportion comes from nutritional supplements. If you’re eating 10,000 calories a day, for example, about 4,000 of those calories are usually obtained from food supplements such as medium chain fatty acids like CapTri® and from protein and carbohydrate supplements like Hi-Protein Powder™ and Pro-Carb™.

Nutritional supplements play a key role in metabolism and nutrition. Used in conjunction with the proper foods, they assist in decreasing body fat supporting muscle growth, extending endurance and promoting better recovery and repair after training.

Food selection is critical. My program includes lean proteins (fish, white meat poultry, and egg whites), starchy carbohydrates (potatoes, yams, brown rice, legumes and whole grain cereals) and fibrous carbohydrates (salad vegetables, green beans, cauliflower, broccoli and others).

Each meal should be structured to include a lean protein or two starchy carbohydrates and one or two fibrous carbohydrates. This combination of foods has two important benefits: First, the protein and fiber slow the digestion of carbohydrates — and consequently the release of glucose — to provide consistent energy levels and sustained endurance throughout the day. Second, this combination provides a constant supply of nutrients so that your body can maintain its energy, growth and repair status.

Also, you should eat five to six meals a day or more, spaced two to three hours apart. This pattern of eating is metabolically beneficial — for three reasons. First, it helps naturally elevate your body’s level of insulin, a hormone with powerful anabolic (growth-producing) effects. One of its chief roles in the body is to make amino acids available to muscle tissue for growth and recovery. Insulin’s release is triggered by the conver-
sion of carbohydrate into glucose by the liver. When glucose is introduced into the bloodstream, the pancreas releases insulin in response.

For growth to occur, insulin must be constantly present in the body so that amino acids and glucose can move into the muscle tissue. Following a meal, amino acids remain available for protein synthesis for only about three hours. By eating meals of protein and carbohydrate two to three hours apart, you assure that your system is releasing adequate amounts of insulin, which, in turn, can exert its growth-producing action.

The second reason frequent meals are beneficial involves “thermogenesis” — the production of body heat from the burning of food for energy. Following a meal your metabolic rate is elevated as a result of thermogenesis. Consequently, the more meals you eat, the higher your metabolic rate stays throughout the day.

Third, with a constant nutrient supply, you are never forced into a “starvation mode,” a state induced by repeated cycles of low-calorie dieting in which the body prepares itself for famine. Because meals are coming at shorter, regular intervals, your body learns to process food more efficiently, and your metabolism is accelerated as a result.
Q. My bench press hasn’t increased in a year. What should I do?

A. There are two tactics you can use: the first is difficult, and the second is easy. I’ll start with the difficult tactic. First of all, incorporate negatives in your bench press routine. Negatives, in which the eccentric or lowering portion of the exercise is performed, enhance neuromuscular efficiency — the ability to recruit a greater number of muscle fibers during muscular contraction.

By doing negatives, you totally exhaust low threshold nerve paths, allowing you to systematically work the higher threshold nerve paths. This ultimately trains the whole muscle to fire at once. Negatives build a quick-firing muscle and you become stronger as a result.

Heavy negatives performed with a spotter, as well as fascial stretching between sets, will increase your golgi tendon reflex threshold. The higher your golgi tendon reflex threshold, the more intensely you can train. This leads to greater gains in strength and size.

The easiest tactic you can use to increase your bench press is to consume more calories to gain more weight. Concentrate on gaining weight at the rate of a pound per week per 100 pounds of bodyweight. To do that, gradually increase your intake of lean proteins, starchy carbohydrates and fibrous carbohydrates until you are gaining at the suggested weight. Quality weight gain of muscle will help boost your strength levels in all your lifts, in addition to your bench press.
Q. Why do you have certain foods on your nutrition program, while excluding others like fruit and dairy products?

A. In working with top bodybuilders and athletes for over 20 years, we’ve identified which foods yield the best results in terms of physique and performance. We’ve learned exactly what foods to eat, what foods to avoid, and how to structure meals.

Lean protein, for example, supplies nutrients called amino acids which are required for every metabolic process. Athletes have higher requirements for protein than the average person. Without enough protein, you cannot build muscle, repair its breakdown after training, or drive your metabolism.

Starchy and fibrous carbohydrates supply energy and are stored as glycogen in the muscles and liver.

You need certain fats called Essential Fatty Acids (EFAs), which must be supplied by the diet. EFAs regulate many biological functions, including the manufacture of connective tissue, cellular walls, and hormones. You can get EFAs from safflower oil, canola oil, flaxseed oil, linseed oil, and sunflower seed oil, among others.

It’s true that fruits and fruit juices are not included in our program. Before explaining why, let me say that fruit is very healthy and high in vitamins, minerals, and fiber. We recommend it for health-conscious people who are not trying to maximize muscle and minimize body fat. We suggest, however, that bodybuilders avoid fruit and fruit juices.

Here’s why: Fruit contains fructose, a simple sugar that is easily converted to body fat. In digestion, food passes from the stomach to the intestines to the liver and finally to the bloodstream. Because of fructose’s molecular structure, the liver readily converts it into a long chain triglyceride (a fat). Therefore, a majority of the fruit you eat can ultimately end up as body fat on your physique. The athletes on our program notice incredible differences when they eliminate fruits and juices from their diets. Eliminating fruit in favor of natural complex carbohydrates, which are also high in vitamins, minerals, and fiber, helps competitors become leaner and more muscular.

Dairy products should be avoided too because they contain lactose, a simple sugar. In addition, dairy products are high in fat. Both simple sugars and fat are easily converted to body fat.

First and foremost, our Nutrition Program is based on food—foods with a “high-nutrient density.” This describes ratio of nutrients in a food to the energy it supplies. Natural starchy foods like potatoes, yams, brown rice, and whole grains are packed with carbohydrates, protein, vitamins, and minerals. Fibrous vegetables are rich in vitamins, minerals, water, fiber, and carbohydrate. And, lean proteins (white meat poultry, fish, and egg whites) are high in protein, vitamin, and minerals. In short, high-density nutrient foods pack a lot of nutritional wallop, and that’s why they’re on our program.

Try to stay away from low-nutrient density foods. These are typically “junk foods” such as processed foods, sweets, soft drinks, alcoholic beverages, and high fat foods. Low-nutrient density foods are easily
converted to body fat or, as in the case of alcohol, can interfere with the body’s ability to metabolize fat.

You can increase the nutrient density of your nutrition by adding in supplements, but only after you are eating properly. By taking supplements, you force your digestive system to process more nutrients. This allows the nutrient levels in your body to be increased at the cellular level beyond what can achieved by food alone. This, along with a gradual increase of calories, helps your body grow. Supplements are quality nutrients that work in conjunction with food to help your body build its metabolism and recovery mechanisms.

Never be misled into thinking that supplements work alone, however. Food is the ultimate growth-enhancing substance.
Today, it seems that so many athletes are searching for a miracle supplement or a miracle training technique that will transform their physiques overnight. What they don’t realize is that they must take a comprehensive approach to bodybuilding.

At Parrillo Performance, we teach you the basics—a set of interrelated programs that are “synergistic;” that is, they all work together to produce the best results. There are five interdependent components involved: proper nutrition, supplementation, training, stretching, and aerobics. These work synergistically to produce results. I’ll briefly explain each one:

1. Proper nutrition: This involves training your metabolism to partition food more effectively, so it can be used to burn fat and build muscle. A diet that achieves this is a high-calorie one (between 2,000 and 10,000 calories a day or more) with five or more meals spread throughout the day and spaced two to three hours apart.

   The meals in this diet should include the proper combination of lean proteins, starchy carbohydrates, and fibrous carbohydrates. This combination of foods slows your digestion for consistent energy levels and increased endurance throughout the day and provides a constant supply of nutrients for muscular growth and repair.

2. Supplementation: Vitamins, minerals and electrolytes, amino acids, medium chain fatty acids, aspartates, lipotropics, and other supplements increase the nutrient density in body cells, activating your body chemistry for growth. Supplements, however, will never replace proper nutrition. Once you’re eating correctly, supplements can be added to your diet to maximize the results.

3. Workouts: The optimum training routine employs heavy/low rep sets to build mass and thickness and high rep sets to build shape and “cardiovascular density.” By cardiovascular density, I mean the size and number of blood vessels. When this circulatory network is increased, more nutrients are carried to the muscles while performance-inhibiting toxins are effectively transported away. All of this results in muscular growth. In other words, the greater your cardiovascular density, the bigger you can become.

4. Fascial Stretching: This is an advanced and specialized method of stretching which I developed just for bodybuilders and athletes. It involves stretching between each exercise set when the muscle is fully pumped and utilizes some very aggressive self and partner-assisted stretches. Fascial stretching stretches the fascial sheath that covers the muscle and leads to greater mass, muscularity, and muscular separations.

5. Aerobic Training: This is absolutely critical for three reasons. First, aerobic exercise enhances recovery. Second, it builds cardiovascular density; and third, it accelerates fat-burning. Aerobics should be performed at certain times during the day: at night after your last meal and in the morning before breakfast, especially if you are trying to lose body fat. In the morning, your body draws upon fatty acids for energy in the absence of muscle glycogen. As a result, more body fat is burned.

   The key point to remember is that these components work together. The most intense training system in the world, for example, will yield only marginal results...
unless you’re fueling yourself with proper nutrition. Used together, however, each of these components will help you achieve your physique and performance goals.
Q. Even though I’m a competitive bodybuilder, I never know exactly how to eat in the off-season to get good results. What’s your off-season nutrition prescription?

A. Many bodybuilders use the off-season to go off their diets, eating everything in sight and paying very little attention to nutrition. For competitive bodybuilders, the off-season is the ideal time to put on muscle, while staying relatively lean. That way, you don’t have to diet as hard as your contest approaches. In the off-season, you must eat enough to increase your body weight and still stay strict on your nutrition program. Eat the right foods (lean protein, starchy carbohydrates, and fibrous carbohydrates) in the right combinations and in multiple meals (five, six, or more a day). In addition, use CapTrir, supplements such as ProCarbt, Hi-Protein Powder, or any of our Supplement Bars to increase your daily caloric intake. (For more information on off-season nutrition, consult the Parrillo Performance Nutrition Manual. Ordering information is on page 14.) Be as consistent with your nutrition during the off-season as you are during the competitive season, and you’ll emerge ready for your contests bigger and more defined.
I’ve been dieting to lose body fat for 12 weeks now, and I seem to have reached a plateau. What should I do?

It sounds like you’ve been in a caloric-deficient state for too long. Your body has adjusted to that caloric level, and as a result, it stops burning body fat. When denied enough food, the body begins to feed on the protein in the muscles. Because muscle is the body’s most metabolically active tissue, depleting it interferes with your ability to burn calories. Plus, staying in a caloric-deficient state lowers your metabolic rate, making it harder for your body to burn fat.

To break your plateau, move into a caloric-surplus state. This will help recharge your metabolism. For a period of two to four weeks, gradually increase your calories — even to the point of gaining weight at the rate of a pound per week per 100 pounds of body weight. That way, you can increase your muscle, which in turn boosts your metabolism so you can burn fat much faster.

Look at it this way: If you gain a pound a week for four weeks and lose a pound a week for four weeks, you’ll gain more mass and be much leaner than if you tried to lose first and gain later. So try to put on weight for several weeks. You will be amazed at how much bigger — and leaner — you will get. Depending on your sex, size, activity level, and present metabolic state, you should eat enough calories a day to gain at the desired rate.

Additionally, make sure you are increasing calories with the proper foods — foods that will help you construct new muscle and stay lean. Not all foods do this. The same number of calories from different foods has different effects on your body weight. This is very easy to prove. Just try replacing 1,000 calories of potatoes and brown rice with 1,000 calories of candy and ice cream in your diet, and see what happens to your body fat levels.

Conventional dietary fat and food containing it (including fatty cuts of meat) tend to be easily stored as body fat. The reason is the chemical composition of dietary fat is similar to that of body fat, so very little energy is needed to turn dietary fat into body fat. By contrast, protein and carbohydrate must be chemically converted to fat before they can be stored as fat. This conversion process uses up a portion of the calories contained in the protein and carbohydrate food, and this expenditure reduces the tendency of these foods to be converted to body fat.

Simple sugars are easily converted to body fat too, although to a lesser extent than conventional fat. When simple sugars are released into the bloodstream faster than the body can use them to replenish glycogen stores or meet energy requirements, an over-production of the hormone insulin occurs. This insulin response causes fat cells to take up the excess sugar and turn it into body fat. Insulin is important in the process of protein synthesis for muscle growth; yet, paradoxically, too much stimulates fat production.
Why do you exclude fruit and fruit juices from your Nutrition Program?

I am frequently asked to explain why fruit and fruit juices are not included in my Nutrition Program. The answer has to do with a little-understood simple sugar found in fruit: fructose.

Fructose came into favor years ago because of its low glycemic index. Unlike other simple sugars, it triggers neither a surge in insulin nor a corresponding drop in blood sugar an hour or more after eating it. But there’s more to the fructose story.

After you work out, your body moves from an energy-using mode (catabolism) to an energy-storing and rebuilding mode (anabolism). During the transition, dietary carbohydrate is broken down into glucose and fructose to be used for “glycogenesis,” the manufacture of glycogen to restock the muscles and liver.

Fructose is used primarily to restore liver glycogen; it’s really not a good re-supplier of muscle glycogen. Glucose, on the other hand, bypasses the liver and is carried by the bloodstream straight to the muscles you just worked, where the glycogen-making process begins. Any muscle emptied of glycogen due to exercise is first on the list to get its quota of glucose.

Clearly, one of the keys to effectively restoring glycogen is the type of carbohydrate you eat. Natural, complex carbohydrates such as potatoes, yams, whole grains, corn, legumes or maltodextrin-based drinks like our Pro-Carb™ Formula do a better job at this than simple sugars do. In one study, a diet high in starchy carbohydrates restocked more glycogen in the muscles 48 hours after exercise than simple sugars did.

If you eat simple sugars like fructose, you’re not going to be able to store as much glycogen. What implications does this have for you as an athlete or bodybuilder?

First, you won’t be able to train as hard or as long during your next workout because you will be glycogen-deficient.

Second, you’ll notice less of a pump while working out, also due to lower glycogen stores in the muscle. If you can’t get a good pump, it’s difficult to fully stretch the fascia tissue surrounding the muscle when you stretch between sets. This limits your growth potential.

Third, fructose is easily converted to body fat. Because of fructose’s molecular structure, the liver readily converts it into a long-chain triglyceride (a fat). Therefore, a majority of the fruit you eat can end up as body fat on your physique. People on our program notice incredible differences when they eliminate fruits and juices from their diets.

If you want to get leaner and more muscular — and build your recuperative powers by restocking glycogen more efficiently — avoid fruit altogether and choose starchy and fibrous carbohydrates instead, as our Nutrition Manual recommends.
Q. Is there such a thing as the “Perfect Supplement” and what is it?

A. As bodybuilders and athletes, we’re continually on the trail of the perfect nutritional supplement. What is the “perfect supplement” and does it exist on the market? The answer to both of these questions is YES!

To begin with, it’s formulated to build mass and burn bodyfat. It provides all the essential and protective nutrients your body needs for peak health, including protein, carbohydrates, essential fatty acids, vitamins, minerals and antioxidants.

The perfect supplement is a slow-release energy source, one that builds and re-builds glycogen stores for endurance and stamina as well as for repair and recovery. It also has the ability to increase your metabolism. And, it contains fiber to keep your digestive system in good working order.

This supplement also contains amino acids, including the branched chain aminos, to help synthesize protein for muscular growth. What’s more, it helps prevent sports anemia, electrolyte imbalances, and other conditions associated with hard training.

Is there such a supplement...one that does it all...one that will transform your physique and boost your performance to never-dreamed of levels?

You bet. And it’s called “FOOD.”

Think about it. Food really does all these things. It is the “perfect supplement.”

For starters, it does build mass and keep you lean — as long as you choose foods that partition to muscle and energy stores and not to fat depots. Your food should come from lean proteins, starchy carbs and fibrous carbs. In the growth-season you need at least one gram of protein from a lean protein source, such as white meat chicken or turkey or fish, per pound of bodyweight. You should obtain an additional .25 to .5 gram of protein per pound of bodyweight from carbohydrates. Protein supplies amino acids for growth and are the building blocks for every cell in the body.

Starchy carbohydrates include such foods as potatoes, sweet potatoes, corn, rice, oatmeal, and other unrefined cereals, beans and legumes. In addition to supplying vitamins, minerals and antioxidants, these foods give you energy to train and the ability to recover quickly.

Fibrous carbs include asparagus, broccoli, cauliflower, green beans, spinach, salad vegetables, and other high fiber, low calorie vegetables. Besides providing fiber, these foods also supply an abundant amount of vitamins, minerals, electrolytes and antioxidants. During pre-contest dieting, you can adjust your intake of starchy carbs and fibrous carbs to help burn more bodyfat.

Next on the list of food “musts” are fats. Each day, take one teaspoon to one tablespoon of unsaturated oil. Safflower, sunflower, linseed, flaxseed or Hain All-Blend are excellent choices. These supply vital nutrients called Essential Fatty Acids (EFAs) which are involved in many biological functions.

It’s one thing to select the right foods and yet another to know how to properly combine them to build metabolism. Each meal should include one lean protein source, one or two starchy carbs and one or two fibrous carbs. This combination of foods is critical. The protein
and fiber slow the digestion of starchy carbohydrates, giving you consistent energy levels throughout the day.

You should structure your meals so that you eat five, six or more meals a day, spaced two to three hours apart. By eating multiple meals in this manner you give yourself a constant supply of nutrients so your body can grow and get big.

Your meals should total between 2,000 and 10,000 calories or more a day. Your individual requirements will vary, depending on your sex, age, size, level of conditioning, metabolic status and proximity to your next contest. Do not jump in at the highest caloric level, however! You must gradually increase your daily calories. If you plateau and are not making gains, gradually add in between 300 to 500 calories to keep putting on weight.

The point is, food is the foundation. There’s no supplement that has ever come close to providing everything you get from food. That’s not to say that you don’t get results from supplements — you do. But you have to start with food first. When you add the right supplements to the proper nutritional foundation, you’ll be bowled over by the progress you can make.
I’ve read a lot about high fat diets. What is your view on this type of dietary regimen?

Diets high in conventional fat (otherwise known as long chain triglycerides or LCTs) have been around for a long time and now appear to be making a comeback. There are, however, a number of problems associated with these diets. While being high in fat, they are also low in carbohydrates, the body’s preferred source of fuel. Low carbohydrate diets upset the body’s electrolyte balance, namely the sodium/potassium ratio. Along with glycogen stores, this may be the reason for the weight gain experienced when carbohydrates are added back into the diet. This weight gain may not be muscle.

The fats typically used in high fat diets come from processed sources, often containing high levels of bacteria, which impairs the function of the Reticuloendothelial System (RES). The RES plays two important roles in the body. First, it clears harmful bacteria in the system. And second, it is involved in lipid clearance. (Guyton’s Textbook of Physiology, 368-369)

After a person goes on one or two cycles of a high fat diet, certain cells in the RES that produce antibodies become loaded with fat droplets, and their ability to clear bacteria from circulation is reduced. Bacteria goes undigested, is not processed in the liver and can end up in the lungs. This action can cause inflammation and possible organ failure. In addition, high fat diets have been linked to cancer, possibly due to the role in fat suppressing the immune system. (Food Technology, 1991)

These health consequences do not occur with diet supplemented with medium chain fatty acids (MCFAs), however. In fact, a five-year study by the American Health Foundation demonstrated that MCFAs (includes MCTs) are a non-tumor promoting fat. Other research has shown the MCFAs and other structured lipids like omega-3 fatty acids do not hinder the function of the RES. (Food Technology, 1991)

If you follow the Parrillo Nutrition Program, you know that we recommend supplementing the diet with the lipid CapTri, our MCFA. CapTri can be used to supply additional calories to support muscular growth and energy needs — without being stored as body fat. For a detailed explanation of how this supplement works, consult the Parrillo Performance Nutrition Manual. Where conventional fats are concerned, we recommend that you eat up to one tablespoon a day or more of safflower, linseed, canola or flaxseed oils to prevent an essential fatty acid (EFA) deficiency.
People come to us for results. It’s that simple. Results are the bottom line. Bodybuilders care about gaining muscle, losing fat, and improving overall health - and they come to us because we can show them how. There are probably a hundred companies that will be happy to sell you supplements. What sets us apart is we provide the information you need to get results — as well as the highest quality supplements available. The foundation of our program is The Parrillo Performance Nutrition Manual. We believe that food is the foundation of nutrition and to derive the most benefit from supplements they should be used in conjunction with the proper diet. We’ve spent years working with bodybuilders perfecting the optimum diet for gaining muscle, losing fat, and improving overall health. Some people work hard at bodybuilding but don’t make any progress because they’re missing one component, and that’s holding them back. Our program works the best because it’s a comprehensive approach to bodybuilding, based on proper nutrition, intense training, aerobics, and stretching.

You’ve seen people who train hard but never seem to grow, and people who spend a lot on supplements but don’t get any results. Not on our program. We know of no one who has followed our program without getting good results. True, our program is demanding and it takes an enormous amount of work, dedication and consistency. It’s not for everyone — it’s for serious bodybuilders who are willing to put forth the effort to get results.

In the Nutrition Manual, we explain the practical information about how to design your diet: which foods to eat, how to combine them, how to divide your calories among protein, carbs, and fat, and how to make adjustments to your diet to ensure that you continue making progress. These days, nearly all of the competitive bodybuilders are following this diet. It has become so standard that you don’t really hear people arguing about nutrition in the gym much anymore.

Basically, everyone is in agreement about what the optimum diet is. But we still get a lot of technical questions about the reasons behind the diet — the underlying principles of biochemistry and metabolism. That’s why we’ve put together this series of technical bulletins that address many of the biological processes behind nutrition and supplementation. These bulletins should help you better understand how the body utilizes the foods and supplements you incorporate in your diet.
stand the basics of how fats are metabolized in the body. Conventional dietary fats found in foods are called “long chain triglycerides” (LCTs). They contain long chain fatty acids (LCFAs), which are 16-22 carbon atoms in length. This also turns out to be the kind of fat stored on your body. CapTri® is known as a medium chain triglyceride (MCT), because it is made of “medium chain fatty acids” (MCFAs), which are only 6-12 carbon atoms long. This difference in molecular structure is the ultimate reason why CapTri® behaves differently in the body than conventional fats (1).

You know that your body is about 70 percent water and that fat is not very soluble in water (oil and water don’t mix). Your body has to go through an elaborate digestive process in order to absorb and metabolize fats (2). The gall bladder produces bile to help dissolve the LCTs, generating little fat droplets called micelles. Cells in the intestines make protein carrier molecules to help transport the triglycerides. These fat-protein complexes are called chylomicrons and are released from the intestines into the lymphatic system. The chylomicrons eventually reach the bloodstream through the thoracic duct. Once in the bloodstream, the fats are circulated throughout the body. Insulin causes fat cells (adipocytes) to absorb the fat molecules and store them as body fat.

CapTri® has a smaller molecular structure and is more soluble in water (1). Therefore, it is easier for your body to absorb and does not require this complicated digestive process. Whereas conventional fats are prone to be stored as body fat, CapTri® is transported directly from the small intestine to the liver by the portal vein. In the liver, some of the CapTri® is turned into ketone bodies which the muscles can use for energy (1). Some is used for thermogenesis (heat), and a portion is converted to ATP, the energy currency of the cell (1,3,4). CapTri®, therefore, is processed in the liver so there is little left to be stored as fat.

CapTri® provides the caloric density of fat—but without the tendency to be stored as fat (1). In fact, medium chain triglycerides have been demonstrated to contribute less to body fat accumulation than conventional fats or even carbohydrates.

In summary, excess calories from any food can be stored as fat, but some foods are much easier to convert to fat than others. Carbohydrate or protein has to be converted to fat before it can be stored as fat. Conventional dietary fat, on the other hand, already has the same chemical structure as body fat. This is why excess calories coming from conventional fats are very prone to be stored as body fat.

CapTri® is processed by the liver and is immediately burned to produce energy, so it has very little tendency to contribute to body fat stores (1).

CapTri® is the purest, most highly refined MCT on the market and is considered to be the world’s premier MCT supplement.

CapTri® is an excellent way to provide extra calories which can be used to support activity or growth without contributing to body fat.

REFERENCES

MCFAs: An Amazing Energy Source
by John Parrillo

Excess calories from any food can be stored as body fat, but some foods are much easier to convert to body fat than others. Conventional fats are the easiest to store as body fat because they already have the same chemical structure as body fat. By comparison, protein and carbohydrate have to be chemically converted into fat before they can be stored as fat. This conversion process uses up some of the calories contained in the protein or carbohydrate food, so this reduces the tendency of these foods to contribute to body fat stores. This is why we recommend a diet high in natural complex carbohydrates and lean protein, and that consumption of conventional fats be kept to an absolute minimum. Just be sure to take a tablespoon of linseed oil or safflower oil everyday to supply essential fatty acids.

Since CapTri® is transported to the liver (instead of fat cells) and burned for energy, it’s no surprise that it contributes less to body fat accumulation than conventional fats do. The amazing thing is that CapTri® contributes less to body fat stores than carbohydrates (3, 4). Even though we’ve just started our discussion of how CapTri® works, we’ve already hit on the central reason why so many bodybuilders are using it today: CapTri® is extremely caloric dense, but due to the way it is metabolized, it has very little tendency to be stored as body fat. It’s the ideal supplement for bodybuilders—concentrated source of calories that won’t make you fat. The calories from CapTri® represent an energy source which can be used to fuel activity or support weight gain.

Now, let’s examine what happens with CapTri® inside the liver. The liver is a miraculous organ; it’s the workhorse of your metabolism. Your liver knows more about biochemistry than all of the scientists in the world. When you mention bodybuilding, everybody thinks of muscles. But your liver is doing all the behind-the-scenes biochemical work that makes it possible. If your muscles are a race car, then your liver is the pit crew. Your liver occupies a central position in metabolism, including metabolism of fat.

Once inside the cells, fat molecules are burned in structures called mitochondria. The mitochondria are little furnaces where the foods you eat are burned to produce energy. All of the enzymes responsible for fat burning are located in the mitochondria. Therefore, if fats are not permitted to enter the mitochondria, they cannot be burned for energy. Conventional fats (LCTs) cannot simply enter the mitochondria by themselves because they can’t penetrate the mitochondrial membrane (1). Instead, they have to be actively transported across the mitochondrial membrane by a special transport system called the carnitine shuttle. Without the carnitine shuttle (1), conventional dietary fats and body fat cannot be burned for energy. (Given an adequate diet your body can make its own carnitine, but we add some to our Lipotropic Formula just to make sure.)

Carbohydrate metabolism generates an intermediate called malonyl-CoA, which inhibits the carnitine shuttle (1). Furthermore, carbohydrates trigger insulin release, and insulin stimulates fat synthesis and fat storage. For these reasons, fat is not burned much as an energy source if carbohydrate fuel is available. This is why we recommend that you do your aerobics either first thing out of bed before breakfast, right after training or after your last meal because at these times you’re relatively carb depleted and will burn more fat for energy.

In contrast to conventional fats, CapTri® can enter the mitochondria by itself and does not require the carnitine shuttle (1, 2). Therefore CapTri® can be burned for energy even in the presence of carbohydrates. This is another reason why CapTri® has very little tendency to contribute to body fat stores: Conventional fats...
can be burned only after carbohydrate fuels have been exhausted, but \textit{CapTri\textsuperscript{®}} can be burned at the same time as carbs (5). The calories from \textit{CapTri\textsuperscript{®}} are an additional energy source which can be used at the same time as carbohydrates, and this helps the carbohydrate fuel last longer (6). This is known as the glyco-
gen sparing effect. The more energy you have, the longer and harder your workouts can be.

Let’s summarize the reasons why \textit{CapTri\textsuperscript{®}} is not stored as fat:

- Conventional fats have the same molecular structure as body fat, but \textit{CapTri\textsuperscript{®}} has a different molecular structure (1, 2).
- Conventional fats are circulated throughout the body, and insulin stimulates fat cells to pick up the fat molecules from the bloodstream and store them. \textit{CapTri\textsuperscript{®}} is not circulated throughout the body but is processed by the liver (1, 2).
- In the liver, \textit{CapTri\textsuperscript{®}} is rapidly burned to produce energy. Some of this energy is used by the muscles and some is converted to body heat. Once the \textit{CapTri\textsuperscript{®}} is burned up, there’s nothing left to be stored (2).
- \textit{CapTri\textsuperscript{®}} does not require the carnitine shuttle for entry into the mitochondria, so it can be burned for energy at the same time as carbohydrates (2, 5).

For these reasons, we recommend \textit{CapTri\textsuperscript{®}} as a key supplement in your nutritional program. Unlike dietary fats, \textit{CapTri\textsuperscript{®}} supplies the body with calories ready to be burned for energy with very little tendency to be stored as body fat.

\section*{REFERENCES}

Energy and MCFAs
by John Parrillo

Whereas regular fats are circulated throughout the body and are prone to be stored as body fat, CapTri® is transported directly to the liver where it is immediately burned to produce energy.

MCFAs (includes MCTs) are very easy for your body to metabolize. In fact, your body prefers to burn MCFAs for energy rather than converting them to stored body fat. So far in this series we’ve covered the digestion, absorption, and metabolism of CapTri® and conventional dietary fats. We’ve also explained the reasons why conventional fats make you fat but CapTri® does not. Whereas regular fats are circulated throughout the body and are prone to be stored as body fat, CapTri® is transported directly to the liver where it is immediately burned to produce energy (1). Conventional dietary fats have the same molecular structure as body fat, so it’s easier for your body to store them.

Metabolism of conventional fats is a lot of work for your body (as you’ve noticed on the stair climber) and in general your body will go to the trouble to burn these fats as your carbohydrate sources are depleted. CapTri®, while being a fat, has a different molecular structure from the fat stored on your body: The fatty acid chains are shorter (1). As it turns out, this results in CapTri® being very easy for your body to metabolize, and your body prefers to burn CapTri® for energy rather than converting it to the form of storage fat (1). If eating regular food is like throwing a log on the fire, then eating CapTri® is like pouring gasoline on the fire. Since CapTri® burns so fast, it has very little tendency to be stored and that is the reason it’s so popular with bodybuilders.

The calories from CapTri® can be used to fuel activity or to support weight gain. Athletes add CapTri® to their food to provide additional calories and make drinks out of CapTri® to use while they train. Some endurance athletes even use it while they’re running.

We explained that CapTri® is metabolized in liver mitochondria. Mitochondria are little furnaces inside cells and are the site of cellular energy production. Mitochondria are sometimes referred to as “the powerhouse of the cell.” As you know, the body produces energy from the foods we eat by combining the foods with oxygen from the air we breathe. This type of chemical reaction is called “oxidation” because it involves reaction with oxygen and is very similar to burning things in a fire. Many oxidation reactions release energy, just like a fire does. The main difference between burning something in a fire and inside your body is that the energy of a fire is released as heat to the surroundings. When foods are burned inside the body, some of the energy is captured so it can be used by the body. This process of burning foods occurs in the mitochondria, and the energy is captured by a molecule called ATP. ATP is the direct source of energy used for all bodily functions, including muscle contraction. Before the energy contained in foods can be used by the body, it has to be converted into ATP.

Unfortunately, body fat and conventional dietary fat cannot enter the mitochondria by themselves because the fat molecules can’t make it across the mitochondrial membrane (2). These fat molecules have to be actively carried across the membrane by the carnitine shuttle. If carbohydrate fuels are available, this transport system is not very active (2). This is why your body burns fat only after carbohydrates have been depleted and is one of the reasons why fat tends to be stored so easily. In contrast, CapTri®, with its small molecular structure, can get into the mitochondria by itself and doesn’t need the carnitine shuttle (1,2). This means that CapTri® is burned immediately—at the same time as carbohydrates (3). This additional energy source has a carbohydrate-sparing effect (4).

What happens to CapTri® inside liver mitochondria? If CapTri® is burned in the liver, how can the energy get to my muscles? Here’s how:

Once inside the mitochondria, all fats are burned in a process called beta-oxidation. In beta-oxidation, blocks of two carbon atoms at a time are chopped off the end of the fatty acid chain. This forms an intermediate called “acetyl-CoA” which then enters an energy-producing pathway known as the “Krebs cycle.” The products of the Krebs cycle then enter the “electron transport chain” which generates our old friend ATP, as the chart below shows.
All of this occurs inside the mitochondria. What happens with CapTri® is that it gets burned in the liver so fast that it makes an enormous amount of acetyl-CoA, and the Krebs cycle can’t keep up with it all. In other words, the Krebs cycle can only make ATP so fast, and CapTri® can overwhelm it. So what happens is that some of the acetyl-CoA gets diverted to a different metabolic fate—conversion to ketone bodies (1).

This process is termed “ketogenesis”—which simply means the manufacture of ketones. What happens is two molecules of acetyl-CoA combine to make one molecule known as a ketone body, or simply a ketone. This process occurs with regular fats too. Your body produces ketones from your body fat while fasting. Under normal conditions, however, regular dietary fats do not produce many ketone bodies because they’re not burned that fast. The Krebs cycle can keep up with it and turn all the acetyl-CoA into ATP. But CapTri®—and not regular fats—will still produce ketone bodies if carbohydrates are ingested at the same time (3). This indicates two things: that CapTri® is burned at the same time as carbohydrates, and that CapTri® is burned really fast.

So, a significant proportion of the CapTri® molecules are converted into ketone bodies in the liver. These are released into the bloodstream and are taken up by muscles to be used for energy (1). In the muscle cells the ketones are converted back into acetyl-CoA and are further metabolized to generate ATP, as outlined. This explains what happens to CapTri® inside liver mitochondria, how it is converted into energy, and how this energy is transported to the muscles to be used.

One interesting point about ketone bodies is that they are readily excreted in the urine—unlike fatty acids or glucose. So any extra calories which are not used as fuel can be eliminated instead of being converted into fat. Add that to your list of reasons why CapTri® is not stored as fat.

CapTri®, unlike conventional dietary fat, is burned very quickly in the liver, producing acetyl-CoA. Part of this is converted to ATP in the Krebs cycle. The remainder, which is a significant portion, is converted to ketones which travel from the liver to the bloodstream to the muscles where it is converted to energy.

You can see that CapTri®, as a supplement to your daily diet, provides your body with the energy-producing calories used in metabolic processes by being converted to ketones which are used directly by the muscles as energy. Ketones can also be excreted by the body when not used, therefore not being converted to bodyfat. Simply put, using CapTri® is one of the most efficient ways to get your body the energy it needs for desired results.

REFERENCES
MCFAs: Metabolic Rate

by John Parrillo

You can control your rate of energy expenditure by careful selection of foods and supplements, proper nutrient combining and proper timing of meals.

Last month we talked about how CapTri is burned in the liver to produce energy, and how some of this energy is converted into ketone bodies which are used by your muscles. Now we’re going to take a look at the bigger picture of energy production by the body. Granted, you’re probably not a biochemist, and may not care about what happens to every molecule inside your body. But the more you understand about something, the better you can control it.

It’s no coincidence that the biggest, leanest bodybuilders are also the ones who consume the most calories - as many as 8,000 to 10,000 a day. On the other hand, how many fat people have you met who are always on a diet - who skip meals and live on 1,000 calories a day? Obviously, the bodybuilders know something the others don’t. If 8,000 calories can make you lean and 1,000 calories can make you fat, then there must be something going on here.

When it comes to gaining or losing weight, everybody is obsessed with how many calories they consume. And that’s good - but it’s only half the story. Changes in body weight are not governed by energy consumption, but by energy balance. There are two sides to the balance equation: energy consumption and energy expenditure. Many people overlook the expenditure side of the equation, because they don’t understand it, but it’s just as important. Obviously you will have more control over your body if you learn to control both sides of the energy equation, instead of just one. And we’re here to show you how.

Everyone knows that you expend energy when you exercise. The lifecycle even tells you how many calories you’re burning. You probably also know that your body is constantly burning calories, even when you’re just sitting around. But what you may not realize is that your rate of energy expenditure - your rate of calorie burning - goes up every time you eat (1). And how much it goes up depends on what you eat. So therefore you can control your rate of energy expenditure by careful selection of foods and supplements, proper nutrient combining, and proper timing of meals. To understand how to do this, you have to know some basic science.

Metabolism is a term which describes the total chemical activity going on inside your body (2). Metabolism has two sides: an energy-consuming component called “anabolism,” and an energy-producing component called “catabolism.” You can think of your metabolism as the flow of energy through your body. This energy is measured in calories.

The “metabolic rate” is your body’s rate of energy expenditure, and is expressed in calories per hour. Nearly all of the energy expended by the body is ultimately converted to heat (2). (The only real exception to this when work is performed outside the body.) Therefore, the metabolic rate can be measured as the amount of heat given off by the body. Since greater than 95% of the energy liberated by the body is derived from the reaction of foods with oxygen, the metabolic rate is proportional to the rate of oxygen consumption (2). In practice, the metabolic rate is measured by the rate of oxygen consumption, since this is much easier than trying to measure how much heat the body gives off.

Anabolism means “building up,” and describes the process of building new bodily tissues. Anabolism is growth. Anabolic steroids are called anabolic because they stimulate growth. Your body produces its own anabolic steroids naturally, and our program is designed to help you take maximum advantage of what your body is capable of doing naturally. Foods provide the building blocks that your body is made out of as well as the energy which fuels your activities. The process of growth essentially amounts to your body disassembling the molecules of the food you eat and restructuring them into the molecular form of new human tissue. This transformation process requires energy, as well as the building blocks used to make new human tissue.

Catabolism means “tearing down,” and is the process of degrading nutrients to provide energy and building blocks. The foods you eat can experience three general metabolic fates: they can be burned to release energy, they can be digested into small building blocks to be used for growth, or they can simply be excreted. Your body is pretty efficient at absorbing nutrients, and not too many are excreted.
without being used. If you consume nutrients in excess over what is required to maintain your current body weight and activity level, the excess calories will generally be converted into body weight - either muscle or fat. The Parrillo diet is specifically designed to provide your body with the building blocks it needs to construct new muscular tissue, but not to give it building blocks which are used to make fat tissue. Of course, excess calories from any food can be converted to fat, but if you are careful and do everything just right you can direct most of those excess calories to muscle. We’ll go more into this in the coming months.

After you eat a meal your body begins to burn the food to release energy. Since food is burned by reaction with the oxygen that we breathe, the rate of oxygen consumption increases after eating. This is proportional to the increase in metabolic rate - the rate of energy expenditure. So in other words, the metabolic rate increases after you eat (1). The same number of calories (the same amount of energy) from different types of foods can have different effects on metabolic rate (3). Different foods increase the metabolic rate to different extents probably due to both the inherent energy content and chemical composition of the food, as well as its rate of digestion and absorption.

So how do you use this information? There are several key ideas. One is that you should eat small, frequent meals. Since your metabolism speeds up after each meal, eating frequently keeps your metabolism elevated all day. If you eat 3,000 calories per day, you will be leaner if you eat six 500 calorie meals instead of one 3,000 calorie meal. If you provide your body with too many calories at one time, some of them will be converted to fat. Give your body a constant and steady supply of energy - enough to fuel your activities and make muscle, but not so much that you’re putting on fat. Your body can only make muscle so fast, so we suggest you gain no faster than 1-2 pounds per week.

Another important point is to always eat breakfast - this gets your metabolism going first thing. This is why breakfast is probably your most important meal. You have the whole day to burn off any excess calories you consume at breakfast - any excess calories you consume right before bed are likely to be stored as fat.

Another one of the keys is to combine your foods properly, so as to slow the release of glucose into the bloodstream. Carbohydrates are digested down into glucose, which is the form of sugar released into the blood. If too many carbs are consumed, or if they are released into the blood too rapidly, the insulin response causes the excess to be taken up by fat cells and converted into fat in a process known as lipogenesis. (We’ll get more into that in the coming months.) By eating unrefined, complex carbohydrates - and not simple sugars - you slow the release of glucose into the blood. This is also the reason we have you combine fibrous carbs and protein together with your starches at each meal - it slows the rate of digestion and release of glucose.

And guess what else? CapTri dramatically increases the rate of oxygen consumption - and thus the metabolic rate - after a meal. It’s no accident that we’ve incorporated CapTri at the core of our supplement program. The reason? As you know, CapTri is a very concentrated source of calories - calories that can be used for energy and to support weight gain. The increase in oxygen consumption that occurs after you eat CapTri means that it is being burned very fast (4, 5). Remember, foods are burned by reacting with the oxygen we breathe, so the reason oxygen consumption increases after you eat is to supply enough oxygen to burn the food to produce energy. As we explained last month, some of this energy is converted to ketone bodies and transported to the muscles. But that’s not the whole story.

Some of the energy from CapTri is converted into body heat in a process known as thermogenesis (4, 5). This is the single most important reason why excess calories from CapTri have less of a tendency to make you fat than excess calories from other foods. CapTri is burned so fast that excess calories from it are turned into body heat instead of being converted into fat. This is why I’ve called CapTri the best supplement ever developed for bodybuilders - it’s an excellent way to supply extra calories but has very little tendency to make you fat.

Next month we’ll go into more detail about the thermogenic effect, energy expenditure, and introduce you to the concept of food efficiency.

REFERENCES

Energetics and Thermogenesis
by John Parrillo

The net energy balance determines whether you will gain or lose weight, but what kind of foods you eat will determine if it’s muscle or fat.

Last month we talked about metabolic rate—the body’s rate of energy expenditure. Most people are very aware of their caloric consumption, but many still ignore the expenditure side of the energy balance equation. That’s a shame, since it is energy balance, not just energy consumption, which determines whether you’ll gain or lose weight. As it turns out, you can exert a considerable amount of control over your metabolic rate by following certain eating habits. Our Nutrition Program is based on using nutrition to control your metabolism. It is possible to eat more than before and get leaner and more muscular as a result. We teach you how to control your metabolism, so you can target your calories to muscle and train your body to burn fat instead of storing it.

Gain and loss of body weight are governed by a simple thermodynamic principle: the conservation of mass and energy. If more or less calories are consumed than expended then weight is gained or lost, respectively. Although this statement is correct, its simplicity is deceiving (1). The human body is very complex, and here’s where some knowledge about metabolism comes in handy. Different foods are metabolized differently and are converted into body weight with different efficiencies (2). This is described by the term “food efficiency,” which is defined as the calories consumed of a particular food divided by the resulting weight gain (3). You may not have realized it, but a given number of calories from one food may have a very different effect on your body weight than the same number of calories from a different food (2). This is easy to prove. Just pull out 1000 calories of potatoes and rice from your diet and replace it with 1000 calories of candy and ice cream, and see what happens.

So you must not only consider the net energy balance (calories consumed versus calories expended) but also the type of calories consumed. If we were throwing foods into a bonfire they would all burn about the same. However, human metabolism is more complex than a bonfire. To the human body, not all calories are the same. Different foods are digested at different rates and with different efficiencies. And different nutrients perform different functions within the body. Generally speaking, calories coming from protein are used for maintenance, repair, and growth of tissues and organs; calories from carbohydrates are used for energy; and calories from conventional fat are very prone to be stored as body fat. Simply put, the net energy balance determines whether you will gain or lose weight, but what kind of foods you eat will determine if it’s muscle or fat.

The food that you eat can experience three general metabolic fates. It can be burned to liberate energy, it can be converted into body weight, or it can be excreted. All foods release heat when they are burned. Not all foods are burned completely to produce energy however; some of them are only partially degraded to provide building blocks to support repair and growth of your tissues. The heat liberated from a particular food is thus a measure not only of its energy content but also of its tendency to be burned. This is known as the “thermic effect of food” (TEF), or the “thermogenic effect” (1). Increased thermogenesis means increased heat production, and this correlates with increased oxygen consumption and metabolic rate (4). Food efficiency is simply a measure of how efficiently a particular food is converted into body weight. Foods with a high food efficiency are more prone to be converted to body weight while foods with a low food efficiency are more prone to be burned for energy.

CapTri® has a very low food efficiency due to the thermogenic effect. This means that it is burned for energy instead of being converted into body fat. CapTri® is rapidly absorbed and metabolized to release energy (5). As we’ve discussed previously, some of this energy is converted into ketone bodies which are transported to the muscles to be used as fuel to power muscular contractions (5). Some of the energy released when CapTri® is burned is simply converted to body heat in the process of thermogenesis (2,6,7).

Think of it this way: CapTri® is burned very efficiently, so it is stored very inefficiently.
Energetics and Thermogenesis

If you’ve read the previous bulletins, you now understand the basics of what CapTri® is, how it works, and why it’s so different from other fats. Now we can get into more detail about some of its more interesting properties and the ways bodybuilders use it.

It should come as no surprise to you that CapTri® has a lower food efficiency than regular fat (2). This means that regular fat will contribute more to body weight gain than an equivalent number of calories from CapTri®. (Unfortunately, most of the weight you gain from regular fat will be fat, not muscle.) The main reason for this is that CapTri® is burned for energy, and a significant portion of this energy is released as body heat (2,6,7). While regular fat can also be burned for energy, it has more of a tendency simply to be stored away as body fat, since it already has the same molecular structure as body fat. Regular fats (LCTs) are not burned much as long as carbohydrates are available, since the carnitine shuttle is not activated until carbohydrate fuels have been depleted. You can think of the carnitine shuttle as a switch which turns on fat burning after the carbs have run out.

But what may come as a bigger surprise is that CapTri® also has a lower food efficiency than carbohydrate (3,8). This means that CapTri® is burned even more efficiently than carbs! These experiments were performed on rats, since at the end of the experiment you can dissect the rat and accurately determine its body composition. Generally, the rats are fed a caloric excess so they will gain weight during the trial. The rats are divided into three groups: a low-fat group, a LCT group, and a MCT group. Grams of protein were held constant among groups, and the remainder of calories are supplied as carbs, conventional fat, or MCT.

Of course, the rats fed conventional fats (LCTs) gained the most weight—because they gained more fat (3,8). Lean body mass was essentially the same in all groups at the end of the experiment. Of the three groups, the rats fed MCT were by far the leanest. They gained about 60% less fat than either the LCT or low-fat groups (3). (I’m sure the results could have been even better, but rats don’t exercise much.) This means that CapTri® is more difficult for your body to convert into fat than carbohydrates are. Do bodybuilders take advantage of this? You bet they do.

When you’re gaining weight in the off season, you can add CapTri® to your food to provide extra calories. And those extra calories are less prone to be stored as fat than if you used conventional fats or carbohydrates to supply the extra calories. Before a contest you can decrease your carbohydrate intake and make up the difference with CapTri®. This lets you use the low-carb strategy to lose fat, but the calories from CapTri® provide a source of energy in place of the carbs so you don’t feel like you’re starving. CapTri® is a concentrated source of calories which can be used to support weight gain, and the low food efficiency makes it a good source of calories when you’re dieting. That’s why most of our bodybuilders use it year-round.

Keep in mind, CapTri® is not a drug, and there’s nothing magic going on here. CapTri® is just a food which provides calories, like any other food. The point is that different types of foods have different molecular structures and are therefore processed differently by the body. Different foods have different effects on your metabolism.

REFERENCES
Liver: Natural Iron

by John Parrillo

Liver has been a mainstay supplement for bodybuilders and power athletes for years — and for good reason. Recently, endurance athletes have also realized the incredible nutritional value of liver. Liver provides heme iron, high quality protein, and B vitamins, thereby meeting several of the increased nutritional needs of athletes in a single blow. Heme iron is responsible for hemoglobin’s ability to carry oxygen in red blood cells. Heme iron is the best absorbed — the most bio-available — of all iron sources (2,6). And liver is nature’s best source of heme iron (2).

Your body generates energy by breaking down foods and transporting the food molecules to all the cells of the body. Inside the cells, the foods are burned in a chemical reaction called “oxidation,” which simply means reaction with oxygen. (This is very similar to what happens to food when it burns in a fire.) For foods to be converted to energy, the cells have to get plenty of oxygen. This constant need for energy is so critical that if tissues are deprived of oxygen for more than a few minutes they will die.

As you know, red blood cells are responsible for transporting oxygen to all the tissues of the body. They do this by binding oxygen to hemoglobin, the red pigment in the blood. Hemoglobin is a protein that includes a special chemical structure known as heme—a complex of porphyrin and iron. And it’s the iron which binds oxygen in the lungs and subsequently releases it in the muscles and other peripheral tissues. Muscles contain myoglobin, an oxygen-carrying protein that works inside cells. Like hemoglobin, myoglobin also requires iron to bind oxygen. Without the iron, the whole oxygen transport system won’t work. Not only that, but iron is also required by the enzymes in the electron transport chain—the series of reactions in which oxygen is consumed in the cells. So iron is required not only for transporting oxygen to the tissues but also for its use inside cells. Because of its critical role in oxygen utilization, iron has earned its reputation for occupying a central position in energy metabolism.

Iron deficiency is widely recognized as the most common nutritional deficiency in the world (2, 3). As many as 22% of American women are iron deficient, and the number is as high as two-thirds in developing countries (1, 2). The daily iron requirement for women is 18 mg per day, while on average they obtain only 10-12 mg per day (1). Men have lower daily iron requirements, so are somewhat less prone to suffer from deficiency. Among athletes, about 10% of males are iron deficient, compared to 22-25% of females. Many times a feeling of fatigue or low energy is the result of an unrecognized iron deficiency (2, 3).

Dietary iron sources are usually divided into two general categories: heme iron and nonheme iron (2). Heme iron is iron which is already bound to heme—the red pigment in hemoglobin. Good sources of heme iron are red meat and liver. White meat chicken and turkey breast also contain heme iron, but in lower amounts (2). The form of iron found in plants is not incorporated into heme and is therefore called nonheme iron. Iron from red meat and liver, in the form of heme iron, is much easier for your body to absorb (6).

Iron deficiency is associated with vegetarian diets (1). Some vegetables, such as beans, corn, and spinach, contain a significant amount of iron. Unfortunately, iron from vegetable sources is poorly absorbed (1). Only 1.4% of iron from spinach is absorbed. Seven percent of iron from soybeans is absorbed, making it one of the best vegetable sources of iron.

Red meat provides much higher amounts of iron per serving than vegetable sources (2). Additionally, liver is an even better source of iron than red meat. Furthermore, the iron from red meat and liver—heme iron—is much easier for your body to absorb (2, 6). About 15-20% of iron from red meat and liver is absorbed (2). The higher iron content of these foods, along with the greater bioavailability of heme iron, makes red meat and especially liver much better dietary iron sources.

Another factor may also be involved in explaining the association of iron deficiency with vegetarian diets. The efficiency of iron absorption depends on protein intake (5). Meat proteins improve the absorption of heme and nonheme iron (5). Furthermore, the presence of heme iron also improves the absorption of nonheme iron (4). Athletes who do not eat red meat or liver have an increased risk of developing anemia (6).
Liver: Natural Iron

Anemic children and adults are often thought of as backward or apathetic (2). Recently it has been realized that subclinical iron deficiency, less severe than anemia, can result in poor performance on a variety of behavioral and cognitive tests (2). This effect is reversible and responds to iron supplementation, depending on the severity of the deficiency. Some test scores of children improved after a single iron injection, while in other experiments 11 or 12 weeks of iron therapy resulted in improvement. Several studies have found a positive correlation between IQ and iron levels: the higher the iron level, the higher the IQ (2). Bear in mind, however, these studies are concerned with deficient children, and increasing iron levels in children with already sufficient amounts would not be expected to confer any advantage.

It is well established that iron deficiency decreases work output and athletic performance (3, 6). This is primarily due to reduced oxygen carrying capacity of the blood, but reduced aerobic capacity of the muscle (due to tissue level iron depletion) is involved as well (3). Iron supplementation has been shown to be effective at increasing productivity of iron deficient workers. Plantation workers and rubber tappers in Central America (2) and tea pickers in Sri Lanka (3) who were iron deficient displayed decreased performance and work output. Following iron supplementation, productivity improved (2, 3). Also, iron deficient children and adults are much more likely to suffer from infectious diseases than those receiving iron supplementation (2). White blood cells need plenty of oxygen to kill invading bacteria. And having a good, strong immune response is critical to maintaining optimum health.

“Sports anemia” is induced by exercise training and endurance athletes are especially at risk (1, 3, 6). Many times, sports anemia is not associated with a true iron deficiency. Skeletal muscle fibers are damaged during intense exercise training, and this damage must be repaired during the recovery period following exercise. If dietary protein intake is inadequate, the body will draw on red blood cells, hemoglobin, and plasma proteins as a source of protein to repair the muscles (3). If protein intake is limited, repair of muscle tissue may soak up all of the incoming protein and not leave enough left to rebuild new red blood cells at the normal rate. Increased protein intake may be effective in treating sports-induced anemia (1). Often times, an athlete experiences a decrease in red blood cell count and serum iron levels during the early phase of training (1). This could be due to the fact that aerobic training causes an increase in myoglobin (an oxygen carrying protein) and cytochrome content of muscle tissue and the protein and iron required for their formation could be obtained from destruction of red blood cells (1, 3). In other words, myoglobin may be increased at the expense of hemoglobin if protein intake is inadequate.

Athletes with low hemoglobin levels do not perform as well at endurance events. Interestingly, endurance athletes have the highest incidence of sports anemia and also have the highest protein requirements. There seems to be an iron cost associated with exercise (3) and there is no question that iron deficiency compromises athletic performance (6). Studies suggest that athletes have a higher than usual incidence of iron deficiency, and this is probably caused by iron depletion during exercise (3). Female athletes and endurance athletes are especially at risk of iron deficiency (1, 2, 3, 6). Iron deficiency anemia reduces maximal oxygen uptake, reduces work output, and increases the time required to recover between workouts (1). Encouragingly, iron supplements have been shown to be effective in reversing the effects of iron deficiency and in restoring hemoglobin levels (1, 2). Iron supplementation is effective in improving athletic performance and work output of deficient individuals (1, 3). It has been reported that iron supplementation alone will not correct true sports anemia, which is reasonable when considering it as a protein deficiency. However, since liver provides both high quality protein and heme iron it should be beneficial to athletes suffering sports anemia. Liver may also be effective in preventing the iron deficiency induced by exercise training.

Liver is the best source of heme iron (2). Heme iron is damaged by cooking, reducing the bioavailability of iron by as much as 50% (5). Desiccated liver supplements thus represent probably the most bio-available iron source. Parrillo Performance Liver-Amino Tablets™ are made from de-fatted liver, which means you don’t get all the fat and cholesterol that comes along with liver and red meat. Plus we add predigested casein to further increase the protein content to 1.5 grams per tablet. This is why we feel Parrillo Performance Liver-Amino™ is one of the best supplements available for bodybuilders and endurance athletes: It provides heme iron, high quality protein, and B vitamins all in one.

REFERENCES


Proteins are found in all cells and tissues and are required for the structure and function of every part of the body. And of special interest to bodybuilders, muscles are made of protein.

Proteins are chain-like molecules, and the links of protein chains are called amino acids. About 20 different amino acids occur in human proteins. Twelve of these can be made within the body. The other eight are called “essential amino acids” because they cannot be made by the body; therefore, it is essential that they be obtained from the diet. The proteins you eat as food are not directly incorporated into your body tissues. Instead, the protein chains are digested to yield short fragments (peptides) and individual amino acids which are absorbed into the bloodstream. The individual amino acids then serve as building blocks your body uses to build its own proteins. If any one of the amino acids is deficient, your body can’t make new protein molecules. They all have to be there at the same time.

Protein is required in the diet to maintain tissues and organs and to supply building blocks for growth.

Proteins are required in the diet to maintain tissues and organs and to supply building blocks for growth. Proteins from animal sources such as meat, eggs, and milk, are called “complete” proteins because they supply all the essential amino acids. Animal proteins provide a balance of amino acids similar to that of human tissues. Plant proteins have a profile of amino acids different from human proteins. For this reason animal proteins are considered to be higher quality protein foods. Most vegetable proteins are deficient in one or more of the essential amino acids and are therefore called “incomplete” proteins. However, if vegetable proteins are combined properly, the balance of amino acids in the combination can approach the amino acid profile found in animal proteins.

While animal proteins are generally high quality protein foods, a problem arises in that many of them also contain a lot of fat. You must be selective when using animal proteins to avoid the fat that comes along with them. Good lean protein sources include skinless turkey breast, skinless chicken breast, fish, and egg whites. Occasional red meat is fine, as long as you consume the leanest cuts. Always trim all visible fat.

There has been a lot of debate about the protein requirements of athletes. Historically, nutritionists assert that athletes do not require any more protein than sedentary people. Athletes, however, believe they need more. There is some reason behind both points of view. On one hand, it is well known that weight lifting causes damage to muscle tissue (1). So it makes sense that someone who lifts weights would have to eat more protein than a sedentary person because his body has to repair that damage. Furthermore, if you want to increase the amount of muscle mass on your body, it seems obvious that you would have to eat some extra protein to support this growth. On the other hand, nutritionists point out that this increase need for protein is offset by increased efficiency of protein utilization in the trained athlete (1). If your body utilizes its protein food more efficiently, then it may not need any extra after all. Furthermore, eating excess protein does not in itself make you more muscular. If it did, we would just eat more protein food and get more muscular. Unfortunately, it’s not that easy.

The National Research Council sets the recommended daily allowance (RDA) for protein intake at 0.8 grams protein per kg body weight per day (g/kg/day). This works out to be 0.36 grams per pound body weight each day (g/pound/day), which is 56 grams per day for a typical male and about 72 grams per day for a 200 pound bodybuilder. This value for the RDA was determined to be the amount required by most of the average population—not for athletes or other very active people. Recently, a new way of measuring the protein status of the body has been developed—the metabolic tracer technique. Using this method, protein requirements are seen to be 23-178% greater than estimated by the nitrogen balance technique (2), a conventional method of measurement.

Much modern research indicates that the protein needs of athletes range from 1-2g/kg/day (0.45-0.9g/pound/day)—about twice the RDA (3). Other studies suggest that some hard training strength athletes require in excess of 2g/kg/day (0.9 g/pound/day) to maintain nitrogen balance (4) and that as much as 3.5g/kg/day (1.6g/pound/day) may be beneficial in maximizing gains in strength and mass (5). Apparently, the increase in efficiency of protein utilization which has been reported to occur during adaptation...
Protein: Superfood For Bodybuilders, Part I

to exercise may not always be enough to offset the increase protein demand. In other words, the RDA for protein may not always be enough even if it is utilized with 100% efficiency. The RDA protein recommendation may be enough for sedentary people but endurance athletes and very muscular athletes need more.

Use Parrillo Performance Hi-Protein Powder™ for increased protein needs.

See bulletin #8 for more on protein.

REFERENCES


Protein: Superfood For Bodybuilders, Part II
by John Parrillo

Strength training is a powerful anabolic stimulus and, if performed properly, results in increased lean body mass (2). Specifically, the amount of myofilbrilar protein, composed of actin and myosin, is increased. Muscular tissue is made of protein which is synthesized from amino acids. The amino acids are derived from the digestion of protein foods. Therefore, eating more protein foods provides more building blocks for the synthesis of new muscular tissue (2, 6). After all, during intense weight lifting, the muscle fibers are damaged (this is why you’re sore after a workout), and they must be repaired (1). Muscular growth occurs by over-compensation during the repair process. The harder you weight train the more damage you do to your muscles (which stimulates growth), and the more protein you need to repair that damage. While strength athletes have known this for years, many nutritionists assert that excess protein will be stored as fat or glycogen. To reconcile these views, we should realize that most studies which fail to demonstrate that exercise increases protein requirements use subjects who are not training intensely enough to stimulate increases in lean body mass.

To extract several examples from the scientific literature: In a group of 10 weight lifters exercising intensely and consuming 2 g/kg/day (0.9 g/pound/day) protein, 4 were in negative nitrogen balance (4). In another study, a protein intake of 2.8 g/kg/day (1.3 g/pound/day) was found to result in higher nitrogen balance and greater muscular gains than an intake of 1.4 g/kg/day (0.64 g/pound/day) (7). When weight lifters increased their protein intake from 2.2 to 3.5 g/kg/day (1.0 to 1.6 g/pound/day) they increased in strength and lean mass (5). A protein intake of 2.6 g/kg/day (1.2 g/pound/day) was found to produce greater nitrogen retention than 1 g/kg/day (0.45 g/pound/day) (8,9). Taken together, these results suggest that a protein intake of 2 g/kg/day (0.9 g/pound/day) is inadequate for many athletes and that as much as 3.5 g/kg/day (1.6 g/pound/day) works better for at least some hard training athletes. Another reason athletes require more protein than sedentary people is that amino acids are used as fuel during exercise. After the body uses up its glycogen stores, it begins to burn amino acids (the building blocks of protein) and fat for energy. In the liver, amino acids with three or more carbon atoms can be converted into glucose via a process called “gluconeogenesis.” The branched chain amino acids (BCAAs) leucine, isoleucine, and valine can be burned for energy directly in the muscle.

This becomes significant during high intensity endurance exercise. Under conditions of prolonged endurance exercise (a 10-mile run, for example), the oxidation of amino acids can approach recommended daily protein requirements, and dietary amino acid needs could be elevated substantially (2, 10). In contrast, studies involving low intensity exercise actually indicate decreased protein need as the athlete adapts to the training regimen.

Oftentimes, an athlete experiences a decrease in red blood cell count and serum iron levels during the early phase of training (6). This condition, known as sports anemia, could be due to the fact that aerobic training causes an increase in myoglobin (an oxygen carrying protein) and cytochrome content of muscle tissue, and the protein and iron required for their formation could be obtained from destruction of red blood cells (6, 17). In other words, myoglobin may be increased at the expense of hemoglobin if protein intake is inadequate. Furthermore, skeletal muscle fibers are damaged during intense exercise training, and this damage must be repaired during the recovery period following exercise. If dietary protein intake is inadequate, the body will draw on red blood cells, hemoglobin, and plasma proteins as a source of protein to repair the muscles (17).

Increased nitrogen excretion (in urine and sweat) is commonly observed after exercise, suggesting that protein is being used as an energy substrate to fuel activity (1). Nearly all studies which include nitrogen loss through sweating find subjects to be in negative nitrogen balance during endurance activities. During prolonged exercise blood glucose levels drop, eliciting a release of glucagon from the pancreas. This hormone mobilizes amino acids from muscle tissue to serve as substrates for glucose synthesis in the liver. Dohm and coworkers (10) found an increase in urinary urea excretion (waste products from protein catabolism) during the day following a 10 to 12 mile run by
male runners. This result indicates an increase in protein catabolism induced by endurance exercise. The amount of protein metabolized was calculated to be 57 grams, enough to supply 18% of the energy expended during the run. The authors suggested that protein was catabolized, possibly from skeletal muscle, to provide precursors for glucose synthesis in the liver.

In summary, the short term studies indicate that endurance exercise is catabolic in nature, leading to an acute increase in protein catabolism. Some long term studies suggest an adaptive response to endurance training whereby the proteins are utilized more efficiently (1). Other experts suggest that protein requirements of trained athletes remain elevated after adaptation (11, 12, 13). For example, 57 grams of protein—equivalent to the RDA for a 158 pound man—may be catabolized as fuel during a 10-12 mile run (10). Apparently, the increased efficiency of protein utilization which occurs as an adaptive response to endurance training is not sufficient to accommodate the demands of intense or prolonged endurance exercise.

Of course, these arguments should not discourage strength athletes from engaging in aerobic exercise. Aerobic exercise is required to condition the cardiovascular system and maintain overall health and is very effective at burning fat. Athletes interested in increasing muscular mass should still participate in aerobic exercise but eat enough additional protein and calories to compensate for the energy expense.

The published studies generally use subjects engaged in either strength training or endurance exercise, but not both. Many professional bodybuilders perform two hours of intense weight lifting plus two hours of aerobic conditioning per day (or even more), while at the same time consuming a calorie restricted diet. Rather than being exceptional, we deal with many athletes following such a regimen as they prepare for competition. These athletes undoubtedly have exceptional protein requirements. On The Parrillo Performance Nutrition Program, we recommend that bodybuilders consume 1.5 grams of protein a day per pound of body weight. One gram per pound of body weight should come from lean proteins, with the remaining .5 gram per pound of body weight coming from starchy and fibrous carbs. We’ve seen bodybuilders greatly improve their physiques by following these guidelines.

If you don’t consume enough protein, your rate of muscular growth will be retarded. To help you meet your protein needs, we have developed Hi-Protein Powder. Each scoop provides 20 grams of ultra quality protein.

People consuming a high protein diet should be sure to drink plenty of water and to get enough calcium. Protein metabolism generates ammonia, which is converted to urea and excreted in the urine and sweat. Drinking plenty of water aids the kidneys in removing this nitrogenous waste and dilutes calcium salts which could form precipitates (kidney stones). Notably, there is no evidence suggesting that strength athletes consuming a high protein diet have an increased incidence of kidney disease. The data suggesting that a high protein diet contributes to the progressive nature of kidney disease come from people with pre-existing kidney problems (2). Many studies have demonstrated a positive correlation between protein intake and calcium excretion (16). Results are equivocal regarding protein intake and calcium absorption. Some studies show that protein improves calcium absorption while others show the opposite. Calcium balance can be maintained during high protein diets by assuring adequate calcium and phosphorus intake (at least the RDA, 800-1200 mg/day). Each of our Mineral-Electrolyte tablets provide 250 mg calcium and 250 mg phosphorus.

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Carbohydrates: Ultimate Food Fuel, Part I
by John Parrillo

Carbohydrates are grouped into two general classes: complex carbohydrates and simple sugars. Complex carbohydrates are nothing more than simple sugars linked together into long chains. Your body digests the complex carbs into simple sugars and releases them into the bloodstream as glucose. In the end, then, all carbohydrates are converted into glucose before they are used. Based on this, you might think it wouldn’t make any difference whether you get your carbs from starch or simple sugars—but it does.

Simple sugars are released into the bloodstream immediately, causing a rapid increase in blood sugar level and an insulin surge. Because simple sugars are released faster than the body can burn them for energy or store them as glycogen, insulin causes the excess to be converted to fat.

Complex carbs, on the other hand, must be digested, a process that slows down their rate of release into the bloodstream, resulting in a more moderate insulin release and a more uniform energy level. Also, since they don’t cause as big an insulin release, complex carbs are not as prone to be converted to fat. One hundred grams of sugar will have a different effect on your body than one hundred grams of starch, even though both supply 100 grams of carbohydrate.

The Parrillo Performance Nutrition Program further subdivides complex carbs into two classes: starchy carbs and fibrous carbs. Good sources of starchy carbohydrates are potatoes, rice, beans, oatmeal, and whole grains, and good sources of fibrous carbs include broccoli, lettuce, spinach, green beans, asparagus, and other fresh vegetables. On The Parrillo Performance Nutrition Program, you eat at least one to two servings of starchy carbs and one to two servings of fibrous carbs at each meal, along with a lean protein source.

High fiber foods such as fibrous carbs contain cellulose, a plant carbohydrate that humans cannot digest. Cellulose, provides bulk which helps with elimination and is good for your intestines. Also, fiber and protein slow the digestion of starchy carbs, resulting in a more gradual release of glucose into the bloodstream and more sustained energy levels. This way, insulin release is more moderate, rather than the sharp spike of insulin released in response to simple sugars. When you combine foods in the way recommended by our nutrition program, you have more energy and less fat storage. Plus, you can eat all the vegetables and salad greens you want and still stay lean.

Because simple sugars are released faster than the body can burn them for energy or store them as glycogen, insulin causes the excess to be converted to fat.

Be sure to avoid simple sugars. These include not only processed sugar but also foods like honey, milk, and fruit. Milk contains lactose, or milk sugar. Fruit contains a simple sugar known as fructose, which is easily converted to fat in the liver (1). Although fresh fruit and low fat dairy products are healthy, nutritious foods, they contain a lot of natural sugars which are easily converted into body fat. If you’re striving for ultimate leanness and a high energy level, avoid the consumption of sugary foods, including fruit and dairy products.

Animals have a very limited ability to store carbohydrate and instead rely on fat as the storage form of energy. Fat is a more efficient way to store energy because it contains nine calories per gram, as compared to four calories per gram in carbohydrate, and because it does not require water for storage, as does carbohydrate. Since animals are mobile, they store energy as fat. That way, they can store more energy in less space and with less weight.

Only about 600 grams of glycogen (the body’s storage form of carbohydrate) can be stored by the human, although this probably varies according to the individual’s training state, diet, and amount of muscle mass. Glycogen is stored mostly in the muscles where it will be used, and also to a small extent in the liver. Muscle glycogen is not released into the bloodstream and is only used by the muscle in which it’s stored.

After muscle glycogen stores become depleted, liver glycogen is broken into glucose units and released into the bloodstream for use by working muscles throughout the body and by the central nervous system. Because the human body cannot store much carbohydrate, it is very important, especially for athletes, to regularly consume a diet high in complex carbohydrates to fuel the body.

Many experiments indicate that
Carbohydrate is the body's preferred fuel during exercise. More than 99 percent of the carbohydrate is used in the body to form adenosine triphosphate, or ATP (2). ATP is the fuel source used directly by the muscles to power contractions. ATP is not stored by the body so it must be constantly produced from the aerobic metabolism of carbohydrates, fatty acids, and amino acids (aerobic means “with oxygen”).

Carbohydrate is unique in that it can also be metabolized anaerobically (without oxygen). The anaerobic production of ATP from carbohydrate is called glycolysis. Glycolysis makes a big contribution to the energy expended during very intense exercise of short duration, such as weight lifting. Lifting weights requires so much energy so fast that aerobic metabolism can't keep up with the demand. By the time oxygen can get from the lungs to the muscles and inside the cells, your set is already over.

Although glycolysis is relatively inefficient, it offers the advantage of generating energy instantly upon demand. One disadvantage of anaerobic metabolism is that it produces lactic acid as a waste product. Lactic acid accumulates in the muscles and the blood and is responsible for the burning sensation at the end of the set. The accumulation of lactic acid shuts down energy production and forces you to stop and rest. Most of the lactic acid makes its way from the muscles into the bloodstream. The liver is able to convert the lactic acid back into glucose so it can be used as fuel again. The conversion of lactic acid back into glucose requires oxygen, and this is why you continue to breathe hard for a few minutes while you’re recovering after a set. This pay-back from anaerobic metabolism is called “oxygen dept.”

In conclusion, your body likes to burn carbs for energy and to store energy as fat. Generally speaking, the more carbs you eat, the more carbs your body will burn for energy, and the more fat you eat, the more fat you’ll store. This is why athletes—and especially bodybuilders—should eat a diet high in complex carbohydrates and low in fat. In fact, anyone interested in having a lean, high-energy body should consume a high-carbohydrate, low-fat diet. We also recommend carbohydrate supplementation with Pro-Carb™, which is formulated with maltodextrin, a slow-releasing carbohydrate. Not only is it high in carbohydrates, but a Pro-Carb™ drink also supplies water which is needed for glycogen storage. To order Pro-Carb™, call our toll-free number at 1-800-344-3404.

REFERENCES


Carbohydrates: Ultimate Food Fuel, Part II

by John Parrillo

High intensity exercise of short duration, such as weight lifting, relies on the anaerobic pathway for adenosine triphosphate (ATP is the fuel source used directly by the muscles to power muscular contractions.) Under these conditions, only glucose can be used as fuel (1). Exercise of low to moderate intensity (up to 60 percent of aerobic capacity) can be fueled almost entirely aerobically (1). This means that carbohydrate, fat, and amino acids can all be used as fuel for low intensity exercise.

Hormones are released into the bloodstream during exercise, and these promote fat mobilization and the use of fat for energy. At low to moderate intensity exercise, fat and carbohydrate each supply about half of the energy (1).

Fat cannot be metabolized rapidly enough to meet the energy requirements of intense exercise (above 70 percent aerobic capacity). Furthermore, it takes more oxygen to burn fat than to burn carbohydrate (1,2). This makes carbohydrate a better fuel choice for intense effort, when oxygen supply is limited. For a given amount of oxygen, more energy can be obtained from carbohydrate than from fat. Muscle glycogen is the fuel source used for most forms of exercise, especially weight training. It takes 30 to 60 minutes of exercise for fatty acids to be available to the muscles to use as fuel (1). Up until this time, glucose derived from muscle glycogen is the primary fuel.

This is why it’s best to do your aerobics when you’re glycogen depleted, and the hormones released during exercise have had time to mobilize fatty acids. An excellent time for aerobics is in the morning before breakfast, because you’re glycogen depleted then. And, the longer you spend exercising, the more fat will be used as the fuel source.

Exercise training, especially endurance exercise, increases aerobic capacity. As the heart, lungs, and blood system get bigger and stronger, they can deliver more oxygen to the tissues. This allows relatively more fat to be used at a given level of exercise intensity. The anaerobic threshold is the intensity of effort at which lactic acid begins to accumulate and is usually expressed as a percentage of aerobic capacity (1). Lactic acid is produced from anaerobic metabolism of glucose, so the anaerobic threshold is a measure of how well your body is trained for aerobic energy production. Trained athletes start to accumulate lactic acid at about 70 percent of aerobic capacity, while untrained individuals begin to accumulate lactic acid in their blood at about 50 percent aerobic capacity.

Furthermore, if aerobically trained and untrained individuals exercise at the relative intensity (the same % VO2max), the untrained individual will accumulate more lactic acid in the muscles and blood than the trained individual (3). The difference would be even greater if exercise was performed at the same absolute oxygen requirement. This is explained in part by decreased clearance of lactic acid through the liver by untrained individuals (3) and also by more efficient aerobic metabolism of carbohydrates and fat in the trained athlete (4). In addition to increasing muscle glycogen storage, endurance training also increases the muscles’ ability to use fat as an energy source. This increased ability to burn fat spares glycogen stores, thus further increasing endurance (4). Endurance training increases the size and number of mitochondria in the muscles and activates enzymes involved in the Krebs cycle and oxidative phosphorylation - the central energy producing pathways of the body (1,3). This is one reason why bodybuilders should engage in aerobic exercise: It increases the ability to burn fat for energy. This not only helps you stay lean but also spares glycogen so you can train harder and longer.

Muscle glycogen reserves become progressively lower during exercise. During long bouts of exercise, glycogen reserves may drop to critically low levels - to the point of glycogen depletion (1). The athlete then feels exhausted and must stop exercising or dramatically reduce the intensity. The point of muscular fatigue coincides with glycogen depletion (5). This is separate from momentary muscular failure at the end of a set which is due to lactic acid accumulation. Glycogen reserves can also be depleted gradually over a period of days if carbohydrate intake does not match that utilized during exercise. This feeling of fatigue from failure of adequately replenish glycogen reserves is often interpreted as overtraining. In some cases, overtraining may be alleviated by increased carbohydrate consumption. Not getting a good pump in the gym is a clue that you’re probably glycogen deficient.

The amount of carbohydrates you take in affects your training intensity. A group of athletes consuming 300 to 350 grams of carbohydrate per day was seen to become progressively more glycogen depleted during successive days of train-
ing (6). After several days, these athletes were unable to continue with heavy training. In contrast, a diet providing 500 to 600 grams carbohydrate per day was seen to result in complete repletion of glycogen reserves, and athletes on this diet were able to maintain a heavy training schedule.

Of course, these numbers are not prescriptive. An individual athlete’s carbohydrate requirement depends on his energy needs, which in turn depend on the type, intensity, duration, and frequency of exercise. Endurance athletes require the most energy and the most carbohydrates. The longer and harder you train, the more carbohydrate calories you need.

Some athletes train so heavily that they have trouble consuming enough high carbohydrate foods to fuel their activities and replenish glycogen stores (1). Also, consuming a huge volume of food can cause gastrointestinal distress, bloating, or discomfort, and is not conducive to optimal exercise performance.

Carbohydrate drinks are very useful in this situation, as well as for athletes trying to further increase caloric intake. Carbohydrate beverages are also useful during training and athletic competitions to help maintain energy. The best carb drinks contain slow-release glucose polymers (dextrins) rather than simple sugars such as glucose, sucrose, or fructose. This is the formula contained in our Pro-Carb™ powder drink mix made from maltodextrin, a slow-releasing carbohydrate. To order Pro-Carb™, simply call our toll-free orderline at 1-800-344-3404.

REFERENCES


The technique of glycogen supercompensation (glycogen loading) allows an athlete to nearly double the level of stored muscle glycogen (1). The greater the pre-exercise glycogen content, the greater the endurance potential (1). The maximum amount of carbohydrate which can be stored by the body is reported to be 600 grams (1), although this probably varies according to the individual’s amount of muscle mass. Presumably, more muscular athletes have the ability to store more glycogen and thus would be expected to have more endurance.

In 1967, a classic study was performed to examine the effects of carbohydrate intake on glycogen levels and endurance (2). Endurance was measured by exercise time to exhaustion at VO2max (75% maximal aerobic capacity). A direct relationship was found between carbohydrate content of the diet and endurance time. A low carbohydrate diet (5% of calories) provided muscle glycogen stores of 38 mmol/kg, which sustained one hour of exercise. A moderate carbohydrate diet (50% of calories) resulted in glycogen levels of 106 mmol/kg, which sustained 115 minutes of exercise. The high carbohydrate diet (82% of calories) resulted in glycogen stores of 204 mmol/kg, which supported 170 minutes of high intensity exercise. This experiment provides solid evidence that a high carbohydrate diet is beneficial for endurance performance.

Taking it a step further, it was found that glycogen stores could be even further increased by a supercompensation technique. For three days, the athlete trains as usual but consumes a low-carbohydrate diet that completely depletes the glycogen reserves. Then, for the next three days, the athlete rests and consumes a high-carbohydrate diet. During this recovery period, the body overcompensates and stores more glycogen than normal. When used before competition, this technique helps extend endurance limits.

A more moderate approach has also been developed which seems to work just as well (3). In this protocol, the athlete consumes a 50% carbohydrate diet for three days, while training hard. For the next two days, carbohydrate intake is increased to 70% of calories, and exercise time is decreased to 20 minutes. On the last day before competition, the athlete rests and consumes a high-carbohydrate diet. This experiment demonstrated that it’s not necessary to totally deplete glycogen reserves for supercompensation to occur.

Bodybuilders should probably not strive to totally deplete their glycogen reserves because at that point it’s very easy to lose muscle. As a general guideline, we suggest while de-carbing that you adjust your carbohydrate intake so that you lose your pump about three-fourths of the way through the workout. For most bodybuilders, this turns out to be between 100 and 300 grams of carbs per day - an amount sufficient to stimulate glycogen supercompensation without causing a loss of lean body mass. Also, supplementation with branched chain amino acids (Parrillo Performance Muscle Amino Formula™) may help prevent any skeletal muscle protein catabolism.

Bodybuilders who want to use glycogen supercompensation to pump up their muscles during competition should be aware that endurance training is the ultimate stimulus for increased muscle glycogen synthesis (1). Endurance training increases the activity of glycogen synthase, the enzyme responsible for glycogen storage (1). Furthermore, the effect is specific for the muscles used. Glycogen depletion and subsequent supercompensation is localized to the muscles which are exercised (4). For example, endurance training legs will promote glycogen loading in legs but not in arms. The endurance athlete practicing glycogen loading should glycogen-deplete using the same form of exercise as he will perform in competition. The bodybuilder getting ready for a show should train all major muscle groups to the point of glycogen depletion for a few days before carb loading. A good way to gauge this is to train to fatigue using high rep sets until you lose your pump. Then, for the last two or three days before the show, taper down your activity and increase your carbohydrate intake. Details are described in the The Parrillo Performance Nutrition Program.

Starchy carbohydrates (complex carbs) such as brown rice, potatoes, yams...
and grains seem to be more effective in replenishing glycogen stores than simple sugars (5). In one study, after a 48-hour recovery period following glycogen-depleting exercise, starch resulted in greater muscle glycogen synthesis than did glucose. Other studies, however, have failed to reproduce this observation.

It seems reasonable to expect that complex carbs would do a better job of replenishing glycogen stores because they are released into the bloodstream more slowly. This slow release maintains elevation of insulin, and insulin in turn stimulates glycogen synthase (4).

Simple sugars are released more rapidly, potentially overwhelming the glycogen synthesis pathways. Furthermore, the increased insulin release resulting from simple sugars causes some of the sugar to be stored as fat. If you supply your body with a given amount of carbohydrate as either complex carbs or simple sugars, both will help replenish glycogen stores, but more of the simple sugar will be converted to fat. For this reason, our program recommends that bodybuilders use complex carbs to minimize any “spill over” of carbs into fat stores.

One study has been performed to investigate the effectiveness of a maltodextrin beverage for glycogen supercompensation (6). Muscle glycogen was measured by biopsy and endurance was measured by run time to exhaustion at 75% VO2max. Subjects glycogen-depleted by consuming a 20% carbohydrate diet for three days while continuing to train. During the next three days, the subjects ran less and consumed a 90% carbohydrate diet to replenish glycogen stores. During the glycogen loading phase, one group received carbs from rice and pasta and another group received a maltodextrin beverage. The 90% rice-pasta diet resulted in lower muscle glycogen levels than did the 90% maltodextrin diet. Total endurance times for the two groups following the 90% carbohydrate diets were essentially identical. The authors suggest that the greater glycogen loading in the group receiving the maltodextrin supplement may be a result of better absorption and assimilation of carbohydrate calories in liquid form. Also, subjects in the maltodextrin group reported less gastrointestinal discomfort.

Carbohydrate feeding during exercise events lasting longer than 90 minutes may increase endurance by providing glucose to muscles after their glycogen stores have been diminished (1). Parrillo Performance Pro-Carb™ is ideal for this, since it provides glucose as maltodextrin—a slow release glucose polymer. Maltodextrin beverages like Pro-Carb™ have been demonstrated to increase blood glucose levels during exercise and to increase exercise time to exhaustion (7, 8). Dehydration and glycogen depletion can both compromise athletic performance, so Pro-Carb™ drinks are perfect for endurance athletes and hard training bodybuilders.

After the muscles deplete their glycogen stores they begin to use more blood glucose for energy. The liver has its own glycogen stores and can also synthesize glucose from amino acids in a process known as gluconeogenesis. While the glycogen stored in the liver can be mobilized and released into the bloodstream, glycogen stored in a muscle is used only by that muscle and cannot provide glucose for the blood (2). After liver glycogen is depleted, blood glucose drops and central nervous system symptoms of hypoglycemia (dizziness, nausea, fatigue) develop, in addition to local muscular failure (1). Carbohydrate supplementation during exercise increases endurance by helping to maintain blood glucose, which provides fuel for the muscles and the central nervous system (1). Experiments with cyclists have demonstrated that carbohydrate feeding during exercise can increase endurance by 30-60 minutes (1).

Replenishing depleted glycogen stores is essential to prevent fatigue associated with repeated days of heavy training (1, 4). Of course, adequate carbohydrate intake is required to maintain glycogen stores. In general, the amount of glycogen stored is proportional to carbohydrate consumption, at least up to 600 grams of carbs per day (4). Athletes who train every day generally need 500-600 grams of carbohydrate per day to maintain glycogen reserves (1). As mentioned, the body has the ability to store about 600 grams of carbohydrate, and carbs consumed in excess of this will probably not result in proportionately greater glycogen storage (4). Of course, individual requirements vary, depending on lean body mass, basal metabolic rate and activity level.

It is important to consume carbohydrate immediately after exercise in order to maximize glycogen storage (1, 9). When consuming carbohydrates after exercise, muscle glycogen stores are replenished first (4). Next, liver glycogen is replaced. After muscle and liver glycogen stores are full, additional carbohydrates will be stored as fat (4).

It has been shown that glycogen supercompensation increases endurance time of runners and cyclists (4). Athletes finish best times when they begin with full glycogen stores (4). Glycogen loading does not improve speed at the beginning of a race but rather allows the athlete to maintain the same pace longer before slowing down (1, 4). In other words, it improves endurance but not speed.

As most athletes aren’t hungry right after training, this is the ideal time for a Pro-Carb™ drink. The Pro-Carb™ Formula is perfect for endurance athletes and bodybuilders who constantly push themselves to the glycogen depletion limit during extended training. Drinking Pro-Carb™, containing maltodextrin, is a great way to get your body the carbohydrates it needs to replenish its glycogen stores following extended periods of training. Pro-Carb™ can also be taken during workouts to supply the added carbohydrates needed to maintain a high energy level during intense workouts.

REFERENCES


Carbohydrate: Ultimate Food Fuel, Part IV
by John Parrillo

In carbohydrate metabolism, the rate of glycogen utilization is directly proportional to the intensity of the exercise (1). In other words, the faster the body needs to produce energy, the more it relies on carbohydrates. This is because fat cannot be metabolized fast enough to meet the energy demands of high exercise. Furthermore, carbohydrates can be metabolized to produce energy anaerobically (in the absence of oxygen) while fat metabolism requires oxygen. Also, during aerobic metabolism, it takes less oxygen to burn carbs than to burn fat. For a given amount of oxygen, the body can produce more ATP from carbs than from fat. This makes carbohydrate a better fuel source during intense exercise when oxygen is a limiting factor.

The respiratory quotient (RQ) is the ratio of carbon dioxide produced to oxygen consumed. One liter of oxygen is able to produce 5 calories from carbohydrates but only 4.7 calories from fat (2,3). Since carbohydrates and fat require different amounts of oxygen to burn, you can tell from the respiratory quotient what kind of fuel is being used by the body. An RQ of 1.0 indicates carbs are being used exclusively for energy (4).

Intermediate values of RQ indicates that a mixture both fuels are being used. Using this sort of measurement during cycling exercise, research found that carbohydrate, when available, is the body’s preferred fuel. Radioisotope studies and muscle biopsy assessments of energy stores before and after exercise have confirmed this finding (4).

In general, as intensity of exercise increases, the relative contribution of carbohydrate as the fuel source increases (1,2). Furthermore, a low-carbohydrate diet reduces exercise time to exhaustion (1). At rest, muscles rely mostly on fat as their energy source (5).

During low intensity exercise (40-50% VO2max) such as walking, the primary metabolic fuel is fat, while muscle glycogen degradation is minimal (1). As the exercise intensity increases, more muscle glycogen is used as fuel. Moderate intensity exercise (50-60% VO2max) is fueled by roughly equal amounts of fats and carbohydrates (2, 4). At 90-95% VO2max, carbohydrates provide as much as 95% of the energy and the RQ approaches 1.0 (1, 2, 4). Many athletes train at intensities above 70% VO2max which precludes the use of fat as fuel.

Although high-intensity exercise burns more calories per hour, more of those calories come from carbs. Low-intensity exercise is fueled mostly by fat, but doesn’t burn very many calories per hour. One of the best exercises for losing fat is running. Although running is high intensity and is fueled partially by carbs, it has the additional benefit of lowering your set point — the amount of fat your body is programmed to store.

When glycogen stores are limiting, the body also draws on amino acids as fuel (4, 5). The liver can convert most amino acids into glucose in a process called “gluconeogenesis.” The branched chain amino acids (BCAAs) leucine, isoleucine and valine can be oxidized as fuel directly in the muscles (5). One study showed that as much as much as 57 grams of protein — equivalent to the recommended daily allowance — could be burned as fuel during a 10-12 mile run (6). Lemon and Mullen showed that during a cycling effort lasting over an hour at 61% VO2max, 10.4% of the energy was derived from protein if the subjects were in a glycogen-depleted state (7). In a glycogen-loaded state, only 4.4% of energy derived was from protein. This is another important reason why bodybuilders need to ensure adequate carbohydrate intake: Carbs have a protein-sparing effect, meaning that if adequate carbs are available, they will be used instead of protein. Obviously, bodybuilders want their amino acids to be used for building protein, not as fuel.

Pro-Carb is the ultimate carbohydrate supplement. Carbohydrates are a great energy source for fueling athletic activities and supporting weight gain.

During aerobic metabolism, it takes less oxygen to burn carbs than fat. This makes carbohydrate a better fuel source during intense exercise when oxygen is a limiting factor.

Pro-Carb is ideal for carb loading, for use during training and athletic competition and as a source of extra calories. Not only is it high in carbohydrates, but a Pro-Carb drink also supplies water which is needed for glycogen storage. Liquid carbohydrate meals can be consumed closer to competition than solid foods.
because of their shorter gastric emptying time (2). Liquid meals also produce a low stool residue and thus minimize intestinal bulk. Liquid meals are a good way to get calories in without filling up your intestines. Pro-Carb is also an excellent supplement to add extra calories during heavy training. Pro-Carb utilizes maltodextrin as its carbohydrate source. Maltodextrin is a complex carbohydrate derived from starch with a low glycemic index (ranging from 22 to 29), meaning that it is released into the bloodstream more slowly than simple sugars (glucose has a glycemic index of 100). That way, you don’t get a large insulin surge with subsequent hypoglycemia. Using Pro-Carb, you get a more even energy level because the carbs are released slowly, minimizing the chance that any will “spill over” into fat stores. Maltodextrin is a glucose polymer, making it ideal for replenishing glycogen stores. Pro-Carb mixes instantly and tastes great, and contains no simple sugars or artificial sweeteners. One scoop provides 22 grams of complex carbs, 4 grams of high quality protein, with less than a gram of fat. Mixed with out Hi-Protein powder, it makes a balanced liquid meal.

References
Supplementation For Ultimate Endurance Performance

by John Parrillo

Parrillo Performance provides the best quality supplements in the world. Period. We don’t cut any corners when it comes to nutritional support for our athletes. We want you to get the most from your training, and we want you to reach your goals. We’re here to help you win. In addition to our famous success with bodybuilders, we also work with world class endurance athletes. In this article I will describe some of our best supplements for endurance athletes, why they work and how to use them. Even if you’re not an endurance athlete and are just looking for more energy, our approach to diet and supplementation is sure to help. Finally, it’s also worth mentioning that many of the best bodybuilders also rely on our endurance supplements when they want to train longer and harder, and, more importantly, recover faster and more completely.

Ultra-endurance activities are associated with loss of lean body mass (1,2). Endurance activity causes loss of lean tissue because as fat and carbohydrate fuels are exhausted the body draws on its own muscle tissue to use as fuel (3). Amino acids can be converted to glucose in the liver via a process known as “gluconeogenesis” (4,5). The so-called “branched chain amino acids” (leucine, isoleucine and valine) seem to be especially preferred as fuel substrates. In addition to being converted to glucose in the liver, the amino acids are unique in that they can also be used directly as fuel by the muscles (5). These are the amino acids included in our product “Muscle Amino.” Muscle Amino contains the balance of branched chain amino acids science has shown most beneficial.

Have you ever noticed an ammonia smell in your clothes after a hard workout? This is because your body was using some amino acids as fuel but was not able to clear the waste products efficiently. When this happens the carbon skeleton of amino acids is burned, leaving ammonia as a byproduct. Ammonia is quite toxic and is converted to urea in a metabolic pathway called “the urea cycle,” which prepares it to be excreted in the urine (4,5). The urea cycle requires certain chemical compounds called “aspartates,” (4,5) which are included in our “Max Endurance Formula.” We have developed this product specifically for use during endurance activities. It works by providing nutrients which are used by the body to detoxify the waste products of protein catabolism. Max Endurance helps filter out toxic waste products your body generates during intense training. Eliminating these waste products helps you have more energy and recover faster. Ammonia is very toxic and will stop energy production in the cell. Using the aspartates in Max Endurance to “neutralize” the ammonia as soon as it forms enables you to have more energy and endurance. We suggest the product be used consistently everyday, not just on days of endurance events.

Perhaps the most crucial supplement for endurance athletes is our “Liver-Amino Formulas.” I cannot overemphasize the importance of this product. What is endurance activity all about, anyway? It’s about producing energy over an extended period of time. Liver-Amino helps in at least three ways — by providing heme iron, protein and B vitamins.

Energy production in the human body requires two things: a fuel substrate and oxygen (3,5). Many people build up the importance of carbohydrates in endurance performance — and rightfully so. Carbs are your body’s best fuel source for endurance activity (3,6,7). However, for those carbs to be used as fuel your muscles require a constant supply of oxygen. Contrary to popular belief, it is usually the rate of oxygen delivery to cells which limits energy production, not the availability of glucose.

As you know, it is the responsibility of red blood cells to deliver oxygen to all the working tissues of your body (4). What you may not know is that endurance training actually can destroy red blood cells rather than building them up — if your nutrition’s not right. Bodybuilders have long recognized that strength training actually breaks down muscles and that this damage provides the stimulus for subsequent growth during the recovery period. To build more muscle, you have to provide the nutrients muscles are made of. The same is true for endurance training, except it’s the blood system that takes a beating. And if you want to recover and be stronger as a result of your workout, you have to feed your body with the nutrients it needs to make red blood cells. Have you ever noticed that many endurance athletes are very thin and don’t have much muscle.
Supplementation For Ultimate Endurance Performance

is the body needs to build up its energy producing systems inside muscle cells to adapt to the training stimulus. These energy producing systems are made of protein. And the easiest place for your muscle cells to find protein is to steal it from red blood cells and plasma protein.

Couple this increased protein need with the fact that endurance activity causes amino acids to be used as fuel substrates instead of as proteins, and you can see why endurance athletes are frequently borderline anemic and why they commonly experience muscle wasting.

Liver-Amino contains heme iron — the most bioavailable iron source. (Refer to our article about Liver-Amino for more information.) The product contains desiccated liver (not cooked), as cooking can destroy the heme group and decrease its incorporation in red blood cells by 50% (8). Liver-Amino formula also provides 1.5 grams of complete protein per tablet. Heme iron and protein are precisely the nutrients your body needs to produce red blood cells. This way you can build your energy producing systems inside muscle cells and your blood system all at the same time, without having to sacrifice one for the other. Plus it’s a rich source of B vitamins, which are used in energy production. Start taking the Liver-Amino (five to eight with each meal) when you’re training hard and definitely at least six weeks before your event, since it takes that long to build up red blood cells.

Next month we’ll examine several supplements that can be used in an endurance program for ultimate performance.

References


Supplementation For Ultimate Endurance Performance, Part II

by John Parrillo

Endurance athletes experience increased need for protein (1-4). Most people are surprised to learn that studies actually show endurance athletes have even higher protein requirements than most strength athletes (1,2). This is due to the fact that the amino acids (the building blocks of protein) are used as fuel during endurance training (1,5). I suggest that you consume at least one gram of complete protein per pound of bodyweight—1.5 grams would be even better—from chicken, fish, turkey or egg whites each day with at least another .25 or .5 gram of additional protein per pound of bodyweight coming from incomplete vegetable sources. This leads directly to our “Hi-Protein Powder.” Calorie for calorie, this protein powder is the highest quality protein food available anywhere. It contains exactly the balance of amino acids your body needs to build proteins, including muscle, red blood cells and the energy producing systems mentioned.

Now we can turn our attention to fuel for optimum endurance performance. We have developed three high-energy supplements to help meet the needs of serious endurance athletes: Pro-Carb Powder, CapTri and the Parrillo Supplement Bar.

Carbohydrate is the body’s preferred energy source (6,7) and Pro-Carb is the world’s most sophisticated carbohydrate powder. The carbohydrate is supplied as maltodextrin, a complex carbohydrate from corn. Maltodextrin has been found to be the ideal carbohydrate source for replenishing glycogen reserves. It is digested and absorbed more rapidly than conventional carbs from food, but not so fast that it causes an over-release of insulin and subsequent hypoglycemia. Maltodextrin provides a much more uniform energy level than do simple sugars. Refer to our recent series about carbohydrates and athletic performance for more detailed information about Pro-Carb.

CapTri is a special kind of fat known as a medium chain triglyceride (8-10). CapTri provides twice the energy density of protein and carbohydrate (8.3 calories per gram for CapTri versus 4 calories per gram for carbs and protein) and is absorbed into the bloodstream as rapidly as glucose (8-10). CapTri is preferentially used as fuel for energy, instead of being stored as fat by the body (9). As an added benefit, CapTri has a thermogenic effect, which means that it is converted to energy very rapidly (9). CapTri is an extremely concentrated source of calories which are rapidly absorbed and metabolized for energy by the human body. We think of CapTri as human jet fuel. Start with 1/2 tablespoon at every meal. After a few days, increase to one tablespoon with each meal. During hard training, many athletes go as high as two or three tablespoons per meal—a level they have found to be beneficial. Continue to use CapTri up to and during your endurance competition. You cannot store the energy from CapTri, so you need to use it at each meal.

Another key point which many people don’t understand is that some of the energy from CapTri is converted in the liver to ketone bodies, which are used as fuel by the muscles (9,11). The efficiency of utilization of ketones as fuel substrates by peripheral tissues improves as the body adapts to CapTri. In other words, your body gets better at using CapTri as it gets used to it. Thus, using it consistently will allow you to get more out of it when you really need it. Also, these same ketone bodies produced by CapTri help prevent the use of amino acids as fuel (11). That way, your aminos get used as protein instead of being burned as energy. CapTri also decreases catabolism of skeletal muscle protein (9,11). This is why CapTri is effective in reducing the loss of lean body mass commonly experienced by endurance athletes.

The Parrillo Supplement Bar is the endurance athlete’s dream. It is a combination of everything—protein, carbs and CapTri—in just the right ratio for optimum energy production. Energy-dense, ready to eat and great tasting. The Bar is very popular with cyclists and hikers and bodybuilders eat them between meals for extra calories.
To sum up, Parrillo Performance has developed a unique and powerful line of nutritional supplements for endurance athletes and anyone who wants more energy, strength and stamina. I suggest you start with the Liver-Amino Formula, since it provides protein and heme iron — the precise nutrients your body needs to build muscle, red blood cells and energy producing systems. Where to go from there is a highly individual matter. If you’re not getting enough protein from conventional sources, the Hi-Protein Powder is probably the next thing to add. If you need more calories, go with Pro-Carb, CapTri or the Supplement Bar. The Supplement Bar is a nice choice because you get protein, carbs and CapTri all in one. If you’re training on the edge and want to explore the limits of your potential, add in Max Endurance Formula and Muscle Amino. Feel free to call or write and we’ll help you work out your individualized program.

In general, I suggest you begin using endurance supplements when training hard and definitely for at least three to six weeks before your event to build up your nutrient level reserves. This is especially true for Liver-Amino, since it takes about six weeks to build red blood cells. We get better results if the nutrition and supplements regimen is followed daily, not just around competition time. Consistency and dedication make the difference between champions and recreational athletes, and that applies to nutrition and supplementation as well as to training.

P.S. Don’t forget your Essential Vitamin Formula and Mineral-Electrolyte Formula, both of which can be doubled when in hard training.

References


Muscularity & Mass: Optimize Your Hormonal Response Through Diet
by John Parrillo

If you’ve been reading my articles consistently over the last couple of years, by now you have a better understanding of biochemistry and sports nutrition. I’ve covered the metabolism of proteins, carbohydrates, fat and medium chain triglycerides in detail, explaining how to use each for maximum results. At Parrillo Performance, we never lose sight of the fact that results are the bottom line. What sets us apart is not just the superior quality of our products but also that we teach you how to get the best results. People who follow the Parrillo Program invariably get better results than they ever thought possible.

In this series, we’re going to look a little deeper into how all the nutrients that we’ve discussed come together in the body to produce results. You know that getting ultimate results requires an intense training program and consistently perfect nutrition. But why does it work and how does it work? Obviously, all the energy used by your body and all the matter that makes up your body ultimately comes from food. For our purposes, it is convenient to consider the body as being divided into fat compartment and lean compartment. What determines whether the food you eat goes to the fat compartment, the lean compartment, or simply gets burned for energy? How can you control this? This is the subject of this series of articles.

The branch of science that explains how the body works and how it is controlled is called “physiology.” This science merges beautifully with biochemistry to explain how you can control nutrient partitioning into the fat compartment or the lean compartment. So, let’s talk a little bit about physiology.

The two master control systems of the body are the nervous system and the endocrine system (1,2). The nervous system consists of the brain, the spinal cord (the central nervous system) and the nerves that transmit information to and from the all parts of the body (the peripheral nervous system). The nervous system works by transmitting information in the form of electrical signals (nerve impulses).

The endocrine system consists of several organs in the body, including the pituitary gland, the thyroid gland, the parathyroid glands, the pancreas, the adrenal glands, the testes or ovaries and the kidneys. The endocrine system transmits information in the form of chemical messages. (When parts of your body talk to each other using the nervous system, it’s like making a phone call, and when they use the endocrine system, it’s more like sending letters.) The chemical messages sent by the endocrine system are called “hormones.” Testosterone, growth hormone and insulin are examples of hormones everyone knows about. These hormones have a profound effect on whether the food you eat ends up as muscle or fat. Your diet and exercise habits, in turn, have a profound effect on these hormones.

Hormones have a profound effect on whether the food you eat ends up as muscle or fat. Your diet and exercise habits, in turn, have a profound effect on these hormones. (Are you starting to get interested in physiology now?)

Hormones can be classified in several ways (1,2). One way is by their mode of release. The classical hormones, for example, are released into the bloodstream and are carried throughout the body. These are called “endocrine” or “telecrine” hormones. Other hormones are not released into the blood but rather into the space between tissues (the interstitial space) and thus exert their effect only on nearby tissues. These are called “paracrine” hormones. Finally, some hormones exert their effect only on the cells that produce them and are called “autocrine” hormones. Hormones can also be classified according to their chemical structure. Examples include the steroid hormones (which are made of fat molecules resembling cholesterol), protein hormones, peptide hormones and amino acid derivatives. Testosterone is a steroid hormone while insulin and growth hormone are protein hormones.

The nervous system acts to control actions that require a fast response time: movement, perception of the world around you, rapid adjustment of heart rate and breathing rate in response to exercise and behavior in general. The endocrine system controls processes that occur over a longer period of time, such as fuel metabolism and growth (Making a phone call is faster than writing a letter.) Notably, the nervous system and the endocrine system do not function separately. They are tied together by a part of the brain called the hypothalamus. This is the main way the two systems communicate to each other to ensure coordinated control of the body. The hypothalamus is located on the bottom surface of the brain roughly in the middle, and the pituitary gland is connected to it. Together, the hypothalamus and the pituitary are considered to be the master endocrine gland of the body, controlling the function of all other endocrine glands.

The endocrine system is chiefly responsible for nutrient partitioning into the fat or lean compartments (1,2). This system deals with fuel metabolism, energy production, energy storage and growth. And this means control of growth of both
muscle stores and fat stores. Therefore, the endocrine system will be the focus of our attention for the next few bulletins.

Remember, the endocrine system is the control system of metabolism and growth, and it issues its orders in the form of hormones. These hormones are released from the various endocrine glands and are carried to all the tissues of the body by the bloodstream. There they bind to special molecules on cells called “hormone receptors” that interpret the signal being sent by the hormone and tell the cell what to do. The transmissions sent by the hormones are messages like “build muscle protein,” “store fat,” “burn fat,” “store carbohydrates,” “burn carbohydrates,” and so on.

Once these signals are received by the body, the biochemical work of obeying the command sent by the endocrine system is carried out by enzymes. Enzymes are special protein molecules that control the rates of chemical reactions going on inside cells. By these reactions, the enzymes can make or degrade proteins and fat. This is how your body composition is regulated. While some hormones work by controlling enzymes, other work by directly activating certain genes in the nucleus. Testosterone is an example of such a hormone, which activates genes involved in protein synthesis.

The main hormones involved in muscle growth and fat loss are insulin, glucagon, testosterone, growth hormone and insulin-like growth factor (IGF). And guess what? We can teach you how to control all of them through diet and exercise. In addition to explaining the control of these hormones, we will also talk about prostaglandins, an important class of hormones involved in regulation of blood pressure, blood clotting, inflammation, growth hormone release and many other processes (3). You can control your levels of prostaglandins through diet, and this in turn can also have a big effect on growth hormone release (4,5). We’re also going to talk about the ways nutrients directly affect enzymes inside cells to influence the rate of fat storage and fat loss.

The first thing to do is to take your Parrillo Performance Nutrition Program off the shelf and take another look at it. That diet didn’t fall together by accident. You will see that it was developed with all of this knowledge of biochemistry and physiology in mind. And it works. Over many years of working with the top bodybuilders we found that this approach simply works the best. As you will see in the next bulletin, one of the most important factors in determining nutrient partitioning is your ratio of insulin to glucagon (6). The ratio of these two hormones produced by the pancreas largely determines whether you will gain fat or lose fat. This ratio also starts a cascade of events which regulates the balance of prostaglandins your body produces, which in turn has a big effect on growth hormone release. And growth hormone has a profound effect on muscle growth and fat loss. It all flows together.

Your body’s ratio of insulin to glucagon is determined solely by the ratio of protein to carbohydrate in your diet. Generally, you want to consume about 1.5 times as many calories from carbohydrate as protein (7). When you’re trying to gain weight, you want a little more insulin so you eat a little more carbohydrate. When you’re trying to lose fat you want to decrease insulin levels and increase glucagon. To do this you adjust your ratio of carbs to protein down a little. You’ll see this is exactly how our Nutrition Program and Pre-Contest Diets are set up.

The Parrillo System was designed to help your body work naturally at peak efficiency to become a muscle-building, fat-burning machine. You want results? Follow the Program.

References


The Insulin-Glucagon Axis and the Control of Nutrient Partitioning

by John Parrillo

In Part I of this series we began our discussion of endocrine physiology. I explained that hormones play a central role in nutrient partitioning. But what is nutrient partitioning? This is the process of determining whether the food you eat ends up as muscle or fat or just gets burned for energy. The hormones chiefly responsible for this are insulin, glucagon, growth hormone, thyroid hormone, cortisol and epinephrine (adrenaline). In addition, testosterone, aldosterone and prostaglandin E1 may also play a role. If this sounds more like a boring medical lecture than an article about bodybuilding, consider the following:

1. Muscle growth and fat loss are controlled almost entirely by these hormones. (Have I got your attention now?) You’re probably asking yourself, “But I thought this was determined by diet and exercise?” Yes, diet and exercise do determine muscle growth and fat loss, but these effects are mediated by hormones. Your diet and exercise habits set up a “hormonal environment” inside your body which determines if nutrients will be stored in the lean compartment or the fat compartment. This is how nutrient partitioning works. Does this mean that if someone injects growth hormone and insulin he can get lean and muscular without having to exercise? No, it doesn’t work that way. Exercise is still required, for reasons we’ll explain in Part III of this series.

2. If two groups of rats are fed and exercised the same, they weigh the same, just as you would expect. If one group is injected with insulin, however, that group becomes very fat (1,2). Furthermore, if another group is injected with glucagon, those rats lose weight [fat] (2). These hormones, insulin and glucagon, are perhaps the most important factors in determining body composition.

3. The composition of your diet (the amount of protein, carbohydrate and fat) seems to be as important as its caloric content in determining whether or not it will make you fat (1). If your metabolic rate is around 2,000 calories a day, two thousand calories from pizza will tend to make you fat. But 2,000 calories from chicken, rice and broccoli will tend to make you lean. Why? Because different foods have different effects on your body’s hormones which control energy usage and fat storage.

4. Over 90% of people who lose weight by caloric restriction return to their original weight within two years (1). This is because there is a weight regulating center in your hypothalamus which tries to maintain a constant body weight. (Remember from last month that the hypothalamus and pituitary gland together represent the master endocrine gland of the body, controlling all of your hormonal responses.) It works like a “fat thermostat” by controlling your hunger level and your body’s metabolic rate (its rate of energy expenditure). These effects are mediated by the nervous system and by hormones and enzymes involved in fat metabolism. If you want to change your body weight, or your body composition, you have to change the set point. The ratio of insulin to glucagon is perhaps the most important determinant of the set point (2) and we’ll teach you how to control it in this article.

5. We all know examples of overweight people who starve themselves on 1,000 calorie a day, only to remain fat. We also know that some bodybuilders eat 6,000 to 8,000 calories a day and are extremely lean and muscular. How can this be? Obese people are very rarely overweight because they overeat, but rather because the way they eat and their lack of exercise raise the set point and act to channel calories to fat stores (1). The bodybuilders have learned how to channel their calories to the lean compartment and to minimize fat stores.

This is what nutrient partitioning is all about. At Parrillo Performance we’ve been teaching people how to do it for years. (We were doing it before it was in, as they say.) We’ve had great success helping amateur and professional bodybuilders climb the ranks, and non-bodybuilders all over the country have used the same approach to lose weight permanently.

So how do you get control of your hormones and use this information to be a better bodybuilder? By careful control of your diet and exercise habits. The most important hormones involved in muscle growth are growth hormone (whose effect is largely mediated by the paracrine hormone IGF1), insulin and testosterone (3). The most important hormones in fat
loss are insulin (lack of insulin, that is), epinephrine, growth hormone, glucagon, thyroid hormone and cortisol (3). Most of these can be controlled by diet and exercise and will fall within optimal levels if you follow our nutrition and training guidelines.

The best place to start in explaining these hormones is with insulin and glucagon. As mentioned earlier, these hormones are among the most potent determiners of fat storage and fat loss. Luckily for us, the levels of these hormones are entirely determined by diet, so we can control them by carefully regulating what we eat. Insulin and glucagon are both produced by the pancreas, but have exactly opposite effects. Their chief concern is the regulation of blood sugar (glucose) levels. Your brain requires a constant supply of glucose for fuel, so the blood glucose level is tightly regulated to make sure the brain never runs out of gas.

When you eat carbohydrates they are digested and absorbed by the small intestine and transported directly to the liver via the portal vein. Essentially, all of the carbohydrate you eat is converted to glucose by the liver before being released into the bloodstream. After a meal your blood glucose level rises as carbohydrates are released. This rise in blood sugar triggers a release of insulin from the pancreas. Insulin is required to help move glucose into cells by a process called “facilitate diffusion.” Once inside cells, the glucose is burned for energy or stored as glycogen. Everything is fine so far. The problem arises when carbohydrates are released into the bloodstream too fast. This causes too much insulin to be released. When insulin levels get too high, some of the carbohydrate is converted to fat instead of being stored as glycogen. Also, if insulin levels get too high this actually causes too much sugar to be moved into cells. This results in “hypoglycemia,” which means low blood sugar. If your blood sugar is too low you feel very tired. Simple sugars cause your blood sugar level to spike, then paradoxically to decrease to a lower level than before (because of insulin over-release).

This is why the rate of digestion of your meals is important. On the Parrillo diet you stay away from foods containing simple sugars (sweets, fruit, dairy products) and refined carbohydrates (bread and pasta) because these are released into the bloodstream too fast, causing too much insulin to be released. These channels calories to fat stores—the opposite nutrient partitioning we want. These foods also have the effect of raising the set point—the amount of fat your hypothalamus programs your body to store (1).

Combining protein and fibrous carbs with your starches, and avoiding simple and refined carbohydrates, slows the release of glucose into the bloodstream resulting in a lower, but longer, insulin release. This gives you a uniform energy level and channels calories toward muscle and away from fat.

In summary, the most important role of insulin is to regulate blood glucose levels. It does this by moving glucose into cells after a meal. It also increases the use of glucose for energy and increases glycogen stores. Too much insulin has the effect of promoting fat storage.

Glucagon is another hormone secreted by the pancreas, but it has the opposite effect of insulin. An increase in blood sugar triggers a release of insulin but inhibits glucagon release. Glucagon is released several hours after a meal when blood sugar levels drop. Glucagon has the effect of reducing glucose for energy and stimulating breakdown of body fat and the use of fat for energy. Glucagon also stimulates the glycogen breakdown.

The net result of glucagon is to raise the glucose levels back to normal and to signal the body to begin using fat for energy since it’s running low on carbs. This is how the insulin-glucagon axis acts to regulate blood sugar levels. Insulin decreases blood sugar by moving glucose into the cells, stimulating glucose burning for energy and increasing glycogen storage. Glucagon acts to increase blood glucose levels by stimulating glycogen breakdown, stimulating glucose synthesis (by a process known as gluconeogenesis) and by shifting the metabolism from carb-burning to fat-burning.

This is why you have to eat relatively more carbohydrates during the growth season and reduce carbs during the precontest diet. Insulin is an anabolic hormone, acting to stimulate growth. Glucagon acts to stimulate fat loss. The insulin to glucagon ratio is determined entirely by the ratio of carbohydrate to protein in your diet (3,4), so you can control it exactly. The insulin:glucagon ratio is believed to be one of the most important factors (if not the most important factor) in determining your set point (2). The precise levels of protein and carbohydrate to eat in order to optimize these hormones to maximize muscle growth or fat loss are described in detail in the Parrillo Performance Nutrition Manual. First, you want to meet your protein requirement by eating 1.0 to 1.5 grams of protein per body of body weight per day. Next, limit fat calories to 5% of your total daily caloric intake. Last, make up the remainder of your calories with a combination of carbs and CapTri. For weight loss, you generally want to limit carb:protein ratio to 1.0:1.5 and use more CapTri. For muscle gain you will want to increase the carb:protein ratio as well as increasing levels.

Combining protein and fibrous carbs with your starches, and avoiding simple and refined carbohydrates, slows the release of glucose into the bloodstream resulting in a lower, but longer, insulin release. This gives you a uniform energy level and channels calories toward muscle and away from fat.
The Insulin-Glucagon Axis and the Control of Nutrient Partitioning

[For those of you technically inclined, this means that insulin increases the activity of glucokinase and phosphofructokinase, which increases glycolysis (the first stage in the conversion of glucose to energy). Insulin also decreases gluconeogenesis—the synthesis of glucose from amino acids. Insulin increases the activity of glycogen synthase, the key enzyme regulating glycogen synthesis, and inhibits phosphorylase A, the enzyme responsible for glycogen breakdown.]

Glucagon has the opposite effects. These two hormones act to stabilize blood levels—insulin by decreasing blood sugar and glucagon by increasing blood sugar. These effects are brought about by exerting control over the enzymes regulating carbohydrate metabolism.

These two hormones act to stabilize blood sugar levels—insulin by decreasing blood sugar and glucagon by increasing blood sugar. These effects are brought about by exerting control over the enzymes regulating carbohydrate metabolism.

[Again, for those of you attuned to strict biological terminology, glucagon decreases phosphofructokinase and glycogen synthase, which decrease glycolysis and glycogen synthesis, respectively. Glucagon also increases the activities of fructose-1,6-biphosphatase and phosphorylase, which increases gluconeogenesis and glycogenolysis, respectively.]

[Regarding fat metabolism, insulin acts to stimulate acetyl-CoA carboxylase and lipoprotein lipase, the most important enzymes regulating fat synthesis and storage, respectively. Glucagon inhibits these same two enzymes. In addition, glucagon activates adenylate cyclase which initiates a cascade of events resulting in mobilization of fatty acids from fat stores. The fats are then transported to the muscles and used for energy.]

In summary, insulin acts to increase enzymes involved in the conversion of glucose synthesis, and to inhibit the enzymes glucose and glycogen breakdown. Glucagon has the opposite effects. These two hormones act to stabilize blood sugar levels—insulin by decreasing blood sugar and glucagon by increasing blood sugar. These effects are brought about by exerting control over the enzymes regulating carbohydrate metabolism.

By now you know that insulin is a powerful growth-promoting hormone—some people consider it the most powerful anabolic hormone. Does this mean we want to overeat carbohydrates or eat simple sugars to get our insulin levels really high? No, obviously not. Although insulin is absolutely required for muscular growth since it transports certain amino acids inside cells, it is not very selective in its actions. It promotes growth of fat cells as well as muscle cells (3,5). When insulin levels get too high some of the carbs “spill over” into fat stores.

When dieting, do we want to go on a zero-carb diet to minimize insulin and maximize glucagon? No way. Under these conditions muscle growth is impossible because some of the amino acids cannot get inside cells (3). However, your body continues to undergo a process called “obligatory protein loss,” which is the process of disposing of worn out proteins. (Proteins are the machinery of the cell, and they get worn out like any other machine.) This amounts to the obligatory loss of proteins from the body at about the rate of 30 grams per day, total calories.

Of course, there is considerable biochemical variation among individuals. Hi-Protein Powder™ and Pro-Carb Powder™ are very useful tools for dialing in your own body’s optimal insulin:glucagon ratio. To gain lean body mass, meet your body’s protein requirement then slowly add in more Pro-Carb™ until you find the optimal caloric level and insulin level for your body to gain lean mass. To lose fat you want to decrease carbs while increasing protein and CapTri®. Hi-Protein™ and Pro-Carb™ are a convenient way for you to experiment and find how to optimize your body’s hormonal responses. We’ve all had the experience of going to the trouble of weighing our food and filling out our Diet Trac Sheets only to find out the numbers don’t work out right and we have to do it all over again. Hi-Protein™ and Pro-Carb™ are perfect for adjusting your dietary intake from food to make your numbers work out right on your Diet Trac Sheets.

One last thing about insulin. In addition to it enhancing transport of glucose inside cells, it is also required for transport of certain amino acids into cells. These include the branched chain amino acids (3), and this is why it is important to take your Muscle-Amino Formula™ with meals and not on an empty stomach. It has been found that neither insulin nor growth hormone alone is sufficient to stimulate growth—you have to have both of them together at the same time (3). This at least partly due to the fact that these two hormones act to transport different sets of amino acids inside cells, and you need all of the amino acids present at the same time in order for growth to occur (3).

How do insulin and glucagon exert their effects over carbohydrate and fat metabolism? By activating or inhibiting the key regulatory enzymes which carry out these processes (5). Insulin acts to increase enzymes involved in the conversion of glucose to energy and enzymes carrying out glycogen synthesis, and to inhibit the enzymes of glucose synthesis and glycogen breakdown.

[Again, for those of you technically attuned to strict biological terminology, glucagon decreases phosphofructokinase and glycogen synthase, which decrease glycolysis and glycogen synthesis, respectively. Glucagon also increases the activities of fructose-1,6-biphosphatase and phosphorylase, which increases gluconeogenesis and glycogenolysis, respectively.]
during starvation (3). When consuming a normal diet, these worn out proteins are simply replaced, but this can’t happen if the amino acids can’t get inside cells. So if you want a sure way to lose lean mass, go on a zero-carb diet. During a zero-carb diet the body is in a very catabolic state, and breaks down proteins to supply amino acids which are converted to glucose, which the brain requires for fuel. This makes the problem even worse.

Of course you want to adjust your carb:protein ratio, but moderation is the key. Going to extremes is asking for disaster. People have actually died from zero-carb diets even while getting plenty of protein, because they lost so much protein from their heart muscle. In general, stick to the formula in the Nutrition Manual, as outlined above. That will put you real close to optimal. Experiment with Hi-Protein™ and Pro-Carb™ to find the perfect ratio for you. Learning to control the insulin-glucagon axis is one of the most important aspects of nutrient partitioning, and it will take you a long way toward a top physique.

References


In the previous bulletins we’ve been discussing nutrient partitioning and dietary strategies to channel nutrients to the lean compartment and not to fat stores. We saw that muscle gain and fat loss are controlled largely by hormones — chemical signals sent out by the endocrine glands which direct the body’s metabolism. We discussed the insulin-glucagon axis in detail and saw that it has a major influence in determining the set point in the hypothalamus — the weight regulating center of the body that decides how much fat we will carry (1,2). Insulin is the body’s most powerful anabolic hormone, acting to transport glucose and amino acids into cells. This supplies energy and the building blocks for growth. Insulin is required for muscular growth, and indeed for life. Glucagon has the opposite actions of insulin. It moves glucose and amino acids out of cells and into the bloodstream when blood sugar gets too low. These two pancreatic hormones work in balance to provide a relatively uniform blood glucose level, to ensure that the brain doesn’t run out of fuel.

The good news is that insulin and glucagon levels are determined solely by diet, so we can exert great control over these hormones by our eating habits. The Parrillo Performance Nutrition Program was designed to take advantage of this fact to keep insulin and glucagon at just the right levels to build muscle and burn fat. Last month we talked about how to use Pro-Carb Formula™ and Hi-Protein Powder™ to fine-tune these hormone levels to optimize your body’s metabolism.

The bad news, however, is that insulin is a powerful stimulus for fat growth as well as muscle growth (3,4). It stores fat inside fat cells as well as it stores protein inside muscle cells. This is why on the Parrillo Program meals are structured so as to release carbs into the bloodstream slowly. This results in a lower and more uniform insulin level, which helps minimize any fat storage. This is also why you should stay away from any products high in simple carbohydrates. These products elicit a rapid, large insulin release. Any time you empty a lot of carbohydrate calories into your bloodstream very rapidly and have a high insulin level you will store those calories as fat. High sugar products would be better called “fat optimizers.” The body can only build muscle so fast, but it has an unlimited ability to store fat. Muscle building is a slow and difficult process, and it works better when you supply your body with slow and steady supply of energy and nutrients. This also provides a more uniform energy level instead of the periods of hypoglycemia you experience after eating simple sugars.

The bad news about glucagon is that, although it stimulates fat breakdown (lipolysis), its actions are mostly limited to the liver (3,4). Like insulin, glucagon is released from the pancreas and transported directly to the liver by the portal vein. While enough insulin is released to effect the whole body, glucagon is released in smaller amounts and most of it stays in the liver. Therefore, glucagon is not a very potent stimulator of lipolysis in peripheral tissues, such as body fat stores.

But don’t get discouraged, the insulin-glucagon axis is still one of the most important controllers of nutrient partitioning — it’s just not the whole story.

**Epinephrine, is the body’s most powerful stimulus for fat breakdown. It is produced by the adrenal glands, two small glands located one just above each kidney.**

This month we’ll begin our discussion of three other hormones that complete the puzzle: growth hormone, testosterone and epinephrine. Once you learn how to control these hormones and add them to your arsenal you’re likely to see the best gains in your life, and get more ripped than you though possible. Now we’re pulling out the big guns!

Epinephrine, more commonly known to the layman as adrenaline, is the body’s most powerful stimulus for fat breakdown (3,4). It is produced by the adrenal glands, two small glands located one just above each kidney. Actually, epinephrine serves not only as a hormone by also acts as a neurotransmitter in the nervous system. This underscores the relationship of the nervous system and the endocrine system working together as a control and communication network to provide instructions to the body. Nerve impulses are conducted to the center of the adrenal gland, the adrenal medulla, by the sympathetic division of the nervous system. This triggers epinephrine to be released into the bloodstream.

Epinephrine has many effects. One you’ve probably noticed is the “fight or flight” response that occurs when you’re really scared or suddenly startled. When your skin and lips turn pale, you feel cold and clammy, you start sweating and your heart pumps really hard and fast — that’s epinephrine. It’s a reaction animals have when they’re confronted by an enemy and have to either fight or run away. It’s the feeling of being “scared to death” that most of us have experienced at one time or another. It’s the “adrenaline rush” you get from bungee jumping. This surge of epinephrine is mediated by a large sympathetic discharge in the adrenal medulla. This gland has a large blood supply for its size and the epinephrine is rapidly carried throughout the body. It primes your muscles for action and mobilizes fat from adipose stores to provide energy. It increases...
Maximizing Anabolic Drive

your heart rate, blood pressure and the force of your heart’s contractions.

Under normal conditions, epinephrine is delivered to fat cells mostly by direct innervation of the fat cells by the sympathetic nervous system, rather than systematic release to the whole body from the adrenal medulla. Its release is increased during exercise, and this is the primary mechanism whereby exercise serves as a stimulus for fat loss. Epinephrine binds to receptors on fat cells and generates a metabolite called cyclic AMP, or cAMP. cAMP activates an enzyme called protein kinase, which in turn activates another enzyme called hormone sensitive lipase. Hormone sensitive lipase breaks down triglycerides (the molecular form in which body fat is stored) into free fatty acids (FFAs) and glycerol. The FFAs then leave the fat cell and are carried by the blood to the muscles, where they are burned for energy (3,4). This is how exercise works to help you lose fat.

While insulin and glucagon are controlled entirely by diet, the most effective way to control growth hormone, testosterone and epinephrine is by exercise (5,6). This is why exercise is required to gain muscle and lose fat. If you try to lose weight by cutting calories, about half of the weight you will lose will be muscle. Conversely, if you gain weight simply by increasing calories (without exercising) you’ll just get fat. Exercise is required to set up the proper hormonal milieu allowing selective fat loss and muscle gain. The favorable effects of exercise in increasing muscle mass while decreasing fat stores are mediated largely through growth hormone, testosterone and epinephrine. Therefore, to really fine tune nutrient partitioning to sculpt the ultimate physique, we have to talk about effective training strategies to optimize these hormones.

Growth hormone (GH) is the most important hormone responsible for normal growth during childhood. Without growth hormone, a person will never attain adult stature. Growth hormone has profound effects on the growth of the skeleton as well as the muscles. Testosterone and estrogen produced during puberty cause the skeleton to mature and stop growing, but growth hormone still promotes muscle growth and fat loss in adults. Growth hormone is released from the pituitary gland when it receives the appropriate signals. One of these signals is “growth hormone releasing hormone” (GHRH) which comes from the hypothalamus.

There are several things you can do to naturally increase your GH levels. One is to get a good night’s sleep. Growth hormone is released maximally during deep sleep, normally about three hours after you fall asleep. Trying to build muscle without getting enough rest is nearly impossible. Second, GH release is increased during and just after intense exercise (5,6). The most effective training style for increasing GH release is high volume training (5,6,7). We recommend a mixture of low rep, medium rep and high rep work to maximally stimulate all the muscle fibers as well as train the nervous system. This results in optimal increases in size and strength. The ultimate training program for bodybuilders is described in the Parrillo Performance Training Manual and High Performance Bodybuilding book. Third, eat a high protein diet. This not only stimulates GH release, but also provides the building blocks you need to build new muscle tissue. Fourth, certain combinations of amino acids have been shown to increase GH release and result in increased lean body mass (7). Enhanced GH Formula™ contains the most effective combination ever developed. Take it on an empty stomach (this is important) just before training and before bed.

In the following bulletins we’ll continue our discussion of muscle-building and fat-burning hormones and talk more about growth hormone and testosterone. The most exciting part of the story is yet to come! Of course, merely having a detailed intellectual understanding of how nutrition and exercise come together in your body to build muscle and burn fat does nothing to achieve those results. It’s up to you to put this information to use in the gym and at the dinner table. Don’t forget the basics of the Parrillo Philosophy: dedication, consistency and hard work. So train hard, eat right and do your aerobics. And have a great summer!

References


In fact, you have to lift weights very intensely and consistently over a period of some time (months to years) to accumulate significant increases in muscle mass. Since muscles are made from nutrients in the food we eat, you may logically ask why can’t we build muscle just by eating the right foods? The answer to this question takes us back to the theme of this series: hormones.

Hormones are ultimately responsible for the process of tissue remodeling — that is, the process of laying down new muscle tissue. Although you can exert great control over some hormones by diet alone (refer back to the previous bulletins in this series), exercise is required to generate the complete hormonal spectrum which will result in muscle gain and fat loss (1,2). Furthermore, the damage to muscle tissue which results from exercise training (especially the eccentric, or lowering phase of muscle contraction) serves as a stimulus to the muscles more responsive to the growth-promoting effects of anabolic hormones (1).

Growth hormone (GH) is the most anabolic substance in the human body (3,4). In a study of old men (whose growth hormone levels are diminished), it was found that GH administration promoted an increase in muscle mass and a decrease in body fat even in the absence of exercise training (3,4). Growth hormone is anabolic, meaning that it acts to promote incorporation of nutrients into new body tissues. This includes increasing protein synthesis in the muscle tissue (5,6). Part of this effect is believed to be due to GH promoting transport of certain amino acids inside muscle cells (5). Notably, insulin also acts to transport a different set of essential amino acids, so you need adequate amounts of GH in insulin present at the same time to stimulate muscle growth (5). GH also has a lipolytic effect, which means it mobilizes body fat from adipose depots and increases the use of fat for energy (5,6). This in turn spares carbohydrates so glycogen stores are preserved (5,6). GH is probably the most important hormone for bodybuilding since it has powerful actions in building muscle and burning fat.

The most important role of growth hormone is in promoting growth during childhood. Without GH, normal adult stature will not be achieved (5,6). Growth hormone acts to promote growth of all tissues of the body except the nervous system. GH levels reach maximal levels in the late teens and gradually decline with age. The high levels of GH and testosterone in young adult males explain why most bodybuilders make their best gains during their late teens and twenties. This again underscores the central role of hormones in bodybuilding.

Although I’ve discussed this before, it is so important as to bear repeating: the central reason behind all of your bodybuilding activity, including both diet and training, is to manipulate your hormone levels so as to promote muscle gain and fat loss. Your body’s level of muscle mass and body fat are determined by hormones and by the set point of your hypothalamus. By following the guidelines in this series and in the Parrillo Nutrition and Training Manuals you will adopt a lifestyle which optimizes anabolic drive and sets up the proper hormonal environment for achieving a top physique.

During the next couple of bulletins I will explain in detail the physiology of growth hormone, including its mechanisms of release, its actions and what you can do to control your GH levels for maximum results. As you know by now, hormones do not work alone in the body. It is the combined interaction of all the hormones which generates the physiological adaptations to exercise. Therefore, I will discuss growth hormone in the context of the other hormones with which it synergizes to produce its effects. I have decided to organize this discussion around some of the most basic and important questions about growth hormone. If the discussion sounds a little medical in places, bear with me. You will come away with a thorough understanding of...
growth hormone and how to control it. Get ready to annihilate the competition.

1. Exactly what is growth, and what is the difference between linear growth, mass increase and obesity?

The common feature of growth is an increase in mass (body weight). The common definition of growth refers to the organized addition of new tissue that occurs normally in development from infancy to adulthood (6). Bodybuilders are a bit unusual in that they continue to grow after reaching adulthood. This is largely due to the effects of intense exercise in increasing growth hormone. Normal growth involves both linear growth (increase in body length or height) and mass increase (increase in body weight). Obesity specifically refers to growth of fat stores out of proportion to the rest of the body. Quantitatively, anything above 30% body fat is commonly considered obese. Growth is normal and healthy; obesity is not. Abnormal growth can be caused by an excess or deficiency in growth hormone. GH causes partitioning of nutrients to the lean compartment and away from fat stores. Administration of GH will increase muscle mass and decrease body fat, and a deficiency of GH will result in excess fat accumulation.

2. What are the main stages of normal growth and the hormones that stimulate growth in each?

Prenatal: Hormonal control during prenatal development is largely unknown, but insulin is believed to be important (6). Human placental lactogen, hPL, is probably also involved.

Infantile (0-1 years): Insulin is required and possibly other unknown hormones as well (6). Interestingly, GH and T3 (thyroid hormone) are not required during prenatal and infantile growth (6).

Juvenile (1-12 years): GH is the most important, but there is also a strict requirement for T3 and insulin (5,6). Vitamin D is also required.

Adolescent (age 10-14 for females, 12-16 for males): The sex steroids are responsible for the adolescent growth spurt, closure of the epiphyseal plate (see below) and attainment of final adult height. GH, T3, vitamin D and insulin are still required for normal growth during this time. Glucocorticoids are also required in normal levels for normal growth but its action is mainly permissive (6). Permissive actions of hormones describe effects of hormones on enzyme systems so as to allow other hormones to exert their regulatory effects. The permissive hormones do not stimulate growth directly, but rather allow other growth-promoting hormones to be active.

3. What is the difference between growth-regulating hormones and local growth factors?

Hormones are released into the bloodstream to exert their effects on target tissues throughout the body, while growth factors act mainly locally (as autocrines or paracrines) to stimulate growth. The most important growth-regulating hormones are GH, T3, insulin and the sex steroids. Most growth factors act as regulators of local processes such as wound healing, tissue repair, regeneration or ordinary replacement of aged cells, but some are found in the circulation and may function as true hormones. IGF1 (somatomedin C) is especially important in this regard in mediating many of the actions of GH. See the below for more information on IGF1.

4. What are the other requirements for normal growth in addition to hormones and growth factors?

Proper nutrition (including energy, amino acids, vitamins, minerals and essential fatty acids) rest, and a good psychosocial environment are all requirements for growth (6). Mental state (emotional state) can directly influence normal growth in humans. No doubt this effect is mediated by the hypothalamus, since it connects the endocrine system to the mind. If you’re eating and training right, but are totally stressed out about work or some personal problem, you’re probably not going to make very good gains. The mind in very important to bodybuilding. You must maintain a positive and aggressive attitude and not be distracted by outside stresses.

5. What are catch-up growth and compensatory growth?

Catch-up growth is a period of growth at greater than the normal rate to recover from a time when growth was retarded, as during illness. Notably, increased levels of hormones (including GH) are NOT required during catch-up growth. Compensatory growth is growth of an organ to compensate for damage to that organ or its pair. For example, if one kidney is removed, the remaining kidney will grow larger. Increased hormone levels are probably not needed for compensation by the liver and kidney, although IGF1 may be increased. Compensatory growth of the adrenal gland is accompanied by increased levels of ACTH (6). Many athletes who are over-trained or under-nourished experience a growth spurt when they correct the problem. In the case of over-training, the problem is likely due to elevated cortisol levels, which are catabolic.

6. What are the roles of insulin, glucocorticoids, sex steroids and thyroid hormone in normal growth? How do these relate to growth hormone?

Insulin: Optimal concentrations of insulin are required for normal growth during postnatal life. Insulin stimulates protein synthesis and inhibits protein breakdown. Without insulin, normal responses to GH are not seen and protein breakdown is severe. Insulin promotes growth primarily by shuttling nutrients (glucose and some amino acids) inside cells, providing energy and the building blocks for protein synthesis. Note that insulin and GH must both be present at the same time for normal growth to occur.
Guyton (5) suggests that this is because insulin and GH each shuttle a DIFFERENT compliment of essential amino acids inside cells, and of course all of the essential amino acids must be present at the same time for protein synthesis (and thus growth) to occur. Neither insulin nor GH alone is sufficient to support normal growth — it takes optimal levels of all the body’s hormones to produce optimal health and optimal gains. As noted in a previous bulletin, excess insulin cannot create muscle mass, but it will promote fat storage. It’s not the calories in sugar that make you fat — it’s the insulin response (7,8).

Glucocorticoids: Glucocorticoids (primarily cortisol) promote optimal function of a wide variety of organ systems, but do not have direct growth promoting actions. Excess GC’s inhibit growth by the catabolic effects of cortisol (increased protein breakdown). Normal levels of GC’s seem to be needed to permit optimal function of the other hormones. The concept here is that glucocorticoids act to stimulate (or maintain) optimal levels (amounts) of metabolic enzymes, whose activities in turn are regulated by the other hormones. GC’s sort of set the stage and make sure all of the machinery is in place. Cortisol functions to make sure the key regulatory enzymes are present in sufficient amounts to allow allosteric regulation (enzyme regulation via small effect molecules such as metabolic intermediates) and enzyme regulation by other hormones. Also, cortisol is important in maintenance of glucose levels and resistance to stress, which intuitively would seem important for normal growth.

Sex Steroids:

Androgens: Androgens (such as testosterone) are potent stimulators of linear growth in children whose epiphyses (the growing ends of bones) have not yet closed. Androgens can promote some growth in the absence of GH, but combined treatment with androgens and GH together promote more rapid growth than the sum of the two hormones alone. This is an example of the synergistic action of certain hormones. Much of the growth-promoting action of androgen appears to be mediated by increased GH secretion (6). Androgens increase the frequency and amplitude of GH secretory pulses (6). In addition to promoting linear growth, androgens also stimulate growth of muscle, and this can occur in the absence of GH or T3. Androgens bind to nuclear receptors and the hormone-receptor complex in turn binds to chromosomes and activates transcription of specific genes.

Estrogens: In normal girls, the adolescent growth spurt usually occurs before estrogen secretion is sufficient to initiate breast development and is probably attributable to very low concentrations of estrogens (6). Paradoxically, concentrations of estrogen sufficient to promote breast development actually inhibit growth (6). Stranger still is the fact the concentrations of estrogens which inhibit growth increase GH secretion. What is the basis for the complex interaction between estrogen and GH? High concentrations estrogens appear to inhibit growth by interfering with the actions of GH (6). Estrogens also antagonize the effects of GH on nitrogen retention. Of course, estrogen is also responsible for the characteristic female fat distribution. The differential effects of estrogen and testosterone, as well as their different interactions with GH, explain why males on average contain 50% more muscle mass than females and why females have a higher body fat percentage.

At the same time that gonadal steroids stimulate linear growth, they also accelerate closure of the epiphyses (the sites at the ends of the bones where bone elongation occurs) and therefore limit the final height that can be attained. This is why linear growth stops a few years after puberty. GH and the sex steroids are still present and active, but the ends of bones are permanently sealed and cannot grow anymore. Flat bones, such as the bone in your forehead, can still increase in thickness, however. People who abuse growth hormone experience this condition, known as acromegaly.

Thyroid Hormone: Thyroid hormone is present in two forms, known as T3 and T4. Most of the circulating hormone is in the form of T4 which is converted to the more active T3 form inside target cells. Thyroidectomy (removal of the thyroid gland) has nearly as devastating an effect on growth as does hypophysectomy (removal of the pituitary gland — the body’s source of GH). Restoration of T3 and T4 promptly reinitiates growth. T3 and T4 have little if any growth promoting effect in the absence of GH however. T3 acts to promote the actions of GH at three levels: GH synthesis, GH secretion and GH action. Plasma concentrations of GH are very low in the absence of T3 or T4. This action is independent of GHRH (growth hormone releasing hormone) and appears to be exerted directly at the level of gene transcription. In addition to its permissive effects on GH synthesis, T3 maintains normal responsiveness of somatotropes (the cells that make GH) to GHRH. Failure of growth in thyroid deficient individuals is largely due to GH deficiency. However, even large amounts of GH cannot sustain normal growth in thyroidectomized animals unless thy-
Both forms are secreted and have similar metabolic effects of the 20K form are and arise from differential RNA splicing. Forms are products of the same gene 15 amino acids corresponding to residues (MW) of about 22,000 daltons (6). The other 10% has a MW of 20,000 and lacks 15 amino acids corresponding to residues 32 to 46 of the 22,000 MW form. Both forms are products of the same gene and arise from differential RNA splicing. Both forms are secreted and have similar growth-promoting activity, although the metabolic effects of the 20K form are reduced. GH is stored in the anterior pituitary and is the most abundant of the anterior pituitary hormones. As much as half of the GH in plasma protein and a substantial fraction is in the form of dimers or oligomers which are inactive. hGH used for therapy today is produced in bacteria from the cloned gene.

8. Describe the major effects of GH on growth (linear and mass) and metabolism of carbohydrate, protein and fat.

Linear growth: Linear growth is a consequence of elongation of the skeleton, especially the spine and leg bones. Proliferation of chondrocytes (cartilage cells) at the epiphyseal border of the growth plate is balanced by cellular degeneration at the diaphyseal end, so in the normally growing individual the thickness of the growth plate remains constant as the as the epiphyses are pushed farther apart by the elongating shaft of the bone (6). In the absence of GH there is severe atrophy of the epiphyseal plates, which become narrower as proliferation of cartilage progenitor cells slows markedly. Conversely, after GH is given to a hypopituitary subject, resumption of cellular proliferation causes columns of chondrocytes to elongate and the epiphyseal plates to widen. Bone growth is also accompanied by an increase in diameter, which involves bone remodeling. Treatment with GH often induces a transient increase in urine calcium and phosphorus excretion, reflecting stimulation bone remodeling.

Mass: GH increases lean body mass by stimulating protein synthesis and increasing nitrogen retention. GH-deficient individuals have a relatively high proportion of body fat. Treatment with GH causes a decrease in body fat accompanied by an increase in body protein, mostly muscle.

Carbohydrate Metabolism: Sometimes, particularly after a period of glucose deprivation, GH has an insulin-like effect in increasing glucose uptake and utilization. This anomalous effect disappears quickly and its physiological significance is a mystery. After about two hours, glucose metabolism is inhibited in muscle and adipose tissue. There is a decrease in glucose uptake and muscle glycogen stores are preserved.

Fat Metabolism: In adipose tissue GH promotes breakdown of stored triglyceride (body fat) which increases plasma free fatty acids (FFA). Since glucose uptake is suppressed byGH, fat synthesis is also suppressed. These effects, combined result is a net loss of body fat.

Protein Metabolism: As already discussed, GH promotes nitrogen retention and increases protein synthesis, mainly as muscle. Part of this effect may be due to GH’s role in transport of certain amino acids inside cells (5). Immediately after GH injection, plasma amino acid concentrations decrease as a result of rapid uptake and conversion of protein.

The thing to remember is GH decreases glucose uptake and utilization and spares glycogen, it increases use of fat for energy by mobilizing fat stores and it increases protein synthesis. The net effect is to make the body leaner and more muscular. Many of the effects of exercise in making the body leaner and more muscular are mediated by an exercise-induced increase in growth hormone (1,2).

9. How do bones grow and how does GH affect this process?

Growth of long bones occurs by a process of called endochondral ossification, in which proliferating cartilage is replaced by bone. Proliferation of chondrocytes (cartilage cells) occurs at the epiphyseal plate — the ends of the bones.

GH interacts with insulin, the sex steroids and thyroid hormones directly to stimulate growth. These actions are not only crucial to growth during childhood but are also at the very core of the adaptations which occur in response to exercise.
where growth occurs. Frequent division of small cells in the germinal zone at the distal end of the growth plate provides for continual elongation of the columns of chondrocytes. GH stimulates proliferation of chondrocytes, and thus bone elongation. GH also stimulates osteoblastic progenitor cells to proliferate causing bone remodeling and an increase in bone diameter. Lack of GH greatly retards bone growth, and without GH normal height cannot be achieved.

10. How are the effects of GH mediated at the cellular level? What is the “somatomedin hypothesis” and the “dual effector hypothesis?”

The SOMATOMEDIN HYPOTHESIS explains the observation that GH alone is not sufficient to stimulate proliferation of cartilage progenitor cells, or protein synthesis by cartilage cells, in vitro. To study the cellular effects of GH, cartilage cells are isolated and grown in culture dishes. When normal blood plasma was added to the mixture, or plasma from a hypophysectomized rat which had been treated with GH, there was a sharp increase in protein synthesis, DNA synthesis and bone matrix formation. These effects could not be stimulated by adding plasma from a hypophysectomized rat which was not treated with GH. These experiments demonstrate that GH requires a factor from plasma to be active, and this factor itself is induced by GH. Thus, GH may not directly promote growth itself, but rather stimulates the liver to produce and intermediate blood-borne substance that stimulates chondrogenesis and perhaps other processes as well. This substance was originally called somatomedin C (somatotropin mediator C). Its insulin-like effects on glucose and its molecular resemblance to proinsulin gave rise to the name insulin-like growth factor (IGF). Now, two IGFs are known: IGF-I (somatomedin C) and IGF-II. IGF-I is a small peptide (MW 7500) produced primarily by the liver. It is tightly bound to specific carrier proteins in the plasma. IGF-I can cause hypophysectomized rats to grow in the absence of GH, indicating many of the actions of GH are mediated by IGF-I.

The DUAL EFFECTOR HYPOTHESIS explains the observation that injection of GH into epiphyseal cartilage of one leg of a hypophysectomized rat produces growth in only that leg. This means that things are a little more complicated than explained by the original somatomedin hypothesis. Studies with cultured fibroblasts which can differentiate into adipocytes in a manner which is absolutely which is absolutely dependent on GH may act directly on precursor cells to initiate differentiation. According to the dual effector hypothesis, cartilage progenitor cells in the epiphyseal plates differentiate in response to GH and then undergo clonal expansion (cell division) in response to IGF-I, whose production is also triggered by GH. Chondrocytes and other cells can synthesize and secrete GH when stimulated by GH. IGF-I may then act as an autocrine to stimulate cell division. Thus we have two effectors, one to stimulate differentiation (GH), and one to stimulate cell division (IGF-I). IGF-I may act locally in processes such as wound healing and compensatory growth.

Apparent eccentric (lowering) muscular contractions result in tearing of myofibrils (muscle fibers) and this in some way causes local release of IGF-I which acts as a paracrine to stimulate differentiation of satellite cells into new myocytes (muscle cells). Exercise is required to induce a GH response (which in turn induces hepatic IGF-I production) and to produce the micro-trauma which serves as the stimulus for tissue remodeling.

11. How is GH secretion regulated in humans?

GH secretion is stimulated by sleep, stress, low blood glucose, an increase in certain amino acids (especially arginine, leucine, valine and ornithine) and exercise. Normally GH is secreted in an episodic fashion with maximal secretion occurring during deep sleep. GH is synthesized and stored in the anterior pituitary, and its plasma level is controlled via its rate of secretion. Its rate of secretion is controlled by two hormones in the hypothalamus: GHRH (growth hormone releasing hormone) and somatostatin (which inhibits GH release). GH secretion is thus under minute-by-minute control by the nervous system. GH secretion is also controlled by negative feedback, mediated by IGF-I. IGF-I appears to increase release of somatostatin by the hypothalamus and to reduce the responsiveness of the pituitary to GHRH. In addition to direct regulation by the hypothalamus, GH release is indirectly regulated by thyroid hormone. T3 stimulates GH release by maintaining sensitivity to somatotropes to GHRH. T3 enhances GH’s actions by decreasing the amount of GH needed to stimulate growth (increases sensitivity) and exaggerating the magnitude of the response (increases efficacy). T3 and T4 seem to potentiate the effects of GH on long bones and to increase its effects on protein synthesis in muscle and liver.

12. How does the integrated GH concentration change with age?

GH secretion is most active during the adolescent growth spurt and persists throughout life, long after the epiphyses
have closed. GH secretion gradually decreases in both men and women between ages 20-40.

13. What are the effects of excess GH in humans before and after the end of adolescent growth?

Overproduction of GH in children produces gigantism — and adult height of over eight feet may be achieved. Over-production of GH in adulthood resulting from a pituitary tumor, or abuse of GH, produces acromegaly. This condition is characterized by thickening of the cranium and mandible and enlargement of the bones of the hands and feet. There is also abnormal growth of the ribs, liver and spleen and thickening of the skin. You never have to worry about acromegaly resulting from naturally increasing your body’s own production of GH. You can naturally increase GH enough to dramatically increase muscle mass and decrease body fat, but not enough to experience the side effects of acromegaly. Acrongaly only results from pituitary disease or abuse of exogenous GH.

14. What are the effects of diet and exercise on GH?

What should I do to naturally increase GH levels? There are several things you can do as a bodybuilder to naturally increase your GH levels (9). First, eat an adequate diet containing at least one gram of protein per pound of body weight. A high protein meal increases GH release. Also remember our previous bulletin about dialing in your protein to carbohydrate ratio to optimize insulin and glucagon levels. Second, supplement your diet with Max GH Formula containing the most effective combination of amino acids for GH release ever produced (10). Use Max GH Formula before bed and before training. Always take it on an empty stomach. Glycine is also a potent GH stimulator (3) and this may explain the well-known anabolic effects of glycine. Parrillo Performance Hi-Protein Powder and Pro-Carb Formula are fortified with significant amounts of glycine. This combination of supplements, along with the right diet, has proven over the years to be incredibly anabolic. Third, make sure you get enough sleep. Maximal GH release occurs during deep sleep. Take a nap during the afternoon if possible. Fourth, train smart. Heavy, low-rep work is known to be effective in increasing strength. This is probably due to an increase in testosterone levels and a training effect on the nervous system. High-rep work with moderate weights is more effective in stimulating GH release (1,2,9). It’s a huge mistake to leave out the high-rep part of your training. While low-rep work is more effective in increasing muscle strength, high-rep work is very effective in increasing muscle size. The GH release resulting from high volume training also serves as a potent stimulus for fat loss.

Of course, you need both high-rep and low-rep work to make continuing progress. Don’t get the idea that you don’t have to lift heavy weights anymore. If you want to get bigger muscles, you will always have to lift heavy weights — but you also have to incorporate high-rep work for maximum development. There are several strategies for doing this. You can incorporate both heavy and light work into the same training session using a pyramid technique. Start with one or two warm up sets around 15 reps. Use a light weight when warming up and do not go to failure. Then pick a weight you can handle in good form for ten reps. Continue increasing the weight and do sets of eight, six and four reps. Take all working sets to positive failure. Then decrease the weight and do a set of 20 reps to failure. This helps pump the blood into the muscle and stimulates GH release. Lower the weight slowly, emphasizing the eccentric part of the contraction. This is especially important at the end of a set when ATP is the muscle is depleted. ATP is required for muscle relaxation as well as muscle contraction. When a muscle runs out of ATP it “locks up” in the contracted state and cannot relax properly. This state is known as “ischemic rigor.” When the muscle is in rigor and you are lowering a weight from the contracted position, the fibers cannot relax and literally get torn as the muscle elongates. If this sounds painful, it is. Most people stop a set just as this starts to happen because the pain gets unbearable. The ones who fight through the pain and crank out a few more reps are the ones who get big muscles. Sorry, but that’s the way it is.

Another way to incorporate high rep work is to train in the four-to-eight rep range one week and the 12-to-20 rep range the next week. Finally, some people do a “powerlifting cycle” involving heavy, low-rep work for four-to-six weeks followed by a “bodybuilding cycle” with moderate weights and higher reps for the next four-to-six weeks. Most advanced bodybuilders have experimented with all three strategies at some point. The key is to find what works best for you. If you’re at a plateau, it’s probably time for a change.

To break out of a plateau, increase calories and try training less frequently by with heavier weights. If you haven’t been doing any high-rep work, doing some will probably stimulate a growth spurt. Of course, there are many reasons for reaching a training plateau, but they usually relate to over-training, under-training, under-nutrition or not enough rest. Constant fatigue, loss of libido and failure to recover from workouts are signs of over-training and not enough rest. If you neglect any part of the program — high-rep training, low-rep training, aerobics, stretching rest, nutrition, or supplementation — your results will definitely suffer. The Parrillo Program is a balanced approach covering every facet of bodybuilding. You supply the hard work, consistency and dedication, and we’ll supply the winning strategy.

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Growth Hormone: The Ultimate Weapon


Energy Metabolism and Thermogenesis: The Ultimate Formula For Losing Body Fat

by John Parrillo

Everyone is concerned about their body fat level. Whether you’re a competitive bodybuilder trying to get down to 4% body fat or just someone trying to get in better shape, everybody wants to know the best way to lose fat and keep it off. It’s no exaggeration to say that we at Parrillo Performance are world class experts at getting in shape. Here in Cincinnati we work with competitive bodybuilders pushing the human body to its limit. Our greatest satisfaction is seeing our athletes improve and win contests. We convert beginners into winners, amateurs into professionals and professionals into champions.

Many people have had a weight problem all their lives and have tried all the diets without success. For every competitive bodybuilder, there are probably a thousand other people who have been cutting calories in a desperate attempt to get rid of a few (or a lot) excess pounds. This approach is doomed to fail.

In this series of articles about energy metabolism and thermogenesis, we explore in great detail the biochemistry and physiology of weight loss, and explain how to do it correctly. We can teach you how to lose fat and keep it off for the rest of your life.

The strategy of how to lose fat while maintaining lean body mass is the same regardless of whether you’re obese or already in great shape. There are a few extra tricks you can use to get into competitive shape, but the foundation of the program is the same.

As you read, keep in mind that this article is written for anyone wanting to lose fat and get lean. The same concepts apply to everyone. We will discuss the process of fat loss and how to control body composition by diet and exercise.

We will discuss the effects of low calorie diets and explain why they fail in 95% of the cases. We will explain the proper way to structure your diet to fuel your metabolism, so you can increase metabolic rate while dieting instead of decreasing it. As a natural result of this program, your body will be leaner and have more energy than ever before.

This series of articles represents the scientific basis for the diet described in the Parrillo Performance Nutrition Manual. The manual contains the nuts and bolts of how to build your diet, describing exactly which foods to eat, how much to eat and how to structure your meals. It also comes with a food scale, which you will need to weight your food. The Nutrition Manual is really the only piece of equipment you will need. Supplements you may find helpful include CapTri, Hi-Protein Powder, Pro-Carb Formula, and Advanced Lipotropic Formula. The place to start, however, is with the proper diet. Without that as the foundation, you will never achieve your goal.

Results. That’s what we’re about.

Everybody has a dream. We can help you make it come true. We’ll start with a discussion of obesity and low calorie dieting, since this is a major medical problem in the U.S.

Obesity

Current estimates indicate that 35 million people in the United States are obese, defined as 20% above ideal body weight (1). Obesity is a risk factor for diabetes, hypertension, coronary artery disease and some types of cancer, as well as being an independent risk factor for premature mortality (3,4). Furthermore, weight loss reduces the risk for these same diseases (4). These observations suggest that obesity may play a causal role in some cases of these diseases or that obesity shares a common cause with these diseases. Among the obese, hypertension is three times more common and hypertriglyceridemia and diabetes are two times more common than in the nonobese (1). In addition, obesity is often associated with low HDL cholesterol levels (1). While remarkable progress has been made in recent decades in many arenas of medicine, the successful treatment of obesity remains an enigma. Given the widespread prevalence of obesity and its association with serious disease states, a re-evaluation of current approaches to obesity management seems warranted.

It is generally assumed that obesity is the result of excess caloric consumption. However, most obese people do not have increased caloric intakes over those of nonobese people (3,4). In fact, long-term studies of deliberate over-feeding and under-feeding in humans and rats demonstrate that body weight is regulated to return to some “programmed” value following periods of altered food intake (4).
Furthermore, the observed increase or decrease in body weight following overfeeding or under-feeding is smaller than predicted by simple considerations of energy balance (5). These observations suggest that the body has some way of regulating its weight in the face of altered energy intake. Many theories and experiments have been devised to elucidate this “weight regulation mechanism.” The most important of these will be discussed below. A synthesis of the available literature suggests that perhaps a successful approach to long-term weight control is now within reach.

Low-Calorie Diets

The conventional treatment for obesity consists of a hypocaloric (low-calorie) diet (3,4). This approach derives from the assumptions that obesity is caused by hypocaloric (high calorie) consumption, and that weight reduction can be achieved by reducing calories. The empirical reality is that 90-95% of people who lose weight by restricting calories experience relapse of obesity within five years (2,3). This is not necessarily a consequence of hyperphagia (overeating following caloric restriction), but occurs even when reasonable form of caloric intake is resumed following weight loss. This is explained intuitively by saying that the body interprets periods of caloric deprivation as starvation (i.e., adequate food is not available), so that when eucaloric consumption resumes, the body repletes its fat stores as a defense mechanism to withstand the next bout of famine.

This makes perfect sense from an evolutionary point of view. Individuals who have adapted to the stress of famine by maintaining fat stores in times of plenty have been selected through evolution. Fortunately, the biochemical mechanisms by which this occurs are now understood.

Chronic caloric restriction causes changes in the body’s pattern of energy metabolism and substrate utilization which favors weight gain (especially fat gain) when normal caloric consumption is resumed (3,4,5). [“Normal caloric consumption” refers to the level of food intake consumed by healthy, nonobese people, about 2,400 calories per day for men and about 1,500 for women (4).] Specifically, 25-50% of weight lost by caloric restriction is muscle mass (3,4). This result is observed even when using “protein-sparing” low calorie diets. Lean body mass (LBM) is the single most important determinant of basal metabolic rate (BMR), and BMR is the largest component of energy expenditure. Thus, when weight is lost by reducing calories, the body’s energy requirement is also reduced, so that a normal diet then results in positive energy balance and weight gain occurs.

Lean body mass is the single most important determinant of basal metabolic rate, and BMR is the largest component of energy expenditure. Thus, when weight is lost by reducing calories, the body’s energy requirement is also reduced, so that a normal diet then results in positive energy balance and weight gain occurs.

In addition, caloric restriction decreases the thermic effect of food (TEF), the amount of food energy wasted as heat (3,4,11). During over-feeding, a significant proportion of the excess calories is liberated as body heat. This effect is largely mediated by stimulation of the sympathetic nervous system by carbohydrate ingestion (3). During under-feeding, TEF is reduced and the efficiency of conversion of food energy to body weight (food efficiency) is increased. This also contributes to obesity relapse following low calorie diets. Finally, hypocaloric diets also decrease the level of thyroid hormones (specifically T3) and this further decreases basal metabolic rate (3,12).

In summary, hypocaloric diets are empirically observed to fail in the treatment of obesity in 90-95% of cases (3,4) and would be expected to do so on theoretical grounds. Historically, obesity has been attributed to consumption of calories in excess of needs, but in fact obese people do not consume more calories than nonobese people nor do they have reduced energy requirements (3,4). This simplistic thermodynamic approach fails to take into account that the human body is not a bomb calorimeter but is rather a Homeostatically regulated machine which strives to maintain the steady state. If caloric intake is reduced, changes in hormones, enzymes, nervous system activity, and body composition occur so as to compensate and try to recover the original steady state. A more fruitful approach might be to consider that body weight and body composition are homeostatically regulated just like every other parameter of body function. The successful approach to obesity man-
Management involves changing the steady state which the body strives to maintain, rather than reducing energy intake and setting into play the body’s compensatory mechanisms, which cannot be overcome.

In the next bulletin, we continue our series on fat loss with a look at how energy metabolism affects your ability to get lean and muscular.

References


transmission, electrochemical gradients across membrane cells, and the energy cost of protein turnover required to maintain cells. The basal metabolic rate accounts for 65-75% of daily energy requirements (1). Metabolic rate is affected by many parameters including energy intake, dietary composition (the percent of calories from protein, carbohydrate and fat), activity (dependent on type, intensity, and duration of activity), lean body mass, age, sex, hormones and drugs. Since greater than 95% of the energy expended by the body is derived from the oxidation of foods, metabolic rate is proportional to oxygen consumption (2).

Perhaps one of the most significant discoveries in nutrition is that feeding different dietary items while maintaining caloric intake affects oxygen consumption (3,4). That different foods, normalized for energy content, increase the metabolic rate to different extents probably reflects tendency of a particular food to be burned for energy versus being stored as body weight, as well as its extent of digestion and absorption. That protein increases the metabolic rate more than carbohydrate and fat suggests that certain amino acids may directly stimulate thermogenesis (3,2). The increase in energy expenditure caused by feeding is known as diet-induced thermogenesis or the thermic effect of feeding, TEF (1). Since different foods increase the metabolic rate to different extents, this means that different foods, normalized for energy content, have characteristic tendencies to be stored as body weight versus being burned as energy. This concept is known as “food efficiency.” Food efficiency is defined as the calories consumed of a particular food divided by the resulting weight gain (3,5,6) and is thus a measure of how efficiently a particular food is converted to body weight. Ingested foods can experience three general fates: 1) they can be oxidized to release energy, 2) they can be retained as body weight (muscle, fat or glycogen), or 3) they can be excreted. The relative balance between these possibilities determine a food’s efficiency. Foods with a high food efficiency are readily stored as body weight while foods with a low food efficiency are more prone to be utilized as energy.

This concept is the basis for use of CapTri® for weight reduction. CapTri® is a highly fractionated medium chain triglyceride formulated especially for body-builders and other athletes. CapTri® is profoundly thermogenic (4,5,7,8,9) and has a very low food efficiency. This means that it is preferentially burned for energy and has very little tendency to be stored as body weight. Calorie for calorie, CapTri® contributes less to body weight gain (fat gain) than carbohydrates or conventional dietary fat. Think of CapTri® as an immediate energy source that will get burned before the body has time to store it. If eating regular food is like throwing a log on the fire, eating CapTri® is like pouring gasoline on the fire.

How does this work? Medium chain triglycerides enter the mitochondria by passive diffusion independent of the carnitine shuttle and thus are immediately oxidized as fuel, bypassing regulation (4,5,7,8,9). Mitochondria are the little furnaces inside cells where foods are burned to produce energy. Normal fats cannot get inside mitochondria by themselves, but have to be carried inside by a transport system called the carnitine shuttle. This results in regular fats being burned relatively slowly, giving them more time to be stored as body fat. Also, this serves as a way of regulating fat metabolism. Regular fats are not used as fuel to a significant extent as long as carbohydrates are available, since the carnitine shuttle is inhibited by malonyl-CoA, a byproduct of carbohydrate metabolism. CapTri®, on the other hand,
is used as fuel even in the presence of available carbohydrates, and spares carbohydrate for glycogen storage. This means more carbohydrates are available for strength and more endurance. The TEF and low food efficiency of CapTri® due to its rapid oxidation (burning). As fats are converted to energy, the initial breakdown product is acetyl-CoA, which then feeds into the pathways of the Krebs cycle, electron transport and oxidative phosphorylation. (The biochemistry of all this is explained in much greater detail in our technical series.) As CapTri® is being burned, acetyl-CoA is produced so fast that as to overwhelm the capacity of the Krebs Cycle in the liver. This excess acetyl-CoA is converted to ketone bodies (6,10,11). Ketone bodies produced in the liver are then used as fuel by skeletal muscle. The strategy is to replace conventional dietary fat with CapTri®, thereby reducing food efficiency of the diet. We have used this technique at Parrillo Performance to convert amateur bodybuilders into professionals (12). Our secret is CapTri® — the most powerful MCT on the market. By replacing regular dietary fat with CapTri®, you can achieve lower body fat levels. Before contests, bodybuilders also substitute CapTri® for starchy carbohydrates. This increases the glucagon to insulin ratio generated by the diet as well as further reducing food efficiency. This all works together to shift your metabolic pathways into a fat-burning mode. Ask for our technical series on CapTri® or consult our Nutrition Program or CapTri® Manual if you want the scientific details on how it works and how to use it.

The thermic effect of food (TEF) is defined as the postprandial (after eating) increment in energy expenditure above the resting rate and is expressed as a fraction of the energy content of the food consumed (3). A substantial part of the TEF (50-75%) is simply the energy used to digest, transport and store food (3). This is termed the obligatory component of TEF. Carbohydrate feeding is known to stimulate the sympathetic nervous system and the ensuing catecholamine-mediated increase in metabolic rate is known as the facultative component of TEF (3). This effect can be blocked by propanolol (a beta-adrenergic antagonist).

Mechanisms which may be involved in facultative thermogenesis include stimulation of sympathetic activity, increased substrate cycling of three-carbon compounds such as lactate (from anaerobic metabolism) and alanine (from branched chain amino acid metabolism), increased redox cycling and stimulation of protein and fat synthesis (3). The relative contribution of each of these probably varies according to the fuel substrate being oxidized. The most important player in glucose-induced thermogenesis is the gut (GIT) is probably activation of the sympathetic nervous system, since this effect can be blocked by propanolol (3). The major contributor to MCT-induced thermogenesis appears to be increased de novo fatty acid synthesis. Hill and coworkers (10,11) demonstrated that MCT overfeeding results in increased hepatic de novo fatty acid synthesis is man. This process is energetically costly and could account for the lesser efficiency of storage of MCT-derived energy. The observed increase in thermogenesis agrees well with the energy cost associated with de novo lipogenesis (10,11). This observation was corroborated by Crozier (13) working with isolated rat hepatocytes (liver cells). This means that some of the excess acetyl-CoA produced during the rapid oxidation of MCTs is used to build new fat molecules. What is the net result of starting with a fat molecule (MCT), taking it apart and using the parts to build new fat molecules? Think of taking a house apart brick by brick, moving it a hundred yards, then putting it all back together just as it was before. The house hasn’t changed but a tremendous amount of energy was expended in the process. This is the biochemical basis for part of the thermogenic effect of MCTs. Does this mean that MCTs will make me fat? NO! REMEMBER, LESS BODY FAT IS MADE FROM EATING MCTs THAN FROM EATING AN EQUAL NUMBER OF CARBOHYDRATES. Rather than contributing to fat stores, this effect reduces fat storage because a higher percentage of dietary energy is converted to heat.

Alternatively, if electron transport is uncoupled from oxidative phosphorylation, the energy spent to establish an electrochemical potential gradient across the mitochondrial membrane is dissipated as heat instead of being conserved as ATP (14). For example, in brown adipose tissue, a pathway exists allowing proton leakage across the mitochondrial membrane (15).

Another method of dissipating energy as heat, believed to occur in liver mitochondria, is redox cycling involving the glycerophosphate and malate shut tles (6,13,16). In the glycerophosphate shuttle, energy is spent to pump reducing equivalents outside the mitochondria to drive the reduction of dihydroxyacetone phosphate to glycerol-3-phosphate in the cytoplasm. The glycerol-3-phosphate then diffuses into the mitochondria and is oxidized to reform dihydroxyacetone phosphate, which then diffuses out of the mitochondria to complete the cycle. The net result is the shuttle of glycerol-3-phosphate and dihydroxyacetone phosphate across the mitochondrial membrane. Free energy is consumed to drive the cycle, but since no net work is performed, the energy ultimately appears as heat (16). The malate/aspartate shuttle works in the same manner.

Finally, increased activity of NA-K ATPase has also been suggested as
a thermogenic mechanism for wasting energy as heat (17). It is estimated that 10-40% of the total energy expended by the cell is used to maintain the concentration of gradient of sodium and potassium ions across the cell membrane (18). Since these ions can also cross the membrane by passive diffusion, an increase in the activity of the enzyme could be a mechanism for spending ATP (5,7,18).

Notably, BMR is increased following excess feeding of a mixed diet, but not if only excess [conventional] fat is consumed (3). Since different fuel substrates follow different metabolic pathways, it is perhaps not surprising that carbohydrate, fat and protein are converted to usable energy (ATP) with differing efficiencies. Energy from carbohydrate is converted to ATP with an overall yield of 75% efficiency, energy from dietary fat is converted to ATP at 90% efficiency and energy from protein is converted to ATP at 45% efficiency (detailed calculations can be found in reference 3, chapter 8). It is evident from these considerations that the energy expenditure required to replace 1 mol of ATP will vary depending on the substrate mix being oxidized (3). This explains, in part, the increase in BMR observed when subjects are changed from a mixed diet to a high carbohydrate diet (3). We see the same thing at Parrillo Performance in our bodybuilders. When we switch them to a high protein, high carbohydrate, low fat diet, the rapidly lose body fat and gain muscle. We know that energy expenditure has increased because they are eating more calories than ever and still losing fat. Of course, we train them harder than they’ve ever trained before too.

Thus, we see that maintenance of constant body weight requires not only that long term energy balance be maintained, but also that the average composition of the fuel mix oxidized be equivalent to the nutrient distribution in the diet (3). In other words, the energy intake required to maintain body weight varies according to dietary composition, since different fuels are converted to ATP with different efficiencies. The respiratory quotient (RQ) describes the substrate mix being oxidized by the body, while the food quotient (FQ) describes the ratio of CO2 produced to O2 consumed during oxidation of a representative sample of the diet (3). If energy intake equals energy expenditure, constant body weight will be maintained only if RQ equals FQ. If RQ is less than FQ, weight will be lost even in energy balance because the fuel mix being oxidized is inefficiently converted to ATP. Thus, more dietary energy will be lost as heat and less will be available as ATP to maintain body weight. By reducing food efficiency and while maintaining energy balance, one can bring about weight loss without activating the body’s homeostatic mechanisms to maintain constant body weight. This concept is at the heart of successful weight reduction, but it’s not the whole story.

In intuitive terms, if RQ is less than FQ this means that more fat is being burned by the body than is being supplied by the diet. This fat is coming from adipose stores. Thus, one can draw upon stored fat for energy even when energy consumption equals energy intake. For example, consider someone who maintains absolutely constant body weight and whose energy intake exactly equals energy output. Let’s say this person is eating 3,000 calories per day, provided as 40% fat, 40% carbohydrate and 20% protein. Now imagine this person continues to consume 3,000 calories per day and does not modify his activity level, but changes his diet to 10% fat, 70% carbohydrate and 20% protein. This person will lose weight because energy from carbohydrate is converted to ATP with less efficiency than energy from fat is converted to ATP. More of his dietary energy will be lost as heat and less will be available for ATP production. Not only will he lose weight while maintaining energy balance, but this weight will come from fat stores since his activity level dictates a certain RQ (within the constraints of substrate availability). Aerobic activity is preferentially fueled by fat (a low RQ) while high intensity anaerobic activity (weight lifting) is fueled primarily by carbohydrate (a high RQ). Increasing lean body mass will also help you burn more fat, since skeletal muscle is the main site of fat oxidation. So while weight lifting is largely fueled by carbohydrates, the increase in lean body mass will increase BMR and result in greater fat metabolism.

It is known from nitrogen balance studies that the adult body maintains a nearly constant protein content (as long as the diet provides sufficient protein) regardless of the proportions of fat and carbohydrate in the diet (4). It is also known that the body’s glycogen reserve is on the same order or as on the daily turnover of carbohydrate (200-400 g) (4). Given the importance of maintaining blood glucose, proper control of the carbohydrate economy is of critical importance (4). The glucostatic theory of food intake regulation describes the priority given to maintenance of carbohydrate balance. The adjustment of carbohydrate oxidation to carbohydrate intake is carefully regulated to result in stable glycogen reserves under widely varying dietary intakes (4). RQ increases following feeding, demonstrating an increase in the proportion of carbohydrate being oxidized in the fuel mix. The change in RQ following feeding is determined by the test meal’s carbohydrate and protein content, but not its fat content (4). Thus, while protein and carbohydrate feeding promotes carbohydrate oxidation, fat feeding does not promote fat oxidation (4). On days when carbohydrate excess carbohydrate is consumed, carbohydrate oxidation is increased to limit excess glycogen deposition, but if excess fat is consumed it is simply stored in adipose depots (4). Thus, while protein and carbohydrate stores are closely regulated, fat stores are generally not regulated, and increase in response to over-consumption of fat. (If fat stores were regulated we wouldn’t have obese people.)

Of course, excess calories from protein or carbohydrate can also be converted to fat, but this is quantitatively insignificant for most people consuming an American diet (4). Thirty percent of excess carbohydrate calories are wasted as heat, and since glycogen stores are generally far from full (especially in exercising
individuals), an excess carbohydrate load of 500 g can be accommodated without an increase in body fat. Notably, all carbohydrates are created equal. Complex carbohydrates which are broken down slowly are more effectively stored as glycogen than are simple sugars, which are released into the bloodstream faster than they can be converted to glycogen. This means some of the simple sugars will be converted into fat and will “spill over” into body fat stores. Also, fructose is famous for its tendency to be converted to fat, and that’s why we limit fruit and juice on our diet — more on that in a future article.

In effect, oxidation is determined by the difference between energy expenditure and energy consumed in the form of carbohydrate and protein (4). Since the average RQ is influenced by the degree of repletion of glycogen stores and by the fat mass, weight maintenance occurs only when a particular body composition has been reached (4). In other words, for a given dietary intake with some average FQ, body composition will change until RQ equals FQ. The steady state is achieved when energy intake equals energy expenditure and when the substrate mix being oxidized is the same as the fuel mix being consumed. Simply put, since protein and carbohydrate stores are narrowly regulated, to lose fat one must consume less fat than one burns. This is achieved by consuming a low fat diet and by performing aerobic exercise. Weight training helps by increasing lean mass and therefore the BMR.

These arguments show that a meal with a high carbohydrate:fat ratio (CHO: FAT) is more thermogenic than a meal with a low ratio. While carbohydrate and protein balance are closely regulated, fat balance is related to the amount of fat in the diet (3). During over-feeding, weight gain is closely related to fat intake. The body’s inability to regulate fat stores explains why the incidence of obesity rises as the fat content of the diet increases (3).

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12. Parrillo Performance, Cincinnati, Ohio, original research results by John Parrillo and Arthur Roberson, PhD.


In the previous bulletins, we have discussed how to effectively lose body fat and why traditional approaches to weight loss are doomed to failure. To illustrate that these theoretical concepts are correct and really work in humans, I have selected one of the articles in the reference list for detailed review. This will give you some idea of how these experiments are performed. We do the same sort of thing at Parrillo Performance except our subjects are competitive bodybuilders and fitness athletes and our end points of measurement are lean body mass, body fat percentage and competitive wins.

The study by Golay (1) was selected for review because it examines energy metabolism in the obese state, after weight loss by hypocaloric diet, and after relapse of obesity following weight loss. Thus, many of the concepts previously discussed are empirically tested. The study was well controlled. measuring energy metabolism in the same individuals before and after hypocaloric diet (internal control) as well as compared to lean controls (external controls). In addition, insulin resistance, which is associated with obesity and impaired glucose-induced thermogenesis (GIT) was also examined. The goal of the investigation was to examine the impact of weight reduction by hypocaloric diet on glucose-induced thermogenesis and its relation to relapse of obesity.

Methods: Energy expenditure was measured by indirect calorimetry for three hours following administration of a 100g glucose load. The glucose-induced thermogenesis was expressed as the percent of energy contained in the glucose dose. Obese subjects were divided into three groups according to their degree of glucose tolerance: normal glucose tolerance, impaired glucose tolerance, and diabetic (NIDDM). Thirty-two obese individuals were studied before and after body weight loss ranging from 9.6 to 33.5 kg achieved by hypocaloric diet for four to six months. Eight obese non-diabetic patients were examined six years later after relapse of obesity had occurred.

Results and Discussions: Although energy expenditure was increased in all groups following administration of the glucose load, GIT was lower in obese patients than in nonobese controls. Furthermore, diabetic obese patients had significantly lower GIT than non-diabetic obese patients. After weight loss by hypocaloric diet, GIT was dramatically reduced in non-diabetic obese patients. Weight loss induced non diminution of GIT in the diabetic group. After relapse of body weight gain, GIT returned to its original value before weight loss. However, basal energy expenditure failed to return to the same level as before weight loss.

These results confirm other reports that postprandial thermogenesis following glucose ingestion is lower in obese than in lean subjects. Regression analysis showed that the main factor in explaining the decrease in GIT observed in obesity is an increase in plasma insulin levels. This suggests that insulin resistance may play a role in suppressing GIT. This obviously could play a role in the development of obesity since if less energy is wasted as heat more is available for storage. Reduction of body weight by caloric restriction is associated not only with a decrease in BMR but also with a blunted thermic response to feeding (1,2,3). The further reduction in GIT in obese following weight loss may thus be involved in relapse of obesity. Notably, while GIT returned to its pre-diet level following obesity relapse, BMR did not.

This sort of compensation is exactly what one would expect of a homeostatic mechanism. This report confirms that a hypocaloric diet fails to achieve body weight control and in fact activates an “anti-starvation” response which works by decreasing energy expenditure. That BMR was not recovered after obesity relapse suggests that repeated cycles of hypocaloric dieting just make it even harder to lose weight. This undesirable effect can be overcome with exercise.

An Integrated Approach To Body Weight Control

Throughout this report it has been emphasized that obesity is not a problem of excess caloric consumption because, in fact, obese people do not, on average, consume more calories than non-obese people (2,3). Therefore treatment of obe-
Energy Metabolism & Thermogenesis: The Ultimate Formula For Losing Body Fat, Part III

Loss by caloric restriction does not make
sense on at least grounds: 1) It is unrela-
ted to the cause of obesity; 2) The body
has compensatory mechanisms to adapt
to the low caloric diet and to recover
fat stores when caloric consumption is
resumed; and most importantly, 3) It is
empirically observed to fail 90-95% of
the time (2,3).

Five great discoveries in nutrition now make it possible to devise
a successful approach to body weight control. These are: 1) The body has a
weight regulation mechanism located in
the hypothalamus; 2) Different foods are
converted to ATP with different ef-
ciciencies; 3) The insulin:glucagon ratio
is determined by diet composition (CHO:
PRO) and can exert powerful influence
on body weight; 4) the sympathetic ner-
vous system is activated by carbohydrate
feeding and can direct partitioning of
ingested energy; and 5) While carbohydrate and protein stores are tightly regulated,
the size of adipose depots correlates most
strongly with fat content of the diet.

From these considerations a simple prescription for long-term body
weight control follows:

1) Caloric intake should not be
drastically reduced below maintenance
requirements. This simply reduces BMR,
TEF and increases lipoprotein lipase.
One cannot make the body healthier by
depriving it of food. It is infinitely prefer-
able to achieve negative energy balance
by increasing energy expenditure through
exercise. This does not activate the star-
vation response, and in fact increases
BMR as well as increasing energy expend-
iture in activity. For the average obese
person consuming the typical American
diet (40% fat, no caloric restriction is
needed. The simplest way to determine
total daily energy expenditure is to weigh
your food and calculate how many calo-
ries you are consuming per day during
a time when you weight is not chang-
ing. This represents the energy intake
required to maintain your present body
weight. In general, this is proportional
to lean body mass and activity level. Try
to lose fat at the rate of one pound per
week. Since one pound of body fat equals
3500 calories, this represents a daily
energy deficit of 500 calories. It is best
to achieve this deficit by performing 500
calories worth of aerobic exercise per day
(which is about one hour of moderately
intense activity). If a reduction in energy
intake is needed, limit it to 10% of the of
the maintenance requirement. It is best to
lose weight slowly, since this seems to
achieve more permanent results (2,3) and
minimizes loss of lean body mass and
consequent reduction of BMR. Monitor
body composition (percent body fat) during
weight loss to ensure muscle is not
being lost.

2) Increase the CHO:FAT ratio
in the diet. This increases thermogenesis
and FQ. (A diet with a low fat content has
a high FQ.) Remember that fat deposition
is related to fat consumption.

3) Perform regular low to mod-
erate intensity aerobic exercise. This de-
creases RQ. When RQ is less than FQ
this means that the body is burning more
fat than it is consuming. This fat comes
from adipose stores. Low to moderate
intensity aerobic exercise is fueled pri-
marily by fat, and if little fat is provided
by the diet, stores will be reduced.

4) Consume a CHO:PRO ratio
which will result in an insulin:glucagon
ratio compatible with fat loss. Remember
that insulin promotes fat storage while
glucagon increases use of fat for energy.
Empirically, a diet consisting of 30%
protein, 65% carbohydrate and 5% fat
(as energy) has proven very successful
for many people (4). The Parrillo Per-
formance Nutrition Manual has all the
details of how to fine tune the diet to fit
your particular needs.

5) Choose complex carbohy-
drates and limit refined carbohydrates,
especially simple sugars. Selecting car-
b carbohydrates with a low glycemic index
will reduce insulin levels and decrease
fat storage. Limit fructose consump-
tion, which is profoundly lipogenic even
though it has a low glycemic index (5).
Fructose enters the glycolytic pathway
beyond the phosphofructokinase step and
thus its metabolism is largely unregu-
lated. It is rapidly metabolized to acetyl-
CoA which serves as a substrate for de
novo fatty acid synthesis. While excess
calories from carbohydrates are readily
stored as glycogen, excess calories from
fructose are converted to fat.

In summary, obesity is not a
problem of excess energy consumption,
but rather is a direct consequence of the
American lifestyle. This is supported by
the observation of increased incidence
of obesity in American immigrants from
Asia and Japan. A person may consume
an appropriate number of calories, but if
he is sedentary and derives 40% of his
calories from fat, his RQ will be greater
than his FQ and he will necessarily ac-
cumulate excess body fat. Caloric restric-
tion in such an individual would serve
no useful purpose. What is called for is a
diet low in fat and high in complex carbo-
hydrates combined with regular exercise.
The successful dieter will realize that
permanent weight loss requires a lifelong
commitment to healthy diet and exercise
habits. The strategy presented here will
work for anyone trying to get in better
shape, from the man on the street to the
Olympia competitor. You want results?
Get with the program.

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At Parrillo Performance we have always said that proper nutrition is the foundation of bodybuilding excellence. And we continually emphasize that food is the cornerstone of nutrition. Our philosophy is to lay the foundation by eating the right foods. The details of exactly which foods to eat, how much to eat, and how to combine meals for maximum metabolic efficiency are all spelled out step-by-step in the Parrillo Performance Nutrition Manual. We specifically address the questions of how to gain lean mass and lose fat.

One of the best things about the Parrillo Performance Nutrition Manual is that proper nutrition is the foundation of bodybuilding excellence. And we continually emphasize that food is the cornerstone of nutrition. Our philosophy is to lay the foundation by eating the right foods. The details of exactly which foods to eat, how much to eat, and how to combine meals for maximum metabolic efficiency are all spelled out step-by-step in the Parrillo Performance Nutrition Manual. We specifically address the questions of how to gain lean mass and lose fat.

Can supplements help? Try to find a champion bodybuilder who doesn’t use them. The key is to use the right ones and use them properly. Again, you must first lay down the foundation by eating the right foods. On top of a diet of lean, nutritious foods, the supplements can boost levels of specific nutrients even higher. For those people who eat a lot of junk food then expect supplements to make up for their lack of nutrients, you must realize that no amount of supplements can redeem a poor diet.

One of the most common questions about our program is why we omit fruit from the diet. Although it will take a few pages of biochemistry to explain it, I can tell you the answer in one sentence: FRUIT MAKES YOU FAT. This little-known fact has caused such a stir that sometimes I almost regret bringing it to light, but my job is to get the best results possible for the people who follow our programs. Can you eat some fruit and still have a good physique? Sure you can. But people who come to Parrillo Performance want the BEST RESULTS POSSIBLE. Professional bodybuilders don’t want good physiques — they want perfect physiques. If you’re not interested in biochemistry or physiology, you can skip the rest. All you need to know is that fruit makes you fat, and juice is even worse than whole fruit.

Of course, fruit is generally a healthy food — high in fiber, vitamins and minerals and low in fat. But try to think of fruit as nature’s candy, because that’s exactly what it is. If your goal is to build a lean and muscular physique, then you don’t want to eat candy. Sugar and fat are natural, but that doesn’t mean they’ll make you lean and muscular.

I originally learned that fruit makes you fat not by reviewing the biochemical pathways of metabolism, but by actually doing nutritional experiments with real bodybuilders. Rather than being some theory out of a book, this is an experimental fact. For a long time I didn’t understand it — I just knew from our work in the gym that certain foods made bodybuilders get in better shape and other foods made them get fat. The experiment goes like this: As a bodybuilder gets closer to a contest, his body fat level gets very low — maybe 3-5% for a male and 8-9% for a female. At this point the skin is paper thin (in the human most fat is stored just under the skin). You can see the striations of muscle clearly through the skin. As you can imagine any little change at this point really shows up. This is why I like to use competitive bodybuilders for the most demanding nutritional experiments — they are a very sensitive indicator of what works and what doesn’t. With the athlete in contest shape, we measure body weight and percentage of body fat every day. We weigh the food the subject will eat and calculate how many calories are being consumed and break it down into calories from protein, carbohydrate and fat. If the subject’s weight doesn’t change, this means caloric intake exactly balances caloric expenditure, so we have a direct empirical measurement of the total daily energy expenditure for the subject. Everything is measured and controlled, and nothing is left to chance.

Okay, here’s what happens: Let’s say we remove 300 calories worth of complex carbohydrates from the subject’s diet in the form of rice, and replace it with 300 calories worth from fruit. The subject’s total caloric intake remains the same as does the percent of calories from protein, carbohydrate and fat. The training program remains exactly the same. The only change is in the form of carbohydrate supplying 300 of the calories: rice has been replaced by bananas. You would expect the subject’s body weight and percent body fat to remain the same, right? To everyone’s surprise, the subject starts to gain fat. We let this go on for a couple of weeks and the subject continues to gain fat. Now, we pull the bananas out of the diet and put the rice back in — i.e., go back to the original diet. Guess what? The subject loses fat. Amazing, but true.

We’ve done countless experiments like this with just about every food imaginable. That’s how we came up with our diet — by finding what really works. The Parrillo Performance Nutrition Manual tells you which foods work to build a lean, muscular physique and which foods don’t. The competitive bodybuilder is our laboratory. The same diet developed to hone champion
Fruit and Your Diet

bodybuilders works equally well for anyone seeking to lose fat and gain muscle. So far, those who have given our program a sincere effort have been thrilled with the results. Granted, some specific parameters have to be adjusted to optimize the program for your individual metabolism. We tell you how to do that too. The optimum number of calories and the optimum ratio of protein to carbohydrate varies among individuals. For example, some people, especially ones who have trouble losing fat, do better with more protein and less carbohydrate. People who have suffered repeated bouts of yo-yo dieting have lost a lot of muscle mass and consequently have a slow metabolic rate. They may actually need to increase calories and put on some muscle before they have any of the physiological machinery to burn fat.

Well, back to the story on fruit. Why does it make any difference what kind of food you eat? For a given number of calories it seems like it shouldn’t matter what foods they come from. This is one of the most common mistakes people make when trying to lose fat. They think that if they reduce calories they will automatically lose weight. This is true, but only for a little while. And if you lose weight by drastically cutting calories, about 50% of the weight lost will be muscle. What people fail to realize is that the types of food you eat is just as important as how many calories you consume. If cutting calories was the answer, then those low-calorie weight loss drinks would work. But they don’t.

The key point is that different foods have different chemical compositions and therefore have different effects inside your body. All food is fuel, but what type of fuel it is matters a lot.

Different foods have different chemical compositions and therefore have different effects inside your body. All food is fuel, but what type of fuel it is matters a lot.

During the last year in this column, I’ve explored two major themes in detail. The first was the central role of hormones in determining your body composition (amount of muscle and fat) and how to control these hormone levels through diet and exercise. The second theme was thermogenesis — the thermodynamics of food metabolism in the human body. The bottom line you should have gotten out of this was that different foods have different effects on the body, by virtue of the hormonal responses they elicit and the route of energy metabolism that they follow. These concepts are so important that we devoted about 50 pages to them in the Performance Press during the last year. They form the theoretical underpinnings of our experiments with the diets of bodybuilders that I described earlier. Like all good scientists, we make progress by combining scientific theory with real life observations.

Some foods, such as simple sugars, are undesirable because they cause a large and rapid insulin release, and insulin is a potent stimulus for fat storage (1). Other foods, such as conventional dietary fats (but not MCTs like CapTri®) are undesirable because they have a low TEF (Thermic Effect of Feeding) and lower the FQ (Food Quotient) of the diet (2). Please see the series on thermogenesis in the December 1993, and January and February 1994 issues in the Performance Press. Remember that the energy contained in all foods is converted to ATP (adenosine triphosphate) before it is used as fuel in the body. ATP is the chemical form of energy directly used to power muscle contractions and other biological functions. Simply put, if a food is efficiently converted into ATP, then all of the energy contained in that food is available to do work in the body. Any excess energy from such a food will be stored as fat. If a food is inefficiently converted to ATP, then a substantial portion of the calories contained in the food will be lost as heat, and therefore cannot be stored as fat.

The problem with fruit is that virtually all of the calories it supplies come in the form of simple sugars. The most abundant sugar in fruit is fructose (commonly known as fruit sugar), although some fruits (oranges and grapes for example) also contain a lot of glucose. I know, I know, all of you budding biochemists out there are going to point out that fructose is very low on the glycemic index. This means that it does not elicit a large and rapid insulin release, and so on that basis we would not expect it to promote fat storage. Right you are. Although the reason fruit makes you fat is because of the fructose it contains, the effect is not mediated by insulin. The problem with fructose is that it bypasses the enzyme phosphofructokinase-I (PFK-I), the rate-limiting step of glycolysis (3). In other words, fructose bypasses the control point that decides if a dietary sugar is going to be stored as glycogen or fat. Complex carbohydrates, such as rice, oatmeal or potatoes, are preferentially stored as glycogen until glycogen stores are full. Fructose, on the other hand, gets directly converted to fat in the liver, then gets whisked off in the bloodstream to be stored in fat cells (3). Next month I’ll walk you through the metabolic pathway, step by step.

References


In the last bulletin, we began our discussion of fruit and fructose metabolism. As you know, I do not recommend fruit or fruit juice in any of my diets. This is a controversial issue that a lot of people don’t understand. Don’t get me wrong: Fruit is generally a healthy, nutritious food. Fruit is high in fiber, low in fat and calories and is a good source of vitamins and minerals. If you want something sweet for dessert, fruit is a good choice. However, there are two groups of people for whom fruit is not the best food choice: bodybuilders and anyone trying to maximize fat loss.

I originally discovered this by conducting carefully controlled nutrition experiments with bodybuilders. Simply put, I found that when fruit was added to their diets, they got fat. This was not due to an increase in calories, because in these experiments fruit was substituted for another carbohydrate source so that total calories were kept constant. So I knew it had to be something special about fruit itself that caused fat accumulation. In this bulletin I will explain what it is.

The problem is that 80-90 percent of the calories in fruit are supplied by simple sugars, fructose and glucose. Some fruits, such as grapes and oranges, contain a lot of glucose, but most fruits supply the bulk of their calories as fructose, which is also known as fruit sugar. The bottom line is that fructose is rapidly converted to fat by the liver. Whereas most other carbohydrate sources are preferentially stored as glycogen, fructose is preferentially converted to fat and stored in adipose tissue. This is a consequence of the molecular structure of fructose, which allows it to skip a key regulatory point in carbohydrate metabolism. This regulatory point is a step in the glucoalytic pathway catalyzed by the enzyme phosphofructokinase-I (PFK-I).

As you know, from previous articles about carbohydrate metabolism and thermogenesis, the dietary energy (calories) supplied by carbs is used for several purposes. Some of it is simply lost as heat during its digestion and metabolism in a process we know as diet-induced thermogenesis. You can loosely think of this as “friction” in the metabolic pathway, and this energy loss contributes to the generation of body heat. Most of the dietary energy is used to maintain the basal metabolic rate (BMR) — the energy cost of keeping your body alive. Some of the energy is used to perform work, like exercise and activities of daily life. After that, any energy left is stored as glycogen in muscles and in the liver. If you consume too many calories from carbohydrate after glycogen stores are full, the rest will be converted to fat (triglycerides) in the liver, and transported by the blood to fat cells (adipose tissue) for storage.

So excess calories from any carbohydrate source can be converted to fat. The enzyme that regulates whether dietary energy supplied by carbohydrate is stored as glycogen or fat is PFK-I. It shuttles carbs into glycogen stores until full, then it switches the flow of carbohydrates from glycogen synthesis to fat synthesis. Glycogen is the storage form of carbohydrate in animals, and the amount of glycogen you can store is quite limited. The upper limit is generally believed to be between 250-400 grams, depending on the amount of skeletal muscle mass you have. This amounts to only 1000-1600 calories — not even enough energy to fuel your body for one day.

The deal with fructose is that it totally skips the enzyme PFK-I, which is the regulatory step responsible for making sure glycogen stores are full before fat synthesis is switched on. Instead of being stored as glycogen, fructose gets directly converted to fat by the liver. Now I think you can see why I have a problem with recommending fruit for bodybuilders. To get a detailed understanding of fructose metabolism, we should start at the beginning. Fructose is absorbed from the small intestine and directly transported to the liver by the portal vein. The first enzyme to act on fructose is fructokinase, which adds a phosphate group to the sugar to form fructose-1-phosphate (F1P). Glucose is similarly phosphorylated at the six position of the hexokinase, forming G6P. All cells have hexokinase and thus have the ability to phosphorylate glucose. This means that all cells can metabolize glucose for energy.

On the other hand, fructokinase is virtually confined to the liver (1). So while glucose is a general substrate for all body tissues, fructose represents a carbohydrate load targeted for the liver (1). The next thing that happens is F1P is split by the enzyme aldolase to form

Fruit is a very healthy, nutritious food source. But if your goal is to lose body fat and become as lean as possible, it should be excluded from your diet.
glyceraldehyde (GA) and dihydroxyacetone phosphate (DHAP). Refer to the figure, which is adapted from Shafir (1). This means that products of fructose metabolism enter the glycolytic pathway at the triose phosphate level (i.e., as three carbon sugars). Glucose, on the other hand, is phosphorylated to yield G6P, which may proceed directly to glycogen synthesis (1). To be broken down for energy, glucose must first pass through the rate-limiting PFK-I step. Fructose metabolites enter below this step, and thus bypass an important point of regulation. Fructose therefore is more prone to be converted to fat, while glucose is more prone to be converted to glycogen.

The biochemistry is much more complex than is appropriate for this article, but I have pointed out the salient features of the pathway to explain why glucose-based carbohydrate sources are better than fructose, especially for people trying to minimize body fat stores. Scientific studies have proven that while fructose is effective at replenishing liver glycogen stores, starch (glucose polymers) is much more efficient at replenishing skeletal muscle glycogen stores (2).

When we were designing the Parrillo Supplement Bar, we surveyed every available sports supplement bar we could find. We found that 25 out of the 26 bars had fructose as either the first or second ingredient. (If you use somebody else’s bar, go read the label.)

Why? Because corn syrup and fruit juice (good sources of fructose) are real cheap and they’re also very sweet. We pioneered the use of a new carbohydrate source in our bar called rice dextrin. It’s a short-chain glucose polymer made from rice. This gives you the quick energy you want from a sports bar, but without the fructose. Each Parrillo Supplement Bar also contains CapTri® (which is legendary by now) and an ultra-high efficiency protein source.

As we discussed in an earlier bulletin about carbohydrate metabolism, complex carbohydrates (such as starch and maltodextrin) are more effective at replenishing glycogen stores than simple sugars (3). This makes sense because complex carbs are released into the bloodstream slowly whereas simple sugars are released very rapidly, potentially overwhelming the glycogen synthesis pathway and “spilling over” into fat stores. Furthermore, the increased insulin release resulting from simple sugars causes more of the sugar to be converted to fat.

This is why Parrillo Performance Pro-Carb™ Formula is based on maltodextrin instead of sugar, like most other carbohydrate supplements. Maltodextrin is a medium-chain glucose polymer made from corn. It has been found that maltodextrin is 15 percent more efficient at restoring muscle glycogen levels than conventional carbohydrate foods like rice and pasta (4).

This makes Pro-Carb™ ideal for glycogen supercompensation (carb loading). Maltodextrin beverages like Pro-Carb™ have also been demonstrated to increase blood glucose levels during exercise and to increase exercise time to exhaustion (4,5).

At this point, I think I can anticipate a question from the biochemists in the crowd. You’ve probably heard that fructose is low on glycemic index, which means it raises blood sugar very slowly and elicits only a small insulin release. From your reading of our series on endocrinology, you know that a slow, steady insulin response is good. Since insulin is a potent stimulus for fat storage, we want to keep insulin levels fairly low, so be this reasoning it seems like fructose would be good. The problem is that the REASON fructose has a low glycemic index and results in a small insulin release is that it is converted to fat in the liver. It doesn’t raise blood sugar very much because it is released from the liver as fat instead of sugar.

Fructose has a MUCH greater tendency to be converted to fat than other carbohydrate sources, so why use it? Now you understand the biochemistry behind my controversial stance on fruit. I’m not just making this stuff up, folks. There’s a reason behind every part of my program.

References
Activating Muscular Growth, Part I

by John Parrillo

Mention the words “Belt Squat” to anyone’s who’s trained at the Parrillo Performance Gym in Cincinnati, and you’ll get a reaction that’s a mixture of fear and nausea. The mere thought of belt squats is enough to make most people need to sit down. There’s really nothing quite like it. Anyone’s who’s done it will agree that it is the most mentally and physically demanding exercise ever developed. The belt squat will take you to a new level of intensity.

At this time, the Parrillo Performance Gym is a private gym, not open to the public. It’s really more of a research facility than a gym. We experiment with new equipment and new techniques, developing the next generation of bodybuilders. We work with a lot of top competitive amateurs trying to make it to the next level and break into the professional ranks. We also deal with a lot of professional competitors, all the way up to people training for the Olympia.

I guess you could say that’s our specialty — taking people to the next level. That’s really what brings me the most satisfaction and is my biggest reward — helping people realize their dreams. And this applies to everyone from the over-weight 45-year-old mother of three to the next Mr. Olympia. Everybody wants to look good, feel good and have more energy. Everybody has a dream. What keeps me going are the people who call in to tell me they’re in the best shape of their lives. I get just as excited whether it’s someone who’s used our program to lose those 30 extra pounds they’ve been struggling with for years, or someone who’s just won her first contest.

Among conventional bodybuilding exercises, most people would agree that a set of squats taken to complete failure is the most demanding. I developed the belt squat to take people to the next level of intensity — it’s probably the ultimate plateau-buster. The belt squat is a special machine where the trainee wears a harness which suspends the weight between his legs. This arrangement takes the stress off the lower back, allowing you to maximally overload the legs. It’s the same movement as the conventional squats, except you can use a lot more weight for a lot more reps.

Of course your legs will grow. This will be the highest intensity exercise your legs will ever experience. But the amazing thing about the belt squat is the overall effect it has on your entire body. It allows you to take your whole body to failure, including all of your energy producing systems. You will be breathing as hard as you can, your heart will be pumping as hard as it can, and every cell in your body will be trying to produce energy as fast as it can. Adding belt squats to your routine will strengthen your cardiovascular system and improve oxygen delivery to your muscles. The belt squat is unique among resistance training exercises in that it truly combines extremes of intensity in both anaerobic and aerobic work. It is well-documented that high-intensity aerobic training increases capillary density in muscles, as well as the number and size of mitochondria (1). It also increases the level of enzyme systems involved in energy production (1). These factors act to increase the anaerobic threshold — the maximum intensity of power production you can achieve aerobically (1).

The Parrillo Belt Squat Machine doesn’t look very imposing. But strap on the harness and you’re asking for trouble. Your body will thank you in the long run, but forget about dancing that night.

No doubt you’ve heard that anaerobic training and aerobic training elicit different adaptive responses which, to some extent, work against each other (2). In other words, strength training and endurance training are not completely compatible, and if you want to maximize your results in one form of training, you should avoid the other form. Everybody’s favorite example is to compare the physiques of a marathon runner with a bodybuilder. To be sure, endurance training improves your endurance and strengthens your respiratory and cardiovascular systems, but marathon runners don’t have big muscles — not even in their legs. Marathon runners don’t want big muscles, because too much weight would actually slow them down. For them, it’s the ratio of strength to weight that’s important. All they care about is how far and how fast they can run. So for what they want, their training style is appropriate. All bodybuilders care about, on the other hand, is getting...
big muscles. So they lift weights a lot and don’t run much. Too much running can actually cause your body to break down muscle tissue to supply amino acids to burn as fuel. This would be a disaster for a bodybuilder. So you don’t find too many endurance athletes who can squat 405, and you don’t find too many bodybuilders who can run a marathon. This is all well and good — decide what your goals are and train appropriately to attain those goals.

Here’s what’s going on: All forms of exercise of sufficient intensity represent a stress on the body. The body responds by adapting to that particular form of stress, so it can tolerate it better the next time around. Strength training (resistance training, weight training) represents a severe stress on the muscle fibers that make up your muscles, and they respond by building bigger, stronger fibers. This, of course, results in bigger, stronger muscles. Endurance training (running, biking, etc.) represents a stress on the aerobic energy producing capabilities of the body, and the body responds by increasing its ability to produce aerobic energy. To run a marathon, you don’t need extremely strong legs, but you need to be able to produce a lot of energy sustained over a long period of time. It’s not easy. Aerobic exercise training therefore results in a stronger heart and more blood vessels to deliver more oxygen to muscles. It increases mitochondria number and size in muscles. Remember that mitochondria are the furnaces inside cells where foods are burned (combined with oxygen) to produce energy. Increasing capillary and mitochondrial density in muscle increases its ability to produce energy.

So to a large extent, the dogma you’ve heard about the “incompatibility” of strength and endurance training is true. One form of training results in bigger muscles, and the other form results in higher energy producing ability. If your body’s adaptive reserve is split trying to achieve both goals, your progress on either will be compromised compared to if you were performing only one type of training. And at this point in the argument most people think they’ve reached the conclusion and stop thinking about it, and therefor miss and important point.

Consider the following: Let’s talk about a bodybuilder who’s been training hard and eating right for a few years and has put on 50 pounds of muscle. Although he’s very happy with this achievement, lately he’s seen his progress slow down and he really hasn’t changed much in the last year. He believes he has probably reached his “genetic limit.” He has basically gone as far as conventional training and dietary strategies can take him. Feeling that it’s genetically impossible to increase size much more, he shifts

### The Belt Squat is Unique Among Resistance Training Exercises In That It Truly Combines Extremes Of Intensity In Both Aerobic And Anaerobic Work.

Now let’s take a microscopic look at his muscles. We see huge muscle bellies with huge, hypertrophied muscle fibers. Crammed wall to wall with contractile proteins — actin and myosin. His muscles have reached a “steady state” — a term from thermodynamics which describes a system where flow of matter and energy into the system is balanced by flow of matter and energy out of the system. Here, protein anabolism (building up) is balanced by protein catabolism (tearing down). Flow of amino acids into the muscle equals flow of amino acids out of the muscle, so his muscles stay the same size. Now think about what would happen if we could somehow double the capillary supply to his muscle. Blood supply doubles, the flow of amino acids and glucose into his muscle doubles and his ability to carry waste products away from his muscle doubles. Is it possible that if we could increase the supply of nutrients and energy to his muscle that we could get it to grow again? Could it be that when a muscle gets very large, maybe the reason it stops growing is it becomes limited by its supply of nutrients and oxygen? Of course may factors are involved, but we believe this is one of them.

So while strength training and aerobic training do represent different adaptive responses and interfere with each other in the short term, there comes a point in muscular development where increasing blood supply to a muscle may help overcome a growth plateau. Does this mean I recommend bodybuilders begin running marathons? Of course not. I’m just saying that a certain amount of high-intensity aerobics may increase nutrient and oxygen supply to a muscle and help it grow better. You think you’ve reached your genetic limit? I think not. A few weeks of belt squat training, and you’ll be growing again.

### References


Activating Muscular Growth, Part II

by John Parrillo

Conventional wisdom has it that strength training and endurance training are incompatible, since they elicit different adaptive responses that compete with each other (1-3). This is true, at least in the short term. Last month I introduced the concept that at some point in the muscle’s growth it may become “perfusion limited,” meaning that any further growth is limited by the muscle’s blood supply. Increasing the vascular supply to a muscle will allow for greater delivery of nutrients and oxygen and greater removal of wastes. Ideally, a bodybuilder would like the benefit of increased capillary density in muscle which accrues from high-intensity aerobic exercise without the catabolic effect that comes from running a marathon. The belt squat is probably the best way to achieve this.

The amazing thing about the belt squat is that it makes your legs grow — everybody expects that. The amazing thing is the overall effect it has on your whole body’s ability to produce energy and perform high intensity exercise. If your strength and muscular development are at a plateau, the belt squat is a great way to blast through it — no matter what muscle group you’re having trouble with. The belt squat increases your cardiovascular reserve and your anaerobic threshold. Cardiovascular reserve is the ability of your cardiovascular system to deliver “extra” oxygen above what you normally need. In other words, it’s your ability to increase oxygen delivery to muscles during times of intense exercise. Anaerobic threshold is the maximum intensity of exercise (power output, which is work per unit of time) your body can perform aerobically, before the anaerobic pathways kick in. Simply put, the partner-assisted belt squat is the most intense exercise you’ll ever do. Acquiring the ability to exercise that intensely will carry over into your other exercises.

I think the key point about the belt squat is that it pushes all three of your energy producing systems to their limit. Let me explain. Your body has three main energy producing pathways that are used during exercise. These are the phosphagen system, the lactic acid system and the aerobic system. All work performed by the body, including muscular contractions, is directly fueled by a molecule called ATP, adenosine triphosphate. ATP is a “meta-stable” chemical compound which is made inside all cells of the body and powers their every function. ATP has a “high energy phosphate bond,” which means that when ATP is broken down a lot of energy is released. This energy is then used to power muscular contractions, maintain ion gradients transmit nerve impulses, synthesize proteins, and provide energy for everything a cell needs to do to live and grow. While fat and glycogen represent energy storage molecules within the body, ATP represents and energy transfer molecule, acting as a molecular bridge between the energy contained in food and the energy used by the cell. To summarize, the energy released when food burned is used to make ATP, and the subsequent breakdown of ATP is the direct energy source for cells.

A typical belt squat workout begins with some leg curls for a warm-up. This gets blood flowing into the muscles and warms up the joints. Two sets of each are enough, for about 10-12 reps with a moderate weight. Be sure and hold the contraction at the top. Next, two or three sets of leg presses are used to further warm up the legs and to prepare you for the squats. Start out light for about 15-20 reps, then do a moderate set around ten reps, and finish with a fairly heavy set around six reps. Be sure to go all the way down on the leg press. You may even want to briefly pause at the bottom to get a good stretch. You don’t want to wear yourself out during the warm-up, but you do want to get things flowing and loosened up. Next, stretch your quads and hamstrings, and walk around the gym for a few minutes to rest. Don’t get a drink of water because you don’t want anything in your stomach. This is a good time to pray and make sure all your important papers are in order. We intentionally place our belt squat by the back door of the gym. If this is not the case in your gym, get a trash can and put it by the belt squat.

The belt squat is strictly a partner-assisted exercise. We like to have a group of four people on the belt squat days. This allows for three spotters, which you will need to take it to the absolute limit (at least one spotter is required). We usually do four sets each, taking turns. You develop pretty good friendships with your belt squat partners. I honestly think I can remember every belt squat workout I’ve ever done.

The first thing you do is put on the harness. Adjust the shoulder straps to fit your body and make sure the belt is tight. Load the weight onto the weight carriage and sit on it. Your partner will attach the straps through the hole in the plates, so that the weight is suspended by the harness. Grab the handle and stand up, and your partner will remove the weight carriage, so that the plates are hanging between your legs. When using...
The Belt Squat Machine looks innocent enough. But once you’re on the platform with the harness strapped on, you’ll wish you had scheduled that dentist appointment that you’ve been putting off for the last two years.

A heavy weight, your partners will help you stand up. Removing the weight carriage exposes “the pit” — a large slot in the platform where the plates will travel as you squat. Place your feet slightly wider than shoulder width with your toes angled out and your heels placed directly underneath your shoulders. Grasp the handle securely and keep your arms straight. You want to keep your arms locked out so you don’t lose balance. If you maintain this stance and keep your arms straight, you won’t get injured. The worst thing that can happen is you lose the weight, which just means you sit down on it in the pit. The beauty of the belt squat is that it’s so intense and yet so safe. The harness takes the strain off your lower back so you can maximally overload your legs without fear of injuring your back. This is an extremely safe exercise.

We usually start with one plate, which is 100 pounds (we have special high density plates made up for the belt squat). Do this for about 20 reps. This is another warm-up set, to get the feel of the exercise. You will probably need no help from your partner on this set. Rack the plate back on the carriage, take off the harness, and give it to the next person. Next, stretch your legs, using one of the fascial stretching exercises in the Parrillo Training Manual. You’re beginning to get a pump, and it feels good — so far. After your training partners take their turns, it’s back to you again. This time we go up to 200 pounds for about 15 reps. This is somewhat harder, but much easier than squatting 200 for 15 reps on the conventional squat because your lower back is taken out of the movement. On your next set you can either go for your heavy set or continue pyramiding by doing 300 pounds for 10-12 reps. Have a spotter stand directly behind you on the platform. He will have his arms around you and hold the belt in the center in the front. The spotter goes up and down with squatter, performing the exercise in parallel. The spotter provides just enough help to get you through any sticking points. On your heavy set, you will be able to go at least 100 to 200 pounds heavier than your max when you didn’t have a spotter — or maybe more. Five hundred pounds for a big guy is not uncommon. Take your heavy set to complete positive failure. You will still be able to resist the weight on the way down, but you will need your spotters to get you up out of the hole. One spotter behind you and one on each side works the best.

The heavy set done to positive failure at around 8-12 reps will stimulate your legs to grow. The next set is the hardest and is the one that will really stimulates your cardiovascular system. In this set we do 100 reps with 100 to 200 pounds. This is especially hard since you just went to failure on your last set. We rotate spotters on this set because they go to failure too. Change spotters after every 20 reps. Next month, I’ll take you through a 100 rep set of belt squats and explain the energy producing systems involved.

References


Activating Muscular Growth, Part III

by John Parrillo

In the last bulletin, I left you ready to start your last set of the belt squat workout — the dreaded 100 rep set. This set pushes both aerobic and anaerobic energy producing systems in their absolute limits. It elicits an adaptive response in your cardiovascular system to strengthen your heart and increase capillary density in muscle. This increases cardiovascular reserve and anaerobic threshold and improve nutrient and oxygen delivery to the muscle.

A cell contains enough ATP to supply energy to last for about two seconds (1). So you would use this up during your first rep. Obviously you have to immediately and constantly replenish you ATP supply. Within about 1.2 seconds of maximum contraction, 80% of the ATP is being derived from CP — creatine phosphate (1). CP is the other phosphagen compound, along with ATP, which supplies energy very rapidly. The phosphagen system is always the first energy pathway called into action. Since the machinery of the cell needs ATP for power, it begins by using ATP, and then other energy sources are used to replenish the ATP. CP acts like a buffer to maintain relatively uniform levels of ATP within the cell. As ATP is broken down to release his energy, one of its phosphate groups is split off to form a molecule of ADP (adenosine diphosphate) and a free phosphate group. CP is able to donate its phosphate group to the newly formed ADP to regenerate ATP. The phosphagen system is able to supply energy in rapid bursts, immediately on demand, but it doesn’t last very long (about six seconds at maximal power output). This is why a typical set with heavy weights doesn’t last very long — you run low on ATP and can’t make it fast enough to continue.

Within 2.5 seconds of maximal contraction, 50% of ATP is being supplied by the lactic acid system, also known as the glycolytic pathway (1). Anaerobic glycolysis is the pathway used to make ATP from carbohydrates in the absence of oxygen. This is the second energy producing system called into play and is used to meet short-term energy demands. When the intensity of exercise is too great and the body can’t supply oxygen fast enough, carbs can be partially broken down to yield energy without oxygen. The advantage is this is a very rapid way to produce energy, but the disadvantage is that it’s not as efficient as aerobic energy production.

After six seconds of maximal contraction CP levels have fallen to around 65% of their resting level and power output begins to decline. Continuing beyond six seconds of maximal contraction, ATP and CP levels begin to fall and lactic acid begins to accumulate. These factors severely hinder power output (1). So we can see that after just a few reps we’re using both of our anaerobic pathways: the phosphagen system and the lactic acid system.

Back to our belt squats: during the second 20 reps you will need some help. ATP levels may be depleted by as much as 60% of initial values (1). CP levels are nearly exhausted after about 40 seconds of maximal intensity exercise (1). At this point glycolysis is going full speed, but is unable to generate enough ATP to keep up with the demand. Lactic acid production is maximal during exercise of intensity that can be maintained for 1-3 minutes. So one minute into the set lactic acid levels are soaring and your muscles are burning like crazy.

The third energy producing system — the aerobic pathway — begins to kick in after about 20 seconds into the set, and becomes the major energy producer after about 90 seconds (see figure). Notice that there is considerable overlap, with all three energy systems being utilized at the same time. It’s not like you use up one energy source, turn off that system, then turn on the next system. They all blend in together, with different systems playing the major role depending on the intensity and duration of the exercise. If we were talking about low intensity exercise like walking instead of belt squats, the aerobic system could produce energy fast enough to fuel the
activity, and the lactic acid system would never be called in.

The aerobic pathway is able to supply energy for long-term demands — even for hours. Activities like weight lifting draw mainly from the phosphagen and lactic acid systems, while things like running and biking are fueled mostly by the aerobic system. The advantage of the aerobic system is that it can supply energy for a very long period of time, but the disadvantage is that it cannot produce energy very quickly. For weight lifting you need to supply a tremendous amount of energy immediately, but for endurance activities you need a lower energy level for a longer period of time.

In the aerobic pathway, carbohydrates and fat are burned — combined with oxygen — to release energy. The rate of energy production by this pathway is limited by your vascular supply (which limits oxygen delivery) and by the size and number of mitochondria inside cells. Mitochondria are organelles in cells where aerobic metabolism is carried out. Notably, fat can only be used for energy via the aerobic pathway. Fat cannot undergo anaerobic glycolysis, as can carbs. Therefore, aerobic activity is the only way to burn fat. This is another reason to make aerobic exercise a part of your program, in addition to strengthening your heart and blood vessels.

Now, back to our set: after 50 reps the phosphagen system is long gone, and the glycolysis is pretty much shot too. You have continued to expend energy faster than your cells can replace it, and consequently build up an “oxygen debt.” This describes a situation we are all familiar with. You know how you breathe real hard for a few minutes after a set? This extra oxygen is being used to replenish the ATP, CP and glycogen you spend anaerobically during the exercise. The oxygen debt is the difference between the amount oxygen actually consumed and the amount that would have been consumed if the exercise had been fueled entirely aerobically from the beginning. By the time the oxygen debt builds up to 3-4 liters of oxygen, you enter a severe level of ATP depletion. Exercise will only continue on a “pay as you go” basis wherein ATP is being continually replenished by aerobic metabolism. Power output decreases and your heart and lungs are working at absolute maximum. You will be sweating profusely. All energy systems are either maxed out or have already failed.

By 60 reps you will begin to quit. At this point you will be beyond positive failure and it will be difficult even to resist the weight on the way down. From here on out your life is in the spotter’s hands. By 70 reps you get that adrenaline rush that comes from the fear of eminent death. By 80 reps you can’t feel your legs anymore and your mind enters a strange trance-like state. You kind of lose touch for a while. You probably won’t have much energy left to groan or scream and your body gets limp. By 90 reps you’re just along for the ride, with the spotters doing almost all the work.

The universal reaction after this experience is to lay down on the floor. Some people have to throw up. Loss of consciousness may occur as the result of acute metabolic acidosis — the lactic acid builds up and acidifies the blood. This corrects itself in a few minutes after you blow off some carbon dioxide. Most people lie down for five minutes or so before pulling themselves over to a bench. You’ll be breathing hard and sweating for about 20 minutes after this.

One other energy system deserves mention, but probably doesn’t play much of a role in belt squats. That’s the glucose-alanine cycle. During long term aerobic exercise after blood glucose and glycogen are depleted, the body begins to break down muscle tissue into free amino acids. The amino groups are removed from the amino acids and added to pyruvate to form alanine. Alanine is transported by the bloodstream to the liver where it can be converted to glucose. The glucose is carried back to the muscle to be used as fuel. In addition, the branched chain amino acids (BCAA’s) leucine, isoleucine and valine can be used directly as fuel by the muscles. So in ultra-endurance activities, such as a marathon, muscle is actually broken down and used as fuel. This is one reason why endurance athletes have small muscles and one reason why bodybuilders don’t run marathons. Amino acids may supply 15% of energy used in endurance activities.

In summary, we find that the belt squat boosts energy producing capabilities of the entire body. Cardiovascular reserve and anaerobic threshold are increased. Training at this level of intensity carries over into your other exercises and allows you to perform them more intensely also. Belt squats tax all three major energy producing systems at maximal levels. While ultra-endurance activities like marathon running are counterproductive for bodybuilders, a certain amount of high intensity aerobic exercise seems to allow increased muscular growth. This may result from increased vascular supply to muscles which may stimulate growth by providing increased nutrient delivery.

Everybody has a dream. Everybody wants to get to that next level. That’s what Parrillo Performance is all about.

References


Diet and Supplementation to Maximize Energy and Growth

by John Parrillo

During the last few months we’ve been discussing the various energy producing systems of the cell and how they are called into play during intense exercise. To review briefly, ATP is the molecule that directly powers muscular contractions. ATP is referred to as a “high energy” molecule, because when its phosphate bonds are broken a lot of energy is released. This energy is transferred to myosin, one of the proteins in muscle fibers, and this enables the fibers to slide past one another, resulting in muscle contraction. (Next month we’ll go more into the molecular anatomy of muscle and explain exactly how this works.)

A muscle cell has only enough ATP to last for a second or two, so the supply of ATP must be continuously regenerated. The first energy system to be recruited is the phosphagen system, which uses energy stored in creatine phosphate (CP) to regenerate ATP. This system can fuel maximal exercise levels for around six seconds (1). The second energy system called into play is the glycolytic system. In the glycolytic system, glucose from the blood stream or from stored glycogen is broken down to lactic acid. This can supply energy at a maximal rate for two or three minutes (1,2). The third and final energy system is the aerobic system, which can supply energy for hours on end. In this system carbohydrates, fat, and protein are oxidized (burned) to produce CO2, and the energy released is used to regenerate ATP (1,3).

The advantage of the phosphagen and glycolytic systems is that they are able to produce enormous quantities of energy very quickly, but they only last for a few seconds. The aerobic system can generate energy for long periods of time, but at a lower level. The first two systems are known as “anaerobic” which means they don’t require oxygen. Aerobic metabolism does require oxygen, and produces energy at a slower rate because it is limited by the rate of oxygen delivery to tissues. Weight lifting is a prime example of anaerobic exercise, and the reason you can carry on a heavy set for only 30 seconds or so is that you run out of CP (3). Weight training then is fueled almost exclusively by the phosphagen and glycolytic systems. Running and cycling are fueled mainly by the aerobic system, and can be carried on for hours.

All of this is very exciting to biochemists and muscle physiologists, but what does it mean to bodybuilders and endurance athletes? How can we use this information? To specifically design our diet and supplementation program to provide the energy and nutrient profile we need for maximum performance and muscular growth. Let me tell you how.

When you want to increase cellular energy levels, the first thing to think about is CapTri®. CapTri® is almost a miracle when it comes to delivering energy to cells. CapTri® is a specially engineered fat which contains medium chain fatty acids (MCFAs). Regular fats and oils are made from long chain fatty acids. Fat is a great molecule for storing energy (nine calories per gram as compared to four calories per gram for carbs and protein) but has the disadvantage of being slowly metabolized. The unique molecular structure of CapTri® gets around this problem. CapTri® harnesses the energy density of fat but is able to deliver that energy as rapidly as glucose (4). CapTri® is not incorporated into chylomicrons and transported in the lymphatic system as is conventional fat, nor does it require the carnitine shuttle for entry into mitochondria. Thus CapTri® skips these time consuming steps that slow down digestion, transport, and absorption of regular fats. CapTri® is absorbed directly into the bloodstream and goes to the liver where it is converted into ketone bodies (4). Ketone bodies are an immediate energy source which can be used at the same time as carbohydrates. This is in contrast to conventional fat and stored body fat, which is not used as a significant source of energy for exercise until carbohydrates are depleted. Carbohydrate metabolism produces malonyl-CoA, a metabolic intermediate which inhibits the carnitine shuttle and thus prevents the use of long chain fatty acids for energy.

Since MCFAs (includes MCTs) do not require the carnitine shuttle they are burned immediately for energy, at the same time as glucose. This has a glucose sparing effect (4) and helps glycogen stores last longer. The longer glycogen stores last, the longer you can train before fatigue sets in. The energy from CapTri® also spares protein (4). This simply means that if CapTri® is being burned for energy, less protein needs to be burned for energy. This effect reduces protein catabolism. Finally, CapTri® does all this without contributing to body fat stores (4). Since CapTri® is burned immediately for energy, it is not stored as fat. CapTri® has a very high thermogenic effect, which means that excess calories from CapTri® which are not used to fuel exercise will be converted to body heat instead of being stored as fat. This is the secret of how Parrillo athletes consume so many calories without getting fat. To learn more about the metabolism
and biochemistry of MCFAs call and ask for our technical bulletins on CapTri®. For energy, nothing can touch CapTri®.

Next we need to talk about a good carbohydrate source. ProCarb™ was developed specifically to fit the carbohydrate needs of athletes. It contains maltodextrin, a partially digested glucose polymer. ProCarb™ has a low glycemic index, around 22-29. This means it is slowly released into the bloodstream for a uniform energy level and a gradual insulin release. This carbohydrate has proven optimal for replenishing glycogen stores (5) and the insulin profile is perfect for building muscle without storing fat. As you know, if insulin levels rise too high this acts as a trigger for fat storage. ProCarb™ is an extremely clean burning energy source which is easily digested and absorbed, without bloating, gas, or bowel residue. This makes it ideal for use during endurance activities, as well as before weight training and for carb loading.

No doubt you’re aware that long, hard training sessions can actually be catabolic to muscle tissue protein stores. After carbohydrate stores are depleted and fat metabolism is at full pace, muscle tissue is broken down to release amino acids which are burned for energy. This is the worst thing that can happen to an athlete. Can you imagine busting your butt in the gym for two hours a day and losing muscle? It can happen very easily if your nutrient intake is not adequate to match your training level. One study found that during a 10 mile run as much as 57 grams of protein were burned for energy (6). That amounts to about half a pound of muscle! The most important thing you can do to prevent muscle catabolism is to make sure you have plenty of other energy sources available. CapTri® and ProCarb™ both have a protein-sparing effect and are preferentially used as energy sources before protein. These are first line defenses against protein catabolism. You may also want to consider Muscle Amino, Parrillo’s exclusive branched-chain amino acid (BCAA) formula. BCAAs are the most abundant amino acids in muscle fiber proteins, and during catabolic states muscle fibers are degraded and the BCAAs are used as fuel. The big problem is that the BCAAs (leucine, isoleucine, and valine) are essential amino acids. This means they cannot be made by the body, so it is essential that they be obtained in adequate amounts from the diet. Parrillo Muscle Amino™ contains BCAAs in the proper ratio required to optimize muscular growth. Having an abundant pool of free BCAAs in muscle ensures that the building blocks are in place when its time to build muscle. Muscle Amino™ also provides amino acids that can be used as fuel so that existing muscle tissue won’t be broken down during catabolic states.

Intense training produces a lot of metabolic waste products, most notably ammonia, which are toxic to cells and need to be eliminated. Parrillo Max Endurance Formula™ was designed to do just that. It provides aspartate, which is an intermediate consumed in the urea cycle, the metabolic pathway responsible for eliminating ammonia. This is of special concern to endurance athletes, who generate a lot of toxic waste products during long training sessions.

The Parrillo Bar™ is one of the best energy sources available for athletes. It contains CapTri®, to provide immediate energy. It provides carbohydrates as glucose polymers to help maintain blood glucose levels during prolonged exercise. It includes a high efficiency protein source with plenty of BCAAs. All of these ingredients are designed for rapid digestion and cellular uptake, and help prevent muscle protein catabolism.

This supplementation program combined with the Parrillo diet will result is maximal energy delivery to cells to fuel exercise performance and muscular growth. If you’re seeking a natural advantage, give it a try. You’ll be amazed what your body is capable of if you supercharge it with the right nutrients. Before your next workout mix a scoop of ProCarb™ and a tablespoon of CapTri® in a quart of water. Drink half before the workout and half during the workout. Before your next bike race take 10 Muscle Aminos™ and 10 Max Endurance™ along with the drink above, and pack along a Parrillo Bar™ for during the race. Call us and let us know what happens - maybe you’ll be featured in the next Parrillo Performance Press!

References


I am excited that muscle is now recognized as being important for everyone, not just bodybuilders and other athletes. You’ve probably seen medical reports on the news showing 80 and 90 year-olds lifting weights. Even in advanced age, resistance exercise makes muscles stronger and improves quality of life. It allows people to be more active and self-sufficient, and it reduces injuries (such as falls) as well. Muscle atrophy (when muscles get smaller and weaker) is so common that it is considered a normal part of aging. In actuality, disuse is probably the main culprit. Resistance training can certainly slow down, and even reverse, many of the signs of physical decline usually attributed to aging.

Strength training is also becoming more popular among young people, including women. People have found that they cannot achieve the lean, muscular, shapely body they desire by aerobic exercise alone. All of the Ms. Fitness competitors I work with include weight training as part of their program. If your goal is to be lean and firm with good muscle tone, but not to get big muscles, remember that muscles are the place where body fat is burned. So if you want to lose your fat, you’ve got to work your muscles. Resistance exercise increases lean body mass and thus metabolic rate, causing your body to burn more fat 24 hours a day. It increases growth hormone, improves glucose tolerance, and lowers cholesterol levels. Simply put, it makes you look better, have more energy, and live longer.

This series of articles will explore the structure, function, physiology, biochemistry, and metabolism of muscle. I will explain basic scientific concepts of muscle as well as training strategies for increasing muscle size and performance.

Bodybuilders, of course, are primarily concerned with increasing muscular size. Power lifters care about muscular strength. Cyclists and runners train to improve muscular endurance. Other athletes, such as basketball and football players, are concerned mainly with muscular power and speed. Each of these concerns describe a different parameter relating to muscular performance.

The first practical training strategy we’ll mention is a principle of muscle physiology known as training specificity (1,2,3). It simply means that a muscle will specifically adapt to the type of training stimulus that is applied to it. The second practical principle to learn is the concept of intensity. In order to cause a muscle to change, or adapt, it must be challenged by an exercise stimulus which exceeds some threshold of intensity.

The reason exercise causes muscles to get bigger and stronger is that the exercise load places a physical and metabolic demand on the muscle. In order to elicit an adaptive response (i.e., to get the muscle to grow) the exercise stimulus must be intense enough to represent a challenge to the muscle. During the next few days after the training session, if adequate nutrients are supplied, the muscle responds by getting stronger so that next time it will be better able to meet that exercise challenge. The most effective exercise stimuli tax the muscle by pushing it to the limit of its perfor-
mance abilities. After a very intense training session it can take as long as two weeks for the muscle to completely recover and adapt. Of course, optimum nutrition and supplementation can speed up the process over what can be achieved with merely adequate nutrition, and that’s where our Nutrition Program comes in.

The training specificity principle states that a muscle will adapt structurally and functionally in a manner appropriate to the type of stimulus applied, provided that the stimulus is intense enough to elicit an adaptive response at all (intensity threshold). To illustrate this concept, compare the legs of a bodybuilder with the legs of a marathon runner. Both of them train their legs hard, pushing themselves to the limit. The bodybuilder trains his legs with squats, and over time develops huge muscles. The marathoner trains his legs by running long distances, and over time improves his speed and endurance, but he never develops huge leg muscles. Can the runner squat as much weight as the bodybuilder? Of course not. He hasn’t trained his legs to lift heavy weights. Can the bodybuilder run a marathon? Of course not. He hasn’t trained his legs to do that. To illustrate the concept of the intensity threshold, consider someone who wants to build massive biceps by curling one pound dumbbells. Consider the sprinter who trains by walking the 100 yard dash. I think you can see intuitively that these athletes will not significantly improve in performance because the training stimulus is not intense enough to challenge the muscles to grow.

So the first thing to do when designing an exercise program is to decide what your goals are. Do you want to maximize muscle size, strength, power, speed, or endurance? These goals are not the same, and different training programs are appropriate for each. We’ll describe how to train effectively for each of these parameters as we go along. For now, let’s start off with some definitions. Increases in muscle size come about by increases in muscle cross sectional diameter (1,2,3). We’ll get into the cellular and molecular basis of this later. Muscle strength is defined as the maximum load (weight) that a muscle can lift one time (1,2,3). Thus, the one rep maximum (1RM) is a measure of muscle strength. Someone who can curl a maximum of 100 pounds one time is twice as strong as someone who can curl a maximum of 50 pounds one time. Speed describes how fast a muscle can contract, and how fast it can move a load. Endurance describes how long a muscle can perform a given task before failing. Someone who can curl 50 pounds 20 times before failing has biceps with twice the endurance of someone who can curl 50 pounds 10 times before failing. In general, you want to train with heavy weights and low repetitions (3-6) to increase in strength, and with lighter weight and more reps (say 15-30) to increase in endurance. This is a result of the training specificity principle. In both cases, you want to train to muscular failure on that set. Training for strength in the 5 rep range means picking a weight which is so heavy that you can perform 5 repetitions, but no more. Performing a set of 5 reps with a weight which you could have lifted 20 times will do you no good. The intensity is too low. In weight training, intensity describes a level of effort where the set is carried to the point of momentary muscular failure. If you’re just trying to tone and firm your muscles, you don’t have to take it that far. But if you’re going for size and strength, that’s what it takes.

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Muscle power is a little more complicated to define. From physics we have three mathematical equations for power. Strictly speaking, power is defined as work performed per unit time, or power = (work/time). Since work is equal to (force X distance), power = (force X distance)/time. And finally, since speed is equal to (distance/time), power = (force X speed). Muscle power then is the product of the force of contraction and the speed of contraction (1,2,3). A person who can squat 300 pounds is stronger than a person who can squat only 200 pounds. However, if the person squatting 200 pounds can do it twice as fast, he will generate more power than the guy squatting 300 pounds. We also know from physics that kinetic energy equals (1/2) X (mass) X (velocity squared), or KE = (m X v2)/2. Let’s say you’re a football player and you want to tackle someone (hopefully another football player). What matters in knocking that person over is how much kinetic energy you can transfer to his body. This depends on the mass of your body and how fast you’re moving when you hit him. Since kinetic energy is proportional to velocity squared, a small increase in velocity can result in a large increase in energy. The same is true of hitting a baseball, a tennis ball, in boxing, and many other sports. This is why power is the most important parameter of muscular performance in sports like football, baseball, basketball, tennis, and sprinting: because performance depends on both force and speed. It’s not just how hard you hit the baseball (force) but also how fast you hit the baseball (speed) that will determine how much kinetic energy is transferred from the bat to the ball, and thus how far the ball will go.

Training for size, strength, power, speed, and endurance are all different. Bodybuilders, power lifters and Olympic style weight lifters all train with weights. They perform largely the same exercises...
and train at maximum intensity. However, while the bodybuilders have bigger muscles, the power lifters can lift more weight. This paradox is explained by the fact that when you lift weights you’re not only training your muscles, you’re also training your nervous system. In general, the bigger a muscle’s size (the larger its cross sectional diameter), the stronger it is. However, power lifters have trained their nervous systems to recruit more muscle fibers to fire at the same time. We’ll cover how to train for size versus how to train for strength in a future article. Training for power includes some strength training, but also includes some work with lighter weights that are accelerated very rapidly to train the speed component. The branch of exercise physiology concerned specifically with training for muscle power is called plyometrics (3,4), and we’ll get into that toward the end of the series. Training for size, strength, and power are similar, and all result in bigger, stronger muscles.

Training for endurance is very different, results in a totally different adaptive response, and does not make muscles get bigger or stronger (1-4). This is a complex issue and is still an area of active investigation. We’ll get into the specifics later. For now, let’s just say you can either have legs like Tom Platz, or you can run a marathon, but probably not both. I have no doubt that Tom Platz could run a marathon, if he trained for it. But by the time he trained long enough to be able to run a marathon, his legs would be half as big as they are now. A note to bodybuilders: don’t stop doing your aerobics! You still need aerobics to burn fat and promote cardiovascular health. But remember, you’re doing aerobics to burn fat, not to become an endurance athlete. For bodybuilders, 30-45 minutes of aerobics a day should be enough. If it’s not, you’re not following the diet. Our bodybuilders do go up to one to two hours of aerobics a day, but that’s only for a few weeks before a contest. It’s far better just not to get fat in the first place, then you won’t have to do too much aerobics and run the risk of losing muscle.

Next month we’ll pick up with the microscopic anatomy of muscle, and explain the cellular and molecular basis of muscle contraction. After we understand the structure of muscles and how they work, we will discuss how they adapt to various training stimuli. This leads right into how to design training protocols to achieve your particular goals. Until then, keep pumping!

References


This month we continue our discussion about muscle. In this installment we’ll cover some basic concepts about muscle anatomy and physiology. This will lead to an understanding of the adaptive response of muscle to exercise, so you can better design an effective program to achieve your training goals.

First off, you should realize that there are three basic types of muscle tissue in the human body. Skeletal muscle, also called striated muscle, is attached via tendons to the skeleton. Usually the two ends of a skeletal muscle are attached to two different bones across a joint. The only thing a muscle can do is contract, and when it contracts (shortens) it brings the two bones closer together. This causes movement of the skeleton at the particular joint spanned by the muscle. Thus the function of skeletal muscle is to move the skeleton. Other skeletal muscles, such as those between vertebrae and between the ribs, play more of a structural role, helping the skeleton to maintain its proper shape. Notably, skeletal muscle is under voluntary control, which means that you control when a skeletal muscle contracts.

Another type of muscle tissue is smooth muscle, called that because it lacks striations. Probably the best example of smooth muscle is the stomach and intestines. Your digestive tract is a huge muscular tube which propels food from your mouth to the other end. Your intestines are ringed by circular bands of muscular tissue which squeeze the food through the tube when they contract. This is called a peristaltic contraction, and is the same kind of contraction that propels food down your esophagus when you swallow. Smooth muscle is not under voluntary control, but instead is controlled by the autonomic nervous system. The autonomic nervous system receives input from the brain, but at the subconscious level. The autonomic nervous system has two divisions: the parasympathetic division which speeds up movement of food through the digestive tract, and the sympathetic division which slows down movement. Of interest, the intestines have their own nervous system built right into the intestinal wall, between muscle layers. It’s called the myenteric nerve plexus, and integrates information from the intestines with input from the autonomic nervous system to precisely control digestion and food movement. Most people don’t realize that there are nearly as many nerve cells in their intestines as in their brains. The complexity of this system has only become understood in the last couple of years. It’s what gives us the freedom to think about other things instead of having to constantly be worried about consciously controlling the movement of food through the gut.

The third type of muscle tissue is cardiac muscle, found exclusively in the heart. It’s somewhere between striated muscle and smooth muscle. It does have striations like skeletal muscle but the fibers are arranged more like smooth muscle, so it has elements of both. Cardiac muscle is not strictly under conscious control (your heart beats without you thinking about it), but is influenced by conscious thought. For example, being nervous or scared will speed up your heart rate, while relaxing will slow down your heart rate. This too is mediated by the autonomic nervous system. Here, the sympathetic division speeds up heart rate while the parasympathetic division slows it down. Heart muscle has some very special properties which allow it to do its job. For one thing, it has a built in pacemaker which causes the heart to spontaneously contract all by itself. You can cut all the nerves going to the heart and it will still beat just fine. (This is what makes heart transplants possible.)

The rest of this series is devoted to a study of skeletal muscle, especially how it works and what to do to make it bigger and stronger. Each muscle is made of muscle cells, also called muscle fibers or myofibers (1,2,3). Muscle cells are very long, sometimes spanning the length of the entire muscle, and are about 50-100 microns in diameter (about the size of a human hair). Each muscle cell contains many nuclei which are located around the outside, just beneath the muscle cell membrane, or sarcolemma. When you look at a muscle fiber with a microscope, you can make out cross striations running perpendicular to the length of the fiber. Each muscle is contained in a bag of tough connective tissue for protection. This connective tissue is called epimysium, because it’s around the muscle. This is the stuff you’re stretching when you do your stretches and fascial planing. It’s really tough, kind of like those nylon-reinforced mailing envelopes, except thinner. The idea is if you stretch the connective tissue covering the muscle you will make it easier for the underlying muscle tissue to expand, but that’s a story for another day.

Just under the epimysium the muscle cells are grouped into bundles called fasciculi, which contain as many as 150 fibers (cells) each (1). Inside the muscle cell is the sarcoplasm, the name for the cytoplasm of a muscle cell (1). There we find the contractile proteins, stored glycogen and fat granules, and mitochondria. The contractile proteins are grouped into bundles called myofibrils, which are about 1 micron in diameter, or about 1/100 the width of a human hair (1). The myofibrils are made of the contractile proteins themselves, which are called myofilaments. The two main proteins in the myofilaments are actin and myosin. So we have myofibers, myofilaments, and myofilaments. (Don’t blame me - I didn’t make this up.)

Actin and myosin, the two main proteins responsible for muscle contraction, are organized into structural and functional subunits called sarcomeres. When you build more muscle tissue, mostly what you’re doing is increasing the amount of actin and myosin proteins in your muscle.
cells, thereby making the muscle bigger and stronger. As you know, proteins are made from building blocks called amino acids. What happens is when you eat some protein your stomach and intestines digest it and break it down into the individual amino acids. These then enter the bloodstream and are transported to all the cells of the body. The cells absorb the amino acids from the bloodstream and then use them as building blocks to assemble whatever proteins the cell needs. Muscle cells absorb the amino acids and use them to build more actin and myosin. Each protein has a unique sequence of amino acids linked together in a chain. You need a different ratio of amino acids to build different proteins, just like you need different letters to spell different words. The proteins in muscle contain a lot of the branched chain amino acids (BCAAs), along with a specific ratio of the other amino acids as well. This is the reasoning behind our Muscle Amino Formula™ and our Hi-Protein Powder.™ These products are designed to supply your body with the perfect balance of amino acid building blocks it needs to build more muscle protein.

Like all cells of the body, muscle cells are surrounded by a plasma membrane. The membrane of a muscle cell is called the sarcolemma. The sarcolemma receives electrical impulses from motor nerves at specialized structures called motor end plates. At the ends of the muscle, the sarcolemma fuses with the tendon, which inserts into bone (2). When the muscle contracts force is transmitted to the tendon, and in turn to the skeleton, which brings about movement. Inside the sarcolemma is the cytoplasm of the muscle cell - the sarcoplasm (2). The sarcoplasm is a gel-like substance that bathes the myofibrils - the contractile elements. The sarcoplasm contains minerals, ions, glycogen, fat, and organelles called mitochondria (2). Mitochondria are powerhouses inside the cell where carbohydrates and fat are converted into ATP, which is the source of chemical energy directly used by the myofibrils when they contract. The sarcoplasm also contains a protein called myoglobin, which functions to bind oxygen much like hemoglobin binds oxygen in red blood cells.

Enclosures of the sarcolemma called transverse tubules, or T tubules, pass to the interior of the muscle cell. When a nerve impulse, or action potential, arrives at a muscle cell it releases a neurotransmitter called acetylcholine (ACh) from the nerve terminal at the motor end plate. The ACh diffuses across a space called a synapse and binds to receptors on the sarcolemma. This initiates an electrical potential, called a wave of depolarization, along the surface of the sarcolemma. The T tubules function to bring this electrical impulse inside the muscle cell to the myofibrils. The sarcoplasmic reticulum is a series of membranous channels which run parallel to the myofibrils. The sarcoplasmic reticulum serves as a storage site for calcium, which is essential for muscular contraction (2). When the electrical impulse is conducted inside the cell by the T tubules, it reaches the sarcoplasmic reticulum where it triggers the release of calcium. Calcium then binds to a regulatory protein called troponin C. This initiates a series of molecular events which allows ATP to bind to myosin. Myosin breaks down the ATP to release energy which is used to power muscle contraction.

This is starting to get technical. To sum up so far: when you decide to contract a muscle an electrical impulse is generated by your brain. This travels down the spinal cord and out a peripheral nerve called a motor neuron. This nerve carries the electrical signal to the muscle. The nerve releases ACh which diffuses across the synapse at the motor end plate. This in turn initiates another electrical signal, or wave of depolarization, along the sarcolemma of the surface of the muscle cell. The T tubule system carries this information to the interior of the muscle cell, where it triggers the release of calcium from the sarcoplasmic reticulum. Calcium binds to a protein on the surface of the myofibrils which normally prevents ATP binding. After calcium binds, these proteins shift positions which subsequently allows ATP to bind to the myofibrils. ATP is then broken down to release energy. This energy causes the actin and myosin proteins in the myofibrils to slide past each other, thus making the muscle contract. This contractile force is transmitted to the tendons and then to the bones, causing movement of the skeleton and the body as a whole (1,2,3). Simple eh?

Next month we’ll talk about exactly how ATP binding to the myofilaments causes the actin and myosin proteins to move, resulting in muscle contraction. That will conclude the anatomy and biochemistry part of our muscle superfeature. Then we’ll move into exercise physiology to discuss how exercise training affects muscle performance. Finally we’ll tie everything together and explain how exercise training elicits an adaptive response in muscle - cellular and molecular changes which make the muscle bigger and stronger. Once you understand how all of this works, you will be better able to design a training program specifically to achieve your individual training goals.

**References**


In Part 3 of our series about muscle we are going to take a microscopic look at exactly what happens inside a muscle cell when you lift weights. First, let’s review some basics about how muscles are controlled by the central nervous system.

The first thing that happens is that you decide to lift a weight. This happens in the frontal lobe of the brain, where conscious thought occurs. The frontal lobe sends a signal to the prefrontal gyrus, or motor strip, of the brain. You see, each muscle cell is controlled by a chain of two neurons, or nerve cells. The first one is in the brain, in the motor strip, and is called the upper motor neuron. The second is in the spinal cord, and is called the lower motor neuron. The upper motor neuron is a very long cell, and sends a cellular process (a long extension) called an axon into the spinal cord. There it makes a contact called a synapse with the lower motor neuron. The upper motor neuron releases a chemical called a neurotransmitter into the synaptic space, which then binds to a receptor on the lower motor neuron. Neurotransmitters can either be inhibitory or excitatory. The balance of inhibitory and excitatory neurotransmitters is what determines if the lower motor neuron fires or not. If the lower motor neuron receives the signal to fire from the brain, it in turn sends a signal out to the muscle cell. Lower motor neurons are also very long cells—sometimes over three feet long! The body of the lower motor neuron is in the spinal cord, and its axon is called a peripheral nerve. Muscles in your feet are thus controlled by a chain of two nerve cells, one that has its body in the brain and sends its axon all the way to the lower spinal cord, and the second which has its body in the lower spinal cord and sends its axon all the way to the foot.

Before a message is sent out from the motor strip in the brain, other parts of the brain are also contacted to help perform the computations necessary for good muscular control. The motor strip contacts the basal ganglia, which helps the muscle contract in a smooth, controlled fashion. This part of the brain helps get just the right balance of excitatory and inhibitory nerve impulses, so the weight moves smoothly and under control. Without the basal ganglia, the muscle would sometimes contract too hard and sometimes not hard enough, and the weight would jerk up and down. People with Parkinson’s disease have a problem in the basal ganglia, and have tremors anywhere from one to several hundred muscle cells. Some muscles, like those controlling the fingers and the eye, are under very fine control, so that each lower motor cell controls only one or a few muscle cells. Other muscles, like those in the quadriceps or glutes, don’t require such fine control and each lower motor cell may control hundreds of these muscle cells. A lower motor neuron and the muscle cells under its control is called a MOTOR UNIT. This is a very important concept, not just for muscle physiologists but for bodybuilders too. When a motor unit fires, it is an all or nothing phenomenon. This means that either all of the muscle cells controlled by that motor neuron fire, or none of them do, depending on the balance of excitatory and inhibitory impulses arriving at that nerve cell. There’s no such thing as a muscle cell partly contracting, or contracting at moderate intensity. It either contracts completely, at full power, or not at all.

You will recall that a given muscle, like the biceps of the arm for example, is made of hundreds of individual muscle fibers, or muscle cells. The strength of a muscle is defined by the maximum weight you can lift for one repetition, the one rep maximum (1RM). The strength of your biceps is determined by a combination of four general parameters: 1. The number of muscle fibers in the muscle. 2. The size of each individual muscle fiber. 3. The number of muscle fibers you can stimulate to fire (contract) at once. 4. Leverage factors, such as the length of your bones and the points of insertion of the muscle tendons onto the bones. You can’t do anything about the leverage factors, this is purely genetics. All other things being equal, someone with better leverage factors will be stronger. Genetics is very important in athletics, includ-
ing powerlifting, for this reason.

You can, however, address the other three factors by using specific training techniques. The strength of your biceps is determined not only by the size of the muscle itself, but by how many of the muscle fibers you can make contract at the same time. Remember, each muscle fiber either contracts completely or not at all. Let’s say for example that your single rep maximum in the dumbbell curl is 50 pounds. Now you pick up a 5 pound dumbbell and begin curling. Only about 10% of the muscle fibers in your biceps are contracting, and the other 90% are just along for the ride. If you keep curling long enough, the 10% of the fibers you started with will eventually fatigue and no longer be able to carry on. Then a different set of muscle fibers will take over the work while the first set rests. By the time you go through all of the muscle fibers, the first set is well rested and is ready to go again. This is why you can maintain low intensity work for a very long time. Now let’s pick up a 25 pound dumbbell and do a set of curls. Here, we have to fire about 50% of the fibers to lift the weight. After a few reps these fibers are tired, and the others take over. After about 15 or 20 reps all of the fibers are tired and you can’t get any more reps. The first set of fibers to fire didn’t get enough time to rest and aren’t ready to go again yet. This is why you can’t get as many reps as you could with the lighter weight. Now let’s consider curling a 50 pound dumbbell, your single rep maximum in this example. You recruit 100% of the fibers to fire, so they all get “spent” after one rep. There are no other fibers left to recruit, which would allow the tired ones to rest, so the set is done after one rep. Read on, because here’s where it gets interesting.

You should realize that the above example is not quite accurate. Here’s why: very few people, if any, actually have the ability to contract all of their muscle fibers to fire at once. The best estimates are that a typical person only has the ability to fire about 50% of his muscle fibers at once, and that with training this may increase to about 70%. This is kind of a safety mechanism to make sure you always have some strength left, even if it’s only a little. (It also helps prevent you from ripping the tendons off of the bones!) Everyone knows after going to recover, which FORCES the muscle to recruit the other fibers that haven’t fired yet. Drop sets are a very effective way to increase both size and strength and should be a part of every bodybuilder’s and powerlifter’s program.

You see, when you lift weights you’re not only training your muscles, you’re also training your nervous system. With practice you can learn to recruit more muscle fibers to fire at once, thus increasing strength. This is a key difference between bodybuilding and powerlifting. As we mentioned before, bodybuilders generally have bigger muscles but powerlifters can usually lift more weight. Powerlifters are generally stronger because they were born with better leverage factors and because they have trained their nervous systems to recruit more motor units to fire simultaneously. The way you do this is by practice. Lifting very heavy weights, in the 1-3 rep maximum range, forces your body to fire more muscle fibers at once. This makes you stronger. And this is why low rep work forms the basis for powerlifting-style training. Powerlifters train with explosive movements using very heavy weights, and often don’t care about the negative portion of the exercise. (You might see a powerlifter virtually throw the weight on the floor after completing a heavy snatch, for example.) This is not the most effective training style for increasing muscular size however. To understand the basis for training to increase muscle size, you need to know a little more about muscle physiology first.

You will recall from a previous article that each muscle fiber is made up of hundreds to thousands of smaller units called myofibrils. These are the contractile units of skeletal muscle (1). Myofibrils are long chains of still smaller subunits called sarcomeres. Sarcomeres have a striped, or striated, appearance
when visualized in a microscope, and this is why skeletal muscle is sometimes called striated muscle. Sarcomeres are made of alternating light regions, called I bands, and dark regions, called A bands. In the middle of each I band is a dark line called the Z disk (1). A sarcomere spans from Z disk to Z disk. A myofibril is thus a long chain of sarcomeres joined end to end at the Z disks. As we discussed in a previous article, the two main proteins in muscle are actin and myosin. Actin is a thin protein filament, while myosin is a thick protein fiber. The light I band is the region of the sarcomere that contains only thin actin filaments. The A band, in the middle of the sarcomere, is a region containing both thin and thick filaments organized in an overlapping arrangement. When the muscle is fully relaxed, a region in the middle of the A band called the H zone becomes apparent, called that because it contains only heavy, thick filaments (1,2,3,4).

Each actin molecule has one end anchored in the Z disk, and the other end extending toward the middle of the sarcomere where it interdigitates with the thick myosin molecules. Each myosin molecule is composed of two protein strands twisted around each other (1,2,3,4). One end of the myosin molecule forms a globular structure called the myosin head, which is attached to the myosin chain by a cross bridge. Each myosin molecule contains several heads, which protrude from the surface of the myosin fiber to interact with special sites on the actin molecules. Each actin filament is actually composed of three proteins: actin, tropomyosin, and troponin (1,2,3,4).

The basic idea of what’s happening here is that muscle is mainly composed of two types of protein strands, actin and myosin. These strands are lying parallel to each other and are overlapping. When a muscle contracts, the fibers slide past each other to make the muscle shorter. Each sarcomere acts as a single unit so when it contracts its fibers slide past each other to pull the Z disks closer together.

Each sarcomere is only microscopic in size, so when it contracts it only gets a little shorter. But since each myofibril is made up of thousands of sarcomeres joined end to end, when they contract the whole muscle gets shorter. How does this happen?

When a nerve impulse arrives at a muscle, the electrical signal is spread across the muscle cell membrane and is conducted to the interior of the cell by the T tubule system (discussed last time). The T tubule system carries the impulse to the sarcoplasmic reticulum (SR) and causes the SR to release a bunch of calcium ions. In a muscle’s resting state, tropomyosin molecules lie on top of the active sites of actin, blocking their interaction with myosin (1). When calcium is released, it binds to troponin, causing the protein molecule to change shape (1). This in turn pushes tropomyosin off of the active site of actin. Actin is now free to bind to the myosin head groups. When a myosin cross bridge attaches to an actin chain, it undergoes a conformational change (a change in molecular shape) which causes the two filaments to slide past one another. This is referred to as the power stroke (1). Immediately after the myosin head tilts, it breaks away from actin, rotates back to its original position, and attaches to a new active site on actin. Repeated cycles of attachments and power strokes cause the filaments to slide past each other in ratchet-like fashion, giving rise to the term “sliding filament theory” (1,2,3,4).

You know from pervious articles that the energy that drives this process comes from ATP. So, how does ATP tie in here? Each myosin head group has an enzyme called an ATPase, which can break down ATP to release its energy. The energy released from ATP is used to bind the myosin head to the actin filament (1,2,3,4). The muscle is thus “primed” and ready to contract. It’s just waiting for calcium to bind troponin and push tropomyosin out of the way. So the energy comes from ATP, the immediate signal to contract comes from calcium, and the calcium release is triggered by neurotransmitters released from the peripheral nerve. Simple, eh?

References


In this bulletin we continue our super-feature on muscle and will discuss some key concepts of muscle physiology. So far we’ve covered muscle anatomy, ultrastructure and biochemistry, as well as control of muscle tissue by the nervous system. In the final three parts of this series we’ll discuss metabolic adaptations of muscle to exercise and how to design effective training strategies to achieve your goals. Please refer back to your back issues of the Parrillo Performance Press for our articles about hormones and cellular energy metabolism, as these tie in directly to muscle metabolism and physiology.

In Part 2 I introduced the concept of the motor unit: a lower motor neuron (nerve cell) in the spinal cord plus the muscle fibers that it controls. I said that a motor unit fires according to the all-or-nothing principle. That means it either fires at full power or not at all. There’s no such thing as partially contracting a muscle fiber, or it contracting at medium intensity. What determines the strength of a muscular contraction is then how many motor units are recruited to fire (contract). This month we will extend this concept to the next level, and talk about patterns of muscle fiber recruitment.

Nerve impulses traveling down the axon of a motor neuron (nerve fiber) to a muscle cell travel in discrete bundles called action potentials. An action potential is an electrical signal that is carried along nerves that stimulates muscle fibers to contract by triggering the release of calcium from the sarcoplasmic reticulum. Rather than being like the continuous flow of electricity that is delivered from a battery, an action potential is a short burst or pulse of electricity, like flipping a switch on and then quickly off again. An example you may be familiar with is an EKG tracing of the heart - this is the action potential of the heart muscle.

Each action potential results in a short period of activation of the muscle fiber, and is referred to as a twitch (1). The calcium released during a twitch is sufficient to allow optimal activation of actin and myosin, and therefore maximal force development by the muscle fiber (1). However, as the contracting muscle fibers begin to pull on the tendons and “take up the slack,” pumps begin pumping the calcium back into the sarcoplasmic reticulum. Thus the muscle fibers begin to relax before the muscle has time to generate maximal force on the tendons. So while a twitch stimulates a muscle fiber to contract maximally, it begins to relax before maximal force is generated by the muscle (1). If a second action potential (nerve impulse) arrives at the muscle fiber and causes another twitch before the fiber has completely relaxed, the force from the two twitches summates (adds together) to generate a greater force than from a single twitch (1). As we increase the frequency of action potentials we will decrease the rest period between twitches, and the summation of force increases (1). At a high enough frequency of stimulation the twitches fuse (that is, there’s no time for the fibers to relax), and force production reaches a plateau called tetany. This is the highest force that a motor unit can produce (1).

A given muscle is composed of several different fiber types. There are many classification schemes for describing different muscle fiber types. The first approach is to classify muscle fibers according to twitch time. You’ve probably heard of slow-twitch versus fast-twitch fibers. A fast twitch fiber (also termed type 2) develops force rapidly and has a short twitch time (1). A slow twitch fiber (also termed type 1) develops force slowly and has a long twitch time (1). This results in different abilities to develop force and resist fatigue. Slow twitch fibers generally are fatigue resistant and have a high capacity for aerobic energy production (refer back to our series on cellular energy metabolism). This makes them ideal for low energy activities that you need to be able to sustain for a long time, like walking or standing or keeping the spine erect while sitting. Fast twitch fibers, in contrast, are easily fatigued, are relatively poor at aerobic energy production, but are able to generate tremendous forces very rapidly. Fast twitch fibers are further subdivided into two subtypes, 2a and 2b, according to differences in ATPase activity (2).

Perhaps the oldest classification scheme is based on gross appearance. In the early 1800’s it was noticed that muscles range in color from deep red to pale white (2). This is most easily observed when looking at the muscles of birds, where the differences are the greatest. It is now understood that some muscles are red because they contain greater capillary density and more myoglobin (an oxygen storing molecule like the hemoglobin found in red blood cells) and mitochondria (the little furnaces inside cells where food molecules are burned to produce energy). These properties (more capillaries, myoglobin, and mitochondria) make red muscle fibers better at aerobic energy production. White muscle fibers have less myoglobin and mitochondria but more stored glycogen, making them better at anaerobic energy production. The difference is easily seen when comparing a chicken breast to a chicken thigh. A chicken breast is white meat (white muscle fibers) and a thigh is dark meat (red muscle fibers). These differences make sense if you think about it. The breast of a bird is involved in beating the wings during flight, which requires a high level of force production. The thighs, however, are involved in weight support.
and walking, requiring a lower level of force production. Another classification scheme is based on metabolic and histochemical (microscopic staining) properties of muscle cells. This is basically an extension of the fast twitch/slow twitch scheme, but also takes into account fuel types preferred by different fiber types. According to this scheme, fibers may be either slow oxidative (SO), fast glycolytic (FG), or fast oxidative glycolytic (FOG) (2). This scheme is based on microscopic analysis of fibers looking at various enzyme subtypes (such as subtypes of ATPases) and it gets real technical real fast. For those of you interested in greater detail, the best discussion of muscle fibers types is found in Lieber, Skeletal Muscle Structure and Function, pages 70-89 (2).

In summary: Within any given muscle different fiber types exist for performing different functions. There are many ways to classify the different fiber types. These include twitch time, muscle color, fuel sources, enzyme subtypes, fatigueability, and combinations of the above. A comparison of different classification schemes is presented in the table.

In general, slow twitch (ST) fibers have a high level of aerobic endurance (3). ST fibers are thus very efficient at producing ATP from the oxidation of carbohydrate and fat (3). As long as oxygen and fuel are available, ST fibers can continue to produce ATP and thus the energy to contract. ST fibers are therefore preferentially recruited for low intensity activities like walking, jogging, or biking. Fast twitch (FT) fibers, on the other hand, are better suited for anaerobic energy production. This is largely through the conversion of stored muscle glycogen to lactic acid via glycolysis. FT motor units can generate considerably more force and power (work per unit time) than ST motor units because their rate of force production is not limited by the rate of oxygen delivery. Furthermore, FT motor units are generally larger (contain more muscle fibers) than ST units. FT motor units fatigue easily however, because they exhaust their fuel supply (and other intermediates) and build up lactic acid. When the acid level builds up too high in the cell, this shunts down the cellular enzymes that produce energy, so contraction comes to a halt. FT fibers are thus best suited for brief, high intensity activities such as sprinting. During extremely high intensity exercise, such as weight lifting, both ST and FT units are recruited to maximize force production.

Remember that force production within a muscle is increased by increasing the frequency of action potentials arriving at the muscle, and thus the frequency of twitches, and by increasing the number of motor units participating in the contraction. When only a little force is needed, only a few motor units are recruited. Recall also that FT motor units contain more fibers than ST units. Therefore, when only a little force is needed, small motor units, which are primarily the ST type, are recruited (3). As exercise intensity increases, FT type 2a (corresponding roughly to FOG type fibers) are also recruited. At maximal intensity, FT type 2b (or FG) fibers are called in.

This gets us back to the concept of intensity threshold that we talked about in the first article of our muscle series. Exercise must provide a high intensity stimulus in order to recruit all of the fibers. I like to refer to these as the “high threshold nerve pathways.” It is of great importance to realize that the fast twitch fibers are the ones with the greatest potential for hypertrophy (growth). In order to stimulate these fibers to grow we must recruit them to contract, and to do that we must apply a high intensity stimulus. This is why you have to lift big weights to get big muscles. Curling 5 pound dumbbells all day will never give you big biceps.

So for maximal muscular growth a bodybuilder has to perform at least four distinct types of training: 1. Drop sets to ensure that nearly 100% of muscle fibers are recruited. 2. Heavy sets around 1-3 rep maximum to recruit the high threshold nerve pathways. 3. High intensity aerobics (around 30 minutes 3 times a week) to increase capillary supply of muscles. 4. Standard “bodybuilding sets” carried to failure at 8-10 reps. I’ll explain more about this in the future, but the basic function of these is to induce local tissue trauma which serves as a stimulus for inflammation and remodeling. In the medium rep work (8-10 rep range), special attention must be paid to going to failure and to resisting the weight during the eccentric (lowering) phase of the contraction.

References


In the previous bulletin I introduced the “all or nothing” principle of muscle contraction, which states that a given motor unit either contracts maximally or not at all. I also explained the pattern of muscle fiber recruitment. For low intensity activities, such as fine finger movements or precise movement of the eyes, small motor units are recruited. Small motor units allow precise muscular control and are primarily composed of slow twitch fibers, which generate low forces and are fatigue resistant. As progressively more force is required for an activity, more fast twitch motor units are called into play. These have more muscle fibers connected to each nerve cell (that is, they are larger motor units) and are capable of generating high forces although they fatigue more easily.

In this bulletin I would like to talk about different types of muscle contraction, and why these are important in bodybuilding. Concentric muscle actions occur when a muscle is shortening. This happens when force generated within the muscle is sufficient to overcome the resistance to shortening (1). An example is the lifting phase of a biceps dumbbell curl. During this phase of contraction, action potentials are arriving at the neuromuscular junction, causing a release of the neurotransmitter acetylcholine at the synaptic cleft. This causes an influx of calcium into the muscle cell, as well as a release of calcium from the sarcoplasmic reticulum. (Review previous articles in this series in these concepts are fuzzy.) The rising calcium concentration sets off a series of events resulting in activation of the actin-myosin cross-bridges. ATP is consumed as the sarcomeres shorten, bringing the Z lines at the ends of the sarcomere closer together. Thus when a muscle fiber contracts, each of the individual sarcomeres contract, and ATP is consumed. Concentric muscle actions are really the only true muscular contractions, because contraction literally means “to shorten.”

Isometric muscle actions refer to the situation where the force generated by the muscle is sufficient to exactly balance the resistance. An example is at the top of a biceps curl at the moment of peak contraction, or any time when you pause during the curl and the weight remains stationary. “Isometric” means “the same length,” and thus describes any time a muscle is working but is not changing in length. Eccentric muscle actions refer to situations when the muscle is generating force but that force is less than the resistance on the muscle. An example is the lowering phase of a biceps curl. Here, the muscle is still working and generating force, but the muscle is actually getting longer. Gravity is the force pulling the dumbbell downward, and this force is transmitted to the forearm and then to the biceps tendon. If this force is greater than the internal force generated by the biceps muscle, then the muscle will lengthen instead of contracting, even though it is still working and generating force. “Isokinetic” means “the same velocity” and describes muscle actions that occur at constant velocity. An isokinetic contraction is simply a concentric muscle action that occurs at constant velocity.

It is important to realize that during isometric and eccentric muscle actions we still have nerve impulses (action potentials) arriving at the muscle, triggering calcium release and activation of the actin-myosin cross-bridges, just like we do during concentric actions. The difference is that the force generated by the muscle is no longer sufficient to overcome the resistance. During isometric actions the sarcomeres remain the same length, and during eccentric actions the sarcomeres actually get longer. During eccentric actions the actin-myosin cross-bridges are still trying to pull the Z lines together to shorten the sarcomere, but they’re just not strong enough. As you might imagine, this causes quite a bit of damage to the cross-bridges and to the whole sarcomere. The sarcomere is working to contract, but is being overcome by external forces which are forcing it to lengthen while it is trying to contract. This is the main source of microtrauma (microscopic damage) to the muscle that occurs when you work out. If you take a muscle biopsy (a small tissue sample) from a muscle after a workout and look at it in the electron microscope, you will see that the normal structure of the muscle has been disrupted. The amount of damage to the muscle is far greater following eccentric actions than for concentric or isometric actions, as you might guess. In concentric actions under heavy resistance, the microscopic structures of the muscle fiber literally get ripped apart as the muscle fiber is forced to lengthen while it is trying to contract.

Following intense training sessions we see a phenomenon called “Z band steaming,” which describes the Z band structure being disrupted and myofilaments streaming out from the normal sarcomere structure. Under extreme conditions you can even see rupture (breakage) the sarcoplasmic membrane (the cell membrane of muscle cells) and leakage...
of cellular contents from the cell. Some of these can be measured in routine lab tests in a hospital. Creatine phosphokinase (CPK) is an enzyme in muscle cells which forms creatine phosphate, the short-term energy reserve in muscle cells which is responsible for immediately replenishing ATP (refer back to our series on cellular energy metabolism). When muscle cells are damaged and the cell membrane starts leaking, CPK is released into the blood and can be measured in the laboratory. In hospitals CPK levels are used as an initial screen to tell if someone has had a heart attack or not, since during a heart attack some of the heart muscle cells die and release CPK. Skeletal muscle cells also release CPK when they are damaged. Using tests like muscle biopsy and CPK, scientists have determined that most muscle damage occurs during eccentric muscle actions, when external forces rip the myofibers apart. This is also the main cause of muscle soreness 24-48 hours after a workout, and is called “delayed onset muscle soreness,” or DOMS. Try a few sets of heavy forced negatives sometime to prove it to yourself. It is well known to bodybuilders that negatives cause the most muscle soreness, and now you know why.

Why is all of this important to bodybuilders? Because it is at the very heart of muscle growth. You see, the microscopic tissue damage that occurs after weight training serves as the stimulus for inflammation. Inflammation is a process that occurs in damaged or infected tissues that signals the immune system to come into play. White blood cells, mainly lymphocytes, neutrophils, and macrophages, are called in to clean up the mess of the damaged and leaking muscle cells. The white blood cells release immune mediators such as histamine, bradykinin, cytokines, and interleukins, which help bring about the repair process. Bradykinin is one of the immune mediators that is particularly famous for causing pain, and immune mediators like bradykinin and prostaglandins are the reason muscles get sore after a workout. During the inflammation process, damaged cells are repaired and the tissue is returned to its original state. The body doesn’t like this inflammation and repair process however, and overcompensates a bit during the repair process. The body makes the muscles a little bit bigger and stronger than they were before the workout, so that next time you hit the weights hopefully the muscles can take it and not get damaged. The body’s ability to overcompensate is very limited however, and estimates are that with each good workout your muscles increase in size only about 0.1%. This is why it takes years of consistent training to get really big muscles.

There are two basic principles of bodybuilding training that are more important than all the others put together. The first is the principle of intensity. A workout must exceed some threshold of intensity in order to stimulate growth. The second is the principle of progressive resistance. This means that as you get stronger, you have to keep progressively increasing the resistance to overload the muscle. In other words, as the muscle gets stronger the intensity threshold required to stimulate further growth increases. This is a direct consequence of the over-compensation process I described above. During the inflammation and repair process, tissue remodeling occurs to help the muscle adapt to the stresses imposed on it. Initially, a 30 pound dumbbell may be intense enough to cause muscle damage and set into play the process of muscle growth. Muscle growth is really just an adaptive response that occurs so that the next time you curl a 30 pound dumbbell it doesn’t cause so much damage to the muscle. After a while, you will be able to curl the 30 pound dumbbell easily, without much strain or damage to the muscle. At that point, the muscle and it’s associated connective structures have adequately adapted to the stress imposed by a 30 pound dumbbell. You can keep working out with 30 pound dumbbells for the rest of your life and little, if any, additional growth will occur. The muscle has grown and adapted to that level of stress. If you stick to the 30 pound dumbbells you will find that over time you will be able to do more and more reps with 30 pounds, but that will do little to increase muscle size. Any time you’re doing more than 12-15 reps with a weight you’re primarily training muscle endurance, not muscle strength. Training for muscle endurance is just fine, but does very little to increase muscle size. To increase muscle size you have to increase strength, which means lifting a heavier weight. So you go up to the 35 pound dumbbells and get maybe 6 reps before your biceps fails. This represents a new level of stress, a higher level of intensity, and the adaptation process begins again. After a few weeks or months you will be able to curl the 35 pound dumbbells for 12 reps and your biceps will be bigger and stronger than it was when you could only curl 30 pounds for 12 reps. This is the principle of progressive resistance.

For maximal gains in strength, you want to train with a heavy weight at low reps, say 3-6 reps. For maximal gains in muscle size, you want to train with a weight you can handle for 6-10 reps. As the muscle adapts and gets stronger, you will need to increase the weight in small increments (about 5-10% per jump) to keep yourself in the proper rep range. The most effective training strategies over the long haul involve some work in the 3-6 rep range and some work in the 6-10 rep range. This helps train the nervous system as well as the muscle and helps ensure the high threshold pathways are recruited. For purposes of increasing muscle size and strength, by the time you can perform 12 reps with a given weight this means it’s time to increase the load.

Just how does this process of muscle growth and adaptation occur? There are two basic mechanisms that come into play: hypertrophy and hyperplasia. Muscle hypertrophy means that an individual muscle cell gets bigger. This occurs as it builds more myofibrils by adding more actin and myosin (and other associated structures). In other words, an individual muscle cell builds more contractile proteins inside it, making it increase in diameter. This of course also makes it stronger and able to generate more force when it
contracts. Muscle hyperplasia describes the situation of adding more muscle cells. Hypertrophy is an increase in muscle cell size, and hyperplasia is an increase in muscle cell number. The overwhelming body of scientific evidence indicates that most muscle growth is the result of hypertrophy (2,3). If you take biopsy samples of muscle before and after a training program, you will see that after training there are still about the same number of muscle fibers (muscle cells), but that each muscle fiber is bigger in diameter. This indicates that hypertrophy is a more important adaptive response to exercise training that is hyperplasia. Several studies with bodybuilders do indicate however that muscle hyperplasia can occur. In these studies it was found that bodybuilders had more muscle fibers (cells) per cross-sectional area than untrained controls (2,3). One experiment with cats demonstrated a 9% increase in fiber number following 101 weeks of resistance leg training (2,3). To reconcile these observations with the body of data suggesting that most muscle growth occurs by fiber hypertrophy, it was suggested that in order for muscle cell hyperplasia to occur the training stimulus must be of high intensity, with heavy resistance and low repetitions (2,3). Most studies in exercise physiology use untrained subjects, with moderate to low resistance and higher repetitions. While both growth mechanisms are probably at play in bodybuilders, most experts agree that most muscle growth occurs by hypertrophy of existing muscle fibers.

When muscle cells do undergo hyperplasia, what is the source of the new muscle cells and the stimulus for their growth? This question is of course of great interest to bodybuilders, since it is the door to almost unlimited muscle growth. New muscle cells are believed to derive from differentiation and proliferation of satellite cells. Satellite cells are little tiny cells not much bigger than nuclei, and are found along the periphery of muscle fibers. Satellite cells seem to be most active during the growth of the fetus, while it is rapidly forming new muscle tissue. During adult life, satellite cells can be induced to turn into new muscle cells by factors released from damaged muscle cells (4). When satellite cells were placed in culture dishes it was found that they could be induced to differentiate (turn into new muscle cells) by adding an extract from minced or ground up muscle tissue (4). An extract from undamaged muscle or from some other tissue could not do the trick. Thus it appears that muscle cells contain some substance that can leak out when the cell membrane is damaged, and this substance acts as a signal to cause the satellite cells to grow. The idea is that satellite cells represent a reserve source of precursor cells that can be called upon following muscle damage, to make new muscle cells and repair the damaged muscle.

This all makes sense if you think about it. We know that most muscle cell hyperplasia comes about as a result of high resistance training with heavy weight (2). We also now that high resistance training, especially the eccentric phase of the muscle action, results in the most muscle damage (1,2,3). Finally, we also know that high resistance training is the most effective stimulus for increasing muscle size and strength (1,2,3). So it all fits together. And this is why it’s vitally important for bodybuilders to pay special attention to the lowering phase of each rep - it’s the most important part of the rep for stimulating muscle growth. You should always lower the weight slowly and resist the weight on the way down. This type of training will make you sore, but it’s the best stimulus for muscle growth. I don’t recommend negative-only training, however. You still need the positive (lifting) part of the rep to fully work the muscle and to exhaust its ATP stores. Since the muscle requires ATP to relax as well as to contract, if you use up the ATP in the positive phase of the movement, this will result in greater microtrauma during the eccentric phase. And this, presumably, will trigger a greater adaptive response and more muscle growth.

The Parrillo program is founded on the basics to help this process work at peak efficiency. I’m sorry, but there really are no tricks or secrets. It takes dedication, consistency, and hard work. What do you do? First, you have to make every workout count. Every workout must be intense enough to stimulate muscle growth, or you’re just wasting your time in the gym. You have to attack each workout. Think of the weights as enemies to be conquered - to be slaughtered. Walk into the gym with a feeling of overwhelming power. The weights simply are not strong enough to resist you. You WILL lift heavy weights today. Get in there, kill the weights, and get out. That’s your job.

Second, supply your body with more than adequate amounts of every nutrient it needs to build muscle. Protein, carbohydrate, vitamins, minerals, branched chain amino acids - and most importantly, a foundation of solid nutritious food. Start with a solid bodybuilding diet and add supplements to boost cellular nutrient levels even higher. Don’t compromise on nutrition. Can you imagine going to all that work of busting your butt in the gym and then not growing because of sub-optimal nutrition? The optimal bodybuilding diet is laid out in detail in the Parrillo Performance Nutrition Manual. Which foods to eat, which foods to avoid, how much protein, carbs, and fat, how many calories, how many meals, and everything else you need to know. It even comes with a food scale and a food composition guide, so you can precisely structure each meal for optimal results. After the foundation is laid with the right foods, then add in supplements to boost nutrient levels even higher. Start with the basics: Hi-Protein Powder®, Pro-Carb®, Vitamins, and Minerals. Add in Muscle Amino® for extra branched chain amino acids — the primary structural amino acids in muscle protein. If you’re a hard gainer or want faster results, add in CapTri®. CapTri® supplies calories which are preferentially used for energy, sparing amino acids so they can be used to build protein instead of being burned as fuel. The special thing about CapTri® is that
excess calories from CapTri® are readily burned as body heat instead of being converted to body fat. This makes CapTri® THE BEST way to add calories to your diet in a way that will minimize body fat. It’s a hard gainer’s dream come true.

Third, get adequate rest to allow muscles to recover between workouts. This is a must. Remember, muscles don’t grow in the gym - they get damaged in the gym. The growth phase occurs during the next couple of days following a workout while the muscles are recovering. You have to get adequate rest for this recovery process to occur optimally. There’s no simple answer to the questions of how often should you train each muscle, or how many days a week should you train. Trainers and muscle physiologists have been studying this for years, and still don’t know the answer. The reason is that the optimal training protocol is different for different people. Hard gainers do better with less work and more time for recovery - say, training three days a week on a one on — one off schedule. People who are naturally muscular and gain muscle easily often can train more, three on and one off, for example. Some people even do well training every day, training one muscle group each day. Some professionals train twice a day. The optimal schedule for you depends on your own body’s recovery ability as well as how many other stressors you have in your life. If you work 60 hours a week, for example, this takes a big toll on your recovery ability, and you probably won’t be able to recover from daily workouts. Professional bodybuilders don’t have any other job to worry about, so they are at an advantage in terms of recovery. You will have to experiment to find the best routine for your body. There are some basics however, that are true for everybody. You have to train hard. You have to give each workout everything you’ve got. You have to keep slowly increasing the resistance and getting stronger. The Parrillo Performance Training Manual describes all the best exercises for bodybuilders, with descriptions of proper exercise performance and sample routines. There’s enough in there to take you from the beginning level all the way through the professional ranks.

Start off with the Nutrition and Training Manuals, which are where you get the information you need to reach your bodybuilding goals. At any time, feel free to call or write with questions or for personal counseling. We support our program all the way - we don’t just sell you something and then turn you loose. What sets us apart is that Parrillo is a comprehensive package, a total program of training and nutrition, which is supported all the way. We supply information, not just supplements. We actually teach you what you need to know to become the best you can be. Who else does that? Who else sends out a free magazine to customers with scientific information about bodybuilding endocrinology, cellular energy metabolism, and muscle physiology just to educate customers so they can get the most out of the workouts? Nobody else. A lot of people sell supplements, but nobody else does what we do. We’re for real. We’re here for the few people out there who are really serious about reaching their goals. We believe that people who are dedicated and work hard in the gym deserve results. When you buy supplements from somebody else, that’s all you get. But when you buy supplements or a manual from Parrillo, that’s just the beginning of a relationship. That’s our commitment to you. To supply not only the products, but more importantly the support and information you need to get results. That’s why the serious people end up with Parrillo.

References


Over the last five bulletins we’ve take a detailed look at muscle. We’ve covered basic scientific concepts of muscle structure, function, and physiology all the way down to the cellular and even molecular level. Now you know about the sliding filament theory of muscle action and the details of how muscle is controlled by the nervous system. In the last bulletin we talked the cellular and molecular basis of muscle growth, including muscle hypertrophy, hyperplasia, and the recruitment of satellite cells. In previous series we explored the aerobic and anaerobic energy metabolism of muscle as well as the hormonal regulation of muscle growth and the way to control hormones through diet and exercise. 

This month I want to talk about different training strategies for muscle and how to tailor your training to achieve your particular goals. Bodybuilding, powerlifting, endurance running and biking, and sports like football and basketball all require muscle training, but obviously the performance goals of these sports are different and the best way to train for each of these is different. The place to start is to decide what your goals are, and then map out a plan for how to get there.

Let’s start with powerlifting, since this is one of the simplest forms of training to consider. Powerlifting is about one thing: the guy who can lift the heaviest weight in proper form wins. The winner will thus be determined by two factors: his shear physical strength and his mastery of technique. At top level lifting events, technique gets to be very important. Elite lifters have great skill in using their strength to lift the heaviest weight possible. The technique of competitive Olympic-style lifting is a field in it’s own right, and is not the topic here. What I want to discuss here is the strength aspect. Muscle strength is defined as the maximum load (weight) that a muscle can lift one time (1,2,3). Thus, the one rep maximum (1RM) is a measure of muscle strength. At first, you would think that the only important thing would be how strong the muscle is, and since bigger muscles are stronger, the guy with the biggest muscles would be the strongest.

This is not quite true, however. The important thing is how much force the muscle can generate, which not only depends on how big and strong the muscle is but also on how efficiently the muscle can be activated by the nervous system. (Obviously, leverage factors like skeletal structure and tendon attachments also are very important, but there’s not much you can do about that.)

The important thing is how much force the muscle can generate, which not only depends on how big and strong the muscle is but also on how efficiently the muscle can be activated by the nervous system. (Obviously, leverage factors like skeletal structure and tendon attachments also are very important, but there’s not much you can do about that.) You can easily prove this to yourself simply by comparing the physiques of bodybuilders and powerlifters. Bodybuilders have bigger muscles, but powerlifters are stronger. So muscle size must not be the only important thing. The higher the percentage of muscle fibers you can recruit to fire (contract) at the same time, the stronger a given-sized muscle will be. Estimates are that the average person has the ability to recruit only about 50% of the fibers of a muscle to fire at once, and that with training this may increase to around 70%. I’m convinced that elite powerlifters can probably do even better - maybe around 90%. It should be obvious that the more fibers you can get to fire at once, the more force the muscle will generate. This is why people see such great gains in strength during the first six months or so of training without seeing much increase in muscle size. What they’re doing is learning how to more efficiently recruit the muscle fibers they have.

This is primarily a consequence of training the nervous system. With practice, your brain learns how to recruit more motor units to fire at the same time, resulting in greater force production from the muscle. This takes us back to one of the fundamental principles of training - that of training specificity. For powerlifting you want to increase strength, which means increasing your 1RM. To do this, you want to train at low reps with heavy weight. Since the competition involves lifting at low reps, you want to do most of your training at low reps. Scientific studies have consistently shown that the greatest gains in strength come from training in the 3-6 rep range with heavy weight (1,2,3). This rep range allows you to train with about 90% of your 1RM. You should also train some heavy singles, especially near the competition, but not at every workout since these are very hard on your joints. You should take plenty of time to rest between sets, generally from 3-5 minutes. This allows your nervous system and muscles to recover completely between sets so you can give maximal effort to each set. The best gains in strength usually come from relatively low volume training, around 3-5 sets per exercise. Keep the number of exercises and the total number of sets fairly low. The concept for strength training is to do a low volume of extremely high intensity lifting. Train mostly the basic compound joint exercises, such as squat, deadlift, bench...
press, military press, and barbell row. These are probably the best exercises for increasing overall body strength.

Bodybuilding is a close cousin of powerlifting, and the training styles are very similar. The goal of bodybuilding is to maximize muscle size, more than strength, and to minimize body fat. Of course, muscle size and strength do go together, and big bodybuilders are indeed very strong. As we discussed last month, the main adaptation responsible for increases in muscle size is hypertrophy - an increase in diameter of muscle fibers (1,2,3). This is accomplished by addition of more myofibrils inside the muscle cell. Packing in more actin and myosin filaments will make the muscle bigger and stronger. The training strategy for this is similar as for powerlifting. For maximal increases in muscle size, it is best to train mostly in the 6-12 rep range with a moderate load (1,2,3). By “moderate” I mean the heaviest load you can lift for 6-12 reps in good form. This rep range allows you to use about 70-80% of your 1RM weight. It is important to train to failure at each working set, which means keep performing reps until you absolutely cannot get another. When you can perform 12 or more reps with a given weight, increase the weight by about 10%. This is the concept of progressive resistance.

Bodybuilders generally get better results from a slightly higher volume of training as compared to powerlifting, say 4-6 sets per exercise, and more exercises per muscle group. Powerlifters might do 8-12 total sets per workout while bodybuilders usually do 15-30. Rest intervals between sets are usually 1-2 minutes for bodybuilding. It is crucially important for optimal gains in muscle size for the bodybuilder to emphasize the eccentric phase of the muscle action. This means lower the weight slowly and resist the weight on the way down. This results in greater micro-trauma to the muscle fibers, and this damage serves as a stimulus to the adaptation process resulting in increases in muscle size. Refer to the Parrillo Performance Training Manual and High Performance Bodybuilding for detailed information on the best exercises for bodybuilders and for instruction on proper exercise performance.

The best bodybuilders also incorporate powerlifting-style training into their workouts. Many bodybuilders actually start off as powerlifters for a few years to get a solid foundation of strength, and then use bodybuilding-style workouts to refine their size and shape. There are several ways to incorporate both training styles into your workouts. One way is to do some very heavy sets to failure at 3-5 reps, followed by some moderate sets to failure at 6-10 reps in a single workout. This approach trains for muscle size and strength at each workout. Another increasingly popular approach is called “periodization,” Which involves a cycle of relatively light break-in training, followed by a cycle of bodybuilding style training, followed by a cycle of powerlifting style training. Each cycle can last from about 4-12 weeks, depending on what works best for you. When you hit a plateau in your training, it generally means it’s time to move to a new workout.

Sports like sprinting, football, and basketball require maximal muscle power, which is different from strength. Power is work per unit time, which is also equal to force times speed. Power requires generating a lot of force, and generating it quickly. Force is equal to mass times acceleration, so the faster you accelerate a given weight, the more force you’re producing. In sports like football and boxing, the transfer of kinetic energy from one player to another is very important. Kinetic energy is equal to one half the product of mass times velocity squared, so the faster you’re moving the more kinetic energy you have. To sum up, powerlifting and bodybuilding are just concerned with muscle size and strength, but these other sports add in the factor of speed.

As an example, if two athletes have a 1RM of 200 pounds on the bench press they have the same strength on that exercise. But if one athlete can perform the movement in 2 seconds while the other requires 4 seconds to lift the weight, the former is generating twice the power of the later. While absolute strength is an important component of performance, power is probably even more important for most sports (1). Muscle power is the product of strength and speed, both of which are obviously central to football, basketball, and like sports.

Training the speed component adds another factor to your training. As you might guess, this involves trying to lift the weight as quickly as possible. One effective approach to weight training for speed calls for using about 30% of your 1RM weight and performing the positive (lifting) phase of the movement in explosive fashion. This is usually done for about 10 reps per set. Another technique to increase muscle power is plyometrics. Plyometrics is a way of overloading the muscle prior to an explosive contraction with speed-strength as the goal (3). An example of plyometric training for legs is to step or jump off of a box, land and squat, and then jump up as fast as possible. This does two things. First, potential energy is stored by stretching the connective tissues, such as the muscle sheath, the tendons, and the muscle itself. Second, the rapid eccentric movement of landing and squatting evokes the stretch reflex, or the stretch-shortening cycle (SSC) of the same muscle (3,4).

The basis of the stretch reflex is the muscle spindle. Muscle spindles are sensory nerves located in special muscle fibers called intrafusal fibers. These fibers run parallel to the extrafusal muscle fibers, which are the ones we normally
think of as being responsible for muscle contraction. When a muscle is stretched this activates the nerves in the intrafusal fibers, which sends a signal back to the motor neurons in the spinal cord. These send a signal out to the extrafusal fibers to contract. The muscle spindle is a safety mechanism that causes a muscle to contract whenever it is stretched. This reflex keeps the muscle from tearing from excessive stretching. When you add in this reflex arc, this results in a more powerful contraction from a stretched muscle than can be consciously achieved by contracting a muscle from its normal resting length. The elastic properties of the muscle and tendons store energy during the eccentric (stretching) phase, and this also contributes to force production (3). Another form of plyometric leg training is jump squats, where a relatively light weight is used and you jump when coming out of the squat, with your feet actually leaving the ground.

Baechle (reference 3) contains an extensive list of plyometric training drills and techniques for those of you interested in more information.

The best form of training for competitive endurance activities is training that activity itself. In other words, endurance cycling is the best way to train for endurance cycling. That’s not to say that weight training can’t help, but weight training is mainly about muscle size, strength, and power, not endurance. Endurance training is an aerobic exercise activity, while resistance training (weight training) is anaerobic. Endurance training involves a very large number of submaximal muscular contractions (3). Compared to weight training, the intensity is very low and the volume is very high (3). The adaptations to aerobic training are very different than those to anaerobic training. Endurance training reduces the overall concentration of glycolytic enzymes, the ones involved in anaerobic energy production (3). In endurance training there is increased recruitment of type I muscle fibers compared to type II fibers (3). However, since type I fibers have less capacity for hypertrophy than do type II fibers, endurance training does not result in as great an increase in muscle size as does resistance training.

During endurance training there is a gradual conversion of type IIb fibers to type Ia fibers (3). Type Ia fibers, or fast oxidative glycolytic (FOG) fibers, have a greater aerobic capacity than type IIb fibers, or fast glycolytic (FG) fibers (3). The result of this conversion is a greater number of fibers which can contribute to endurance performance (3). Endurance training increases the number of mitochondria and the concentration of myoglobin in muscle cells (3). As you know, mitochondria are the organelles responsible for aerobic energy production. Myoglobin is a protein which can bind and store oxygen, much like hemoglobin. Thus while weight training mainly results in bigger, stronger muscles, endurance training results mainly in increased aerobic energy producing ability.

Bodybuilders should remember however to include aerobic exercise as part of their training, since this trains a very important muscle called the heart. Aerobic exercise also burns fat and helps to increase capillary density in muscle. This allows for increased blood supply, which means increased nutrient supply, which means bigger muscles.

This concludes our series on muscle. Whatever your training goals, don’t forget the central role of nutrition. Serious training is hard work - don’t throw it away by not eating right. Try to eat every three hours or so, and include the right balance of carbohydrates and protein at each meal. Good protein sources are chicken breast, turkey breast, fish, and egg whites. Good carbs include potatoes, rice, beans, oatmeal, peas, corn, and vegetables. Refer to the Nutrition Manual for detailed instruction. As far as supplementation goes, the most important ones for increasing muscle size and strength are Hi-Protein Powder, CapTri, and Muscle Amino. For endurance performance, the most important are Pro-Carb, The Bar, CapTri, and Max Endurance. Never lose sight of your dream. Never give up. The Parrillo Program has built a lot of champions, and we’ll build a lot more. Be one. Parrillo Performance - where dreams come true.

References


Sometimes as you read this column, you may get the impression that attaining a bodybuilding physique is pretty easy. I talk about how to control your hormones, how to stimulate fat loss, how to drive muscle growth, how to channel food energy to muscle stores, and so on, and bodybuilding sounds not too hard. The truth is, achieving a bodybuilder’s physique is very hard, and that’s why you don’t see too many bodybuilders walking around. If it was easy, everybody would look great.

The key reason why it’s so hard is that you have to be in a calorie deficit to stimulate fat loss, yet in order to drive muscle growth you have to supply all the nutrients and energy muscles need to grow. In a way it’s a paradox to do both at the same time. But it is possible.

The easiest way to lose fat is just to starve yourself. Starving people are not fat. As you know, the problem with this approach is that during severe caloric restriction you lose about half muscle and half fat. Your body tries to hang on to the fat as long as it can so it won’t run out of energy. At the other end of the spectrum, is pretty easy to gain weight if you just eat like a pig. There are very few people who can’t gain a lot of weight if they just eat enough calories. This is what the board of “weight gainer” powders out there are for. If you add 1,000 calories a day to your diet, you will gain weight. The problem, of course, is that if you just indiscriminately add calories to your diet most of them (probably about 75% by most estimates) will end up as fat.

So we have to lose calories to lose fat, but if we cut calories half the weight which is lost will be muscle. And we have to add calories to gain weight, but about 75% of excess calories usually end up as fat. Genetically gifted bodybuilders may not have such a problem. I’ve met several people who were quite strong and who looked like bodybuilders before they ever went into a gym. But these people are rare. Most of us are all too familiar with the scenarios described above. And this is why attaining that bodybuilding look is hard for most people.

What’s the answer? How can the average person attain a really spectacular physique? Hard work, consistency, and dedication. These are the core principles of the Parrillo philosophy. If you can give me those, I can give you a great physique. Without those, all the information and training and supplements in the world just don’t matter. It’s really up to you. So how do you do it?

The key concept is an idea called nutrient partitioning, which means directing ingested dietary energy toward the lean compartment and not to fat stores. The idea is to have your food energy go to build muscle while drawing on your fat stores to fuel activity.

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help? Yes, definitely. One in particular that fits into this program is called Muscle Amino™. Muscle Amino™ is a pharmaceutical grade, ultra-pure, crystalline, free-form amino acid mixture of leucine, isoleucine, and valine. These are the so-called “branched chain” amino acids, because their side chain contains a branched carbon structure. The branched chain amino acids (BCAAs) are among the essential amino acids. Of the twenty amino acids common in human proteins, twelve of them can be made by the body and are called “nonessential” amino acids. The other eight cannot be made by the body and are called “essential” amino acids because it is essential they be obtained from the diet. Obviously, bodybuilders need to be attentive that their diet supplies all of the essential amino acids they need, because they are required for muscle maintenance and growth.

There are two special things about the BCAAs: they are among the most abundant amino acids in muscle proteins (1) and they are heavily catabolized (broken down) during exercise, especially intense aerobic exercise (2). These two reasons plus the fact the body cannot make its own BCAAs increase the need for BCAAs by athletes, especially athletes concerned about achieving maximum muscle mass. BCAAs seem to be preferentially taken up by muscle tissue and stored there, providing an anabolic effect as well as a nitrogen-sparing (anti-catabolic) effect (3).

Muscle Amino™ is really the exact thing we’re looking for in a supplement. It’s selectively taken up by muscle, so it will add to muscle mass and not fat mass. It provides essential building blocks which are used to build muscle protein, having an anabolic effect. And it blocks break-down of existing muscle tissue during intense exercise. This is a perfect example of positive nutrient partitioning. Muscle Amino provides nutrient energy which is specifically targeted to building up muscle stores while not contributing to fat stores. You can see why I call it “Muscle Amino.”

Exercise induces changes in the body’s pattern of energy metabolism, and these changes are driven by energy needs, substrate availability, and hormonal regulation (2). This change in the pattern of energy flow in the body is what brings about the change in body composition we seek. Energy to fuel body is derived from oxidation (burning) of the carbon chains in carbohydrates, fats, and proteins. The ratio of the fuel mixture which is oxidized depends on the nutrient ratio consumed as well as exercise type and intensity (2). In other words, whether you burn fat or carbs or protein for energy depends on what you eat and how you exercise.

During normal conditions, 80 - 100% of the body’s energy requirements are supplied by fats and carbohydrates (2). This means that amino acids can provide up to 20% of energy needs on a daily basis, and more during intense exercise. In one study protein breakdown and use of amino acids for fuel were measured in men following a 10 mile run. It was found that 57 grams of protein were consumed as fuel during the run, accounting for 18% of the energy cost of the run (2). This means that as much as the entire USRDA for protein can be burned during a single intense aerobic exercise bout. There seems to be little doubt that intensely training athletes need more protein than sedentary people, since the energy cost of exercise results in a significant amount of amino acid oxidation.

Bodybuilders virtually unanimously agree that they need extra protein. Most of them have the misconception that they need extra protein to supply the building blocks for muscle growth. The truth is that two or three extra bites of chicken every day will supply enough protein for your muscles to grow as fast as they can. The real reason bodybuilders and endurance athletes need more protein is that they burn more protein for fuel during exercise. If you don’t supply enough protein in the diet to make up for this increased demand then the body will actually break down muscle tissue to supply the amino acids to use as fuel. This is your worst nightmare. Since the biggest demand for amino acid fuel is during aerobic exercise, it turns out that endurance athletes actually have even higher protein requirements than bodybuilders (2). Very few people realize this, including very few endurance athletes. This is why endurance athletes usually have a very thin (sometimes referred to as “stringy”) look - they burn more protein than they take in, so their muscles get catabolized as fuel. If endurance athletes would simply increase their protein intake they would become more muscular and stronger, and probably become better, faster athletes as well. Usually in a contest between two equally skilled athletes, the stronger one wins.

Muscle mass is determined by the balance of protein synthesis and protein degradation (2). When synthesis exceeds...
degradation, protein mass accumulates and the body is said to be in positive protein balance (or positive nitrogen balance). When degradation exceeds synthesis, the body is in a negative protein balance and muscle mass is lost. The proteins in your muscles are not exceptionally stable over time, but rather are in a constant state of “turnover.” This means that every day some of your body proteins are broken down and destroyed to be replaced with new proteins. Proteins are the mechanical workhorse of the cell, being responsible for doing the physical work of life. For example, during muscle contraction what happens is protein filaments called actin and myosin slide past each other in opposite directions, thus making the muscle shorter. Like any mechanical parts that move and rub against each other, they get worn out. After a while the old proteins are broken down and replaced with new ones.

When you eat a protein food, it gets digested in the stomach and intestine into individual amino acids and short chains of amino acids that are small enough to be absorbed into the bloodstream. Eventually all of the protein is broken down into individual “free” amino acids. These can experience two main metabolic fates. They can be used to build new proteins or they can be burned as fuel to produce energy. Not all of the amino acids are treated equally however. The branched chains are used as fuel more than the others (2). Muscle contains special enzymes called branched chain aminotransferase and branched chain keto acid dehydrogenase which permit the breakdown of the BCAAs for energy (2). This allows muscle to use BCAAs as fuel whereas the other amino acids are oxidized in the liver. So while exercise increases protein requirements in general, it especially increases BCAA requirements.

This coupled with the fact that the BCAAs are among the most abundant amino acids in muscle protein make it obvious why athletes have increased need for the branched chains. They use more for energy, plus they need more for protein synthesis. Virtually every book and article about supplementation for athletes suggest the BCAAs as one of the core supplements. Of all the supplements out there, Muscle Amino is certainly one of the most high-tech, because it specifically targets the metabolic problem at hand. By supplying more BCAAs to the body less muscle tissue is catabolized during exercise, helping to maintain positive protein balance and net gain of muscle tissue. This is a prime example of a low calorie nutrient which specifically targets metabolic pathways to have a positive partitioning effect. Muscle Amino™ is selectively taken up by muscle where it acts to promote protein synthesis and prevent protein breakdown. Since it is taken up by muscle and not by fat, this is a way to supply nutrient energy which will be partitioned to the lean compartment. It should be emphasized that endurance athletes will benefit from this supplement at least as much as bodybuilders, if not even more.

To see a real noticeable effect from Muscle Amino™ you need to take a fair amount of it. At least ten grams a day, and twenty would not be too much. I suggest three capsules with each of six meals per day. Smaller amounts will have a smaller effect, but this is a supplement where the effects accumulate over time. It is best to take Muscle Amino™ with meals to increase absorption. There’s a lot more to be said about amino acid metabolism during exercise, and how to use exercise and nutrition to shift your metabolism into a muscle-building, fat-burning mode. I’ll pick up here next month and get into some of the molecular details of what’s happening with amino acid metabolism during exercise and how to use this information to maximize muscle mass.

References


Muscle Up - The Keys to Building Mass and Staying Lean, Part II

by John Parrillo

For years bodybuilders have asserted that they need more protein than average people, and all the while nutritionists have kindly replied, “No, you don’t.” Most of the scientific studies show that athletic activity does not appreciably increase protein requirements. Could it be that bodybuilders really don’t need any “extra” protein? Think about this for a minute: Muscle is about 75% water, so a pound of muscle only contains about 100 grams of protein. Most people would consider gaining 10 pounds of muscle a year to be good progress, and that would amount to 1,000 grams of protein. Over a year’s time, that equals out to gaining 2.74 grams of protein per day, which is about one or two bites of a chicken breast. So, they say, eat a couple extra bites of chicken breast and that’s enough protein to grow as big as Arnold.

Bodybuilders, on the other hand, have said that if they want muscles twice as big as everybody else they have to eat twice as much protein as everybody else. They need extra protein to supply the building blocks to build extra muscle. So who’s right?

Well, neither party turned out to be exactly right. Bodybuilders do need more protein than average people, but not for the reason they thought. In fact, those two extra bites of chicken every day would be enough to grow muscles as big as Arnold’s, if it all ended up being converted to muscle. The problem is, it doesn’t. The original studies looking at protein requirements of athletes were flawed in several ways. First, they used untrained athletes and the exercise protocols were not very intense. The subjects simply did not exercise long enough or hard enough to see an effect of exercise on protein requirements. Second, in the old studies nitrogen lost in sweat was not measured, and this turns out to be significant.

A little background: What bodybuilders seek to achieve is a state of positive protein balance. This means that more protein is coming into the body than is leaving. Protein is on average about 16% nitrogen by weight. Since nitrogen is easy to measure in the lab, nitrogen balance is used as a way to measure protein balance. Nitrogen is also a good way to keep track of the protein economy in the body because carbohydrate and fat do not contain nitrogen. You see, when we eat excess protein it can be stored as muscle, but it could also be converted to fat. If it is converted to fat, the nitrogen is removed (as ammonia) and is excreted in the urine (after the ammonia is converted to urea). This leaves the carbon skeleton of the amino acids, which can be broken down and used to make fat. By measuring nitrogen balance we see how much nitrogen is entering the body and how much is leaving, and any that remains in the body must represent new protein tissue.

The old studies measuring nitrogen balance in athletes looked at how much nitrogen was consumed as protein in the diet versus how much nitrogen was excreted in urine and feces. They found that athletes could remain in nitrogen balance without eating much, if any, extra protein. This is the basis for the long-standing disagreement between bodybuilders and nutritionists. During the last few years a number of important studies have been performed showing that hard-training athletes may actually need vastly more protein than average people. The new experiments also measure nitrogen lost in sweat, which the older studies failed to do. Also, the new experiments are much more realistic, using experienced athletes in intense training programs. It turns out that a significant amount of nitrogen can be lost in sweat, and if this is factored in then intensely training athletes may need as much as two or three times as much protein as an average person to maintain nitrogen balance (1-18). (I have included a rather extensive reference list here, as this controversial topic has been the subject of much research. If you’re only going to read one reference, read #17 by Peter Lemon. It’s an excellent review that puts
a lot of this in perspective.)

So what does all of this mean? Do athletes need more protein? Yes, definitely, they need significantly more protein than sedentary people. The controversy is over on this argument, and now even the old-school nutritionists agree. Do bodybuilders need more protein so they can have more substrate to build new muscle tissue? No, they need more protein because they excrete more nitrogen during exercise. In other words, very little extra protein is needed to build new muscle tissue, but a lot of extra protein is needed to make up for how much is burned as fuel during exercise.

The branched chain amino acids (BCAAs) are of special importance to athletes because they are metabolized in muscle, rather than in the liver. Here’s what happens: After you eat the food is digested and absorbed into the bloodstream through the small intestine. The blood from the small intestine drains into a special vein called the portal vein, which goes to the liver. So the liver gets first “dibs” on all the nutrients before they are transported to the rest of the body. (With the exception of long chain fats, which enter the lymphatics and bypass the liver.) The primary site for degradation of most amino acids also happens to be the liver (19). The liver thus has the ability to break down most amino acids for energy when it needs to, such as during starvation or during intense exercise. The first step is to remove the amino group (–NH2) from the amino acid. This is accomplished by enzymes called transaminases or aminotransferases.

However, the liver is very low in branched chain aminotransferase, which means it can’t break down BCAAs to a significant extent. This results in release of any BCAAs from the liver into the circulation (19).

Skeletal muscle does contain branched chain aminotransferase and thus is able to break down the BCAAs for energy. During periods of increased energy need such as starvation, trauma, or exercise, the enzyme pathways responsible for BCAA oxidation are activated. Notably, however, during resting periods in the absorptive state (after a meal) when other fuel sources are available such as glucose or ketones from CapTri®, these alternate fuel sources “spare” the BCAAs from catabolism (degradation) leaving them available for use in protein synthesis. Thus after a meal there is a small burst in liver and muscle protein synthesis, after which time any left over amino acids are burned for energy or converted to glucose and stored as glycogen (20).

It is estimated that about one third of the amino acids entering the liver from the portal vein are used for protein synthesis by the liver (serum proteins) or are converted to glucose or used for energy by the liver (20). Thus a high protein meal only increases serum amino acid levels by about 20%.

Well, so what, and what does all this have to do with bodybuilding? Remember that the liver does not have the enzymes to metabolize the BCAAs, and this means that the BCAAs increase markedly in the bloodstream after a meal. (In other words, they pass straight through the liver without being broken down.) In fact, the BCAAs can account for about 70% of the amino acids released from the small intestine via the liver to the rest of the body (20). Are you starting to get the idea that the branched chain aminos are important in muscle protein metabolism? Indeed, it has been shown that the BCAAs account for 50-90% of the amino acids taken up by muscle tissue in the 3 hours following a protein meal (20). The branched chain aminos are also effective at stimulating protein synthesis.

So what’s the bottom line here? First off, the branched chains account for 50-90% of the amino acids taken up by muscle after a protein meal. Once there, they are available to serve as substrate for protein synthesis. They increase insulin, which further stimulates protein synthesis. This is their anabolic effect. During periods of intense exercise, they can be burned for energy, helping prevent breakdown of muscle tissue to use as fuel. This is their anti-catabolic effect. Parrillo Performance Muscle Amino™ is a special formulation of BCAAs in the proper balance to help promote muscle growth and prevent muscle breakdown. The best way to use it is to take it with meals, and to eat six small meals per day. The most important times to take this are the meal before your workout and the meal after your workout. I suggest taking three to six Muscle Amino™ caps with a Pro-Carb™ drink after your workout. The carbohydrates will prevent oxidation of the BCAAs, leaving them available for use in protein synthesis. The insulin release from the Pro-Carb™ will help drive the aminos inside the muscle cells, as
well as stimulating protein synthesis (20). This is also the optimum time to replenish glycogen stores. Another suggestion which seems to be very effective is to use about one tablespoon of CapTri® with each meal. The ketones spare oxidation of the BCAAs, leaving them available for use as protein. This enhances their ana-
obolic activity. Combine this supplement program with a healthy diet adequate in calories and protein, and I think you’ve got the best muscle-building program modern science has to offer.

References


MCT’s — Setting the Record Straight

by John Parrillo

There has been some confusion in the recent bodybuilding literature about metabolism of medium chain fatty acids, or more precisely, medium chain triglycerides. The specific areas of uncertainty revolve around whether MCTs are converted into ketones and if they are stored as body fat.

Since what has been written contains come misinformation, let’s start with the general and move to the specific. First, when people disagree about technical matters like this it’s always nice to check their references. If somebody takes a position and defends it by citing references to the scientific literature, he might be right or he might be wrong, but at least you have the option of checking the information out for yourself to see if he has interpreted it correctly. When people comment on research results and don’t cite any references, then they’re asking you to take their word for it without furnishing any proof one way or the other. I try to stay out of discussions like this because without any objective data it just turns into an argument about opinions. Don’t get me wrong: expert opinions are important and count for a lot, but you can’t really have much of a discussion of scientific research without citing the literature.

The next general issue has to do with if MCTs are stored as body fat. This seemingly simple question has a relatively complex answer. Literally speaking, the human animal stores fat in the form of long chain triglycerides, LCTs. These are triglycerides comprised of fatty acids 14 carbons long or longer. Most fatty acids in human fat are either 16 or 18 carbons long, with a small percentage being longer. So, literally speaking, MCTs are not stored as fat in the human (or in rats, where a lot of research was also done). Does this mean we can eat all the MCTs we want and never get fat? Of course not. If you eat too many calories you will gain weight, and for most people, most of the time, any extra weight they gain from over-eating will be fat mass. I’ve said this before many times, but I’ll say it again to make sure I’m understood: too many calories from any source can be converted to fat. What you have to realize is that different foods are metabolized differently in the body, and don’t all have the same tendency to store as fat. So all foods have the potential to be converted into body fat if consumed in excess, and what bodybuilders want to do is pick the food choices that have the least tendency to do so, while having the greatest tendency to contribute to muscle tissue.

So what is this business about different foods having different tendencies to be converted to fat? This is one of the most exciting and important discoveries in nutrition since vitamins. It comes from the realization that while protein, carbohydrate, and fat can all be converted into usable energy in the form of ATP, they follow different metabolic pathways and are thus converted into energy with different efficiencies. Chapter 8 in reference 1 contains detailed calculations showing that different dietary energy substrates are converted into ATP with different yields.

The experiments done specifically with MCTs sought to determine if including MCTs in the diet can reduce fat accumulation during over-feeding, compared to other foods. References 2-6 describe what are the best studies done to date on this issue. These studies are well-controlled trails in rats and humans that measure the effect of replacing some part of dietary energy as MCT. It was found that if conventional fats (LCTs) are replaced by MCTs this results in diminution of fat stores. This is explained by the fact that MCTs are profoundly thermogenic, so a significant fraction of the dietary energy supplied by MCT is released as body heat, making it not available for storage as fat. References 2, 4, and 6 specially demonstrate the thermogenic effects of MCTs, including studies in humans. Reference 7 is an excellent review article on the subject.

Let me clear up one minor area of confusion on thermogenesis, while I’m on the subject. Thermogenesis, or more properly the thermic effect of feeding, refers to increases in body heat production following feeding. All foods release heat when they are burned. Indeed, maintenance of core temperature is one of the main functions of dietary energy. Different foods release different amounts of heat when they are burned. MCTs happen to be profoundly thermogenic, meaning that they release a lot of heat (2,4,6,7). This is a consequence of the metabolic pathway they follow, which is in turn a consequence of their unique molecular structure (7). It has nothing to do with increasing thyroid hormone or noradrenaline levels and re-setting the thermostat in the hypothalamus, but is merely a result of rapid metabolism and conversion of dietary energy to heat within the liver. This does not mean however that they increase body temperature. It has been well known for years that MCTs are thermogenic without increasing body
temperature (7). This just means that as more heat is produced, it is liberated to the environment. If foods, including MCTs, elevated body temperature then we would get a fever after we ate, and if we ate too much we would die from hyperthermia. It doesn’t work that way.

Regarding the question of ketogenesis, I’m glad that was brought up because that’s one of the key things that makes MCTs so special. It is quite correct that regular fats, including conventional dietary fats as well as body fat, are not converted into ketones to any appreciable extent as long as carbohydrate fuel is available. This is because regular fats require the carnitine shuttle to transport them across the mitochondria membrane to the mitochondrial matrix, where they are metabolized to produce ATP or else converted into ketones. The carnitine shuttle requires the activity of an enzyme called carnitine acyl-transferase I, or CAT-I, which sticks a fatty acid onto carnitine, which then carries it across the mitochondrial membrane. CAT-I is inhibited by malonyl-CoA, a byproduct of carbohydrate metabolism. This means that fat metabolism is effectively shut down (or at least significantly down regulated) as long as carbohydrate fuel is available, and this is the molecular switch that does it. The special thing about MCTs is that they can enter the mitochondria by passive diffusion, without the help of the carnitine shuttle (7). This means they are rapidly oxidized as fuel even in the presence of glucose (7). The MCT is burned so rapidly, in fact, that the capacity of the Krebs cycle to produce ATP (literally reducing equivalents, which are later converted to ATP) is overwhelmed (7). This means that MCT is burned faster than the mitochondria can produce ATP, so the rest of the energy is converted into ketones. The ketones then leave the liver cell and are carried by the blood to muscle, where they are used for energy (7).

One of the most amazing things about MCT is that it is converted into ketones even in the presence of glucose (7). This is a well established fact that has been in the literature for years. Many studies (reviewed in reference 7) have shown a sharp increase in ketone production following MCT ingestion, even in the presence of glucose levels which inhibit ketone production from regular fats.

These ketones are taken up mostly by muscle (the brain continues to run on glucose as long as it’s available) and rapidly burned for energy. In fact, they are converted into ATP preferentially over glucose, having what is called a “glucose-sparing” effect (7). The ketones are burned first, saving the glucose for later. If you don’t see ketones in your urine with Ketosticks while you’re using MCT, this means it is working like it is supposed to, and the ketones are being used as fuel inside muscle cells. If you use more and more MCT, eventually you will indeed see ketones spilling over into your urine. At that point it means you’re using too much and your supplement dollars are just ending up in the toilet.

Now I want to get back to a question I touched on earlier, and that is the issue of storage of MCTs as body fat. As I explained, MCT is not directly stored as fat, but it is a concentrated source of calories. Too many calories in any form can contribute to fat stores. How this happens with MCT is that they are broken down into acetyl-CoA, which are two carbon fragments of fatty acids (acetate) attached to co-enzyme A (Co-A). These acetyl-CoA units then can be re-assembled into long chain fats, most commonly 16 carbons long, and subsequently stored as body fat (8). So while MCT is not stored directly as fat, it can be converted into LCT which is stored as fat, just like any other food.

The point, which has been proven over and over in the literature (2-8), is that calories derived from MCT have much less tendency to be converted into body fat than excess calories from other food sources. This is because excess calories from MCT are preferentially lost as heat through the process of thermogenesis, making them not available for storage (2,4,6,7). This makes MCT the ultimate energy source for bodybuilders, since it is a form of calories with less tendency to store as fat than conventional fats or even carbohydrates.

Finally, it deserves mention that none of the scientific studies in the medical literature were done with bodybuilders. That’s where our research here at Parrillo Performance picks up. We learn as much as we can from the literature, and then work on how to best use that information to make better bodybuilders. We’ve personally done the research over the years to determine the best way to incorporate MCTs into a diet to derive maximum benefit from this unique energy source. If you’re still confused and don’t know what to believe, you have two options left. One is check out the scientific literature for yourself. By siring specific references, I’ve given you that option. Second, try MCT for yourself and see if it works. Be sure to use it as instructed in the Parrillo Performance Nutrition Manual. The basic concept is to substitute MCT-derived calories for an equivalent amount of calories from convention fat or carbohydrates. This increases the thermogenic effect of the meal, thus decreasing fat storage. Some people make the mistake of simply adding several hundred calories a day of CapTri® to their normal
diet without making any other changes. This, of course, just adds calories to the diet and may increase fat accumulation and as mentioned earlier, excess calories from your diet can be converted to body fat. CapTri® is not some magic fat-burning chemical. CapTri® is not a drug. It’s just a very special nutrient that supplies energy in a way less likely to be stored as fat that regular foods.

As with any supplement, the key is to use it in the proper way in combination with the proper diet. There’s no substitute for a sound nutrition program, but by using supplements to complement your nutrition program, you can take your training and physique even further. CapTri® is an extension of the Nutrition Program. You use it for added calories in your diet. But you can’t just start taking it, without first establishing a good nutrition program.

So why use it? Here’s some of the ways bodybuilders and other athletes utilize this supplement in a positive way. First, CapTri® can help you gain muscle, by providing extra energy for increased intensity in workouts and by sparing amino acids that could be oxidized during this training. Second, CapTri® is used by bodybuilders as a replacement for carbohydrates when dieting. The key here is to change the insulin:glucagon ratio so more fat is burned. By replacing carbs with CapTri®, you increase your protein:carbs ratio, thus decreasing the amount of insulin in the blood. That sparks the release of glucagon which promotes fat metabolism for energy in the body. And while a low-carb diet alone would tire and lifeless, the calories from CapTri® provide the energy to continue training hard and burning fat. Third, bodybuilder and endurance athletes alike use CapTri® to increase energy for tremendous workouts. It’s an additional energy source that can be used in the presence of carbohydrates to keep you going harder for a longer period of time.

References


Carbohydrates: Mega Fuel For Growth and Energy, Part I

by John Parrillo

Some debate has appeared in the bodybuilding magazines recently about what’s the best dietary fuel for bodybuilders. Some people are advocating the high-fat diet, in which most of the day’s calories are derived from fat while keeping carbohydrate consumption to a minimum. The rationale for this approach is to avoid carbohydrates in order to keep insulin levels as low as possible, thus promoting use of stored body fat as energy. This is a topic near and dear to my heart, so let’s take a close look at the facts.

Let’s begin our analysis with the most basic concepts and move to more specific considerations later. What the high-carb diet and the high-fat diet have in common is that they both emphasize consuming adequate protein to maintain positive nitrogen balance. This is the first consideration of any bodybuilding diet. Many studies have documented that bodybuilders and endurance athletes need a lot of protein to make up for the loss of amino acids which are oxidized as fuel during exercise and to repair muscle tissue which is damaged during exercise. (See the July ‘95 issue of The Parrillo Performance Press for an extensive reference list.) Most bodybuilders do well on one gram of protein per pound of body weight per day, while others may need as much as one-and-a-half or more. The primary function of protein in the diet is to supply amino acids which are used to support protein synthesis in the body. This is required to repair muscles that are damaged during exercise, to support growth of new muscle tissue, and to allow for protein turnover, which is the replacement of all sorts of cellular proteins that “wear out” from every day wear and tear.

The rest of your daily calorie intake is to provide energy, and this is where the two diets differ. One strategy is to supply most of this energy in the form of complex carbs, while the other approach is to supply the energy as fat. The truth is that either approach can be made to work, and the question is which one works best? To promote the use of stored body fat as energy the one crucial requirement which must be met is the body must function in a net energy deficit. This means that energy consumed (dietary calories) must be less than the total amount of energy (calories) the body expends. Only when an energy deficit is to increase your energy expenditure by doing more aerobic exercise. You burn fat while doing the aerobics and burn more fat afterwards because your metabolism has increased.

So to lose body fat while maintaining muscle mass we need to consume a diet adequate in protein and deficient in calories (that is, we need to burn more calories than we consume). After meeting the protein requirement, the rest of the calories can come from carbohydrates, fat, or some combination. Just so we burn more calories than we eat, we will lose body fat. So both diets will work, but that’s not to say they work equally well. I believe that it is best to supply the bulk of dietary energy in the form of complex carbohydrates and to keep conventional dietary fat to a minimum. Three general categories of reasons have lead me in this direction: personal experience with real-life bodybuilders, general health considerations, and the scientific literature. The simple truth is that the vast majority of bodybuilders stick to the high-carb approach because they have found it works better for them. Almost all of the professionals I’ve trained just seem to do better on the high-carb/low-fat diet. Believe me, what matters at this level is results. If the high-fat diet gave better results, that’s what I would use. But the fact is that in my experience with elite athletes the high-carb diet works better. That’s not some fancy technical explanation, it’s just the bottom line, plain and simple.

The second reason I favor the low fat approach is for general reasons of good health. The number one killer of people in this country is heart disease, which accounts for as many deaths as all other causes of death put together (including cancer). Coronary artery dis-
ease occurs when cholesterol plaques build up inside the arteries supplying the heart muscle, cutting off some of its blood supply (3). When the heart muscle can’t get enough oxygen angina (chest pain) occurs. Sometimes the cholesterol plaques rupture (break), causing a blood clot to form in the coronary artery. This completely cuts off blood supply to part of the heart resulting in myocardial infarction, or a heart attack. Doctors and nutritionists all suggest following a low fat diet to help reduce blood cholesterol level and prevent coronary artery disease. A diet high in conventional fat has also been associated with some cancers, including breast cancer and colon cancer (3). Furthermore, doctors and nutritionists suggest eating a low-fat diet to help lose weight, because gram for gram fat contains more than twice as many calories as protein or carbohydrate, so cutting down on fat is the easiest way to cut down on calories. So from the point of view of general health concerns, such as heart disease, cancer, and obesity, eating a low-fat diet seems to be the way to go.

Finally, there is quite a body of research literature supporting carbohydrates as the preferred energy source for athletes (see chapters 2, 3, and 7 in reference 4). In contrast, I don’t know of any scientific studies which have found conventional fat to be a superior energy source for athletes. As you know, weight lifting is an anaerobic activity. That means the energy is produced without using oxygen. Carbohydrate is the body’s preferred fuel substrate which can be broken down to yield energy without reacting with oxygen. Here’s what’s going on: Let’s say you’re doing a set of bench presses to failure, and you can get 8 reps with 225 pounds but you fail on the ninth rep and your training partner has to help you rack the weight. Your pecs are working as hard as they can for about 30 seconds and then they give out and can’t do another rep. They fail because they run out of energy and because waste products accumulate which inhibit further contraction. While this is happening blood is flowing to the muscle supplying it with nutrients and oxygen. The problem is the blood can only flow so fast, so there’s a limit to how fast it can supply fuel and oxygen. Furthermore, it takes some time for these chemicals to move from the bloodstream into muscle cells.

When you go for a walk there’s no problem supplying oxygen and fuel fast enough to keep up with the demands of your leg muscles. This is a low intensity exercise and you can keep it up for hours because the blood flow is adequate to supply the muscles with fuel and oxygen as fast as it’s being used. Weight training, on the other hand, is very intense and the muscles are performing work at the fastest rate they can. This means they are consuming energy as fast as possible if they had to wait for oxygen to be delivered by the blood. The glycolytic pathway can supply energy for a minute or two, until energy substrates within the cell are depleted and waste products accumulate.

The point of all this is that fat cannot be readily used as a fuel for lifting weights because fat REQUIRES oxygen to be broken down (3,4). Carbohydrates are essentially the only fuel your body can use to lift weights, because it’s the preferred fuel the muscles can break down without using oxygen (4). So right off the bat there’s a pretty good reason why bodybuilders should eat a high carbohydrate diet. How can people on the high fat diet still manage to lift weights? Because they are breaking down protein and the amino acids are converted to glucose in the liver in a process called gluconeogenesis. To me it makes more sense to let dietary protein be used as protein instead of being converted to glucose (a simple carbohydrate) so it can be used as fuel. If your body requires carbs to lift weights, then feed it carbs. Is that so complicated?

So high intensity exercise such as lifting weights is fueled almost exclusively by carbohydrates, while low intensity exercise like walking or riding the stationary bike can be fueled by carbs or fat. This is why I recommend aerobic exercise for bodybuilders: fat oxidation is by necessity an aerobic activity, so this makes aerobics the best way to lose body fat. If you’re going to do some aerobic exercise activity to burn fat, why supply fat in the diet? Would you rather be burning fat that you just ate or stored body fat? It makes more sense to me to supply dietary energy in the form of carbohydrates, which can be used as fuel for weight training, and to burn body fat to fuel my aerobic exercise. Why burn 300 calories worth of fat on the stationary bike and then turn around and eat 300 calories worth of fat your next meal? That just puts the same amount of fat right back into your system. Keep in mind that fat cannot be converted into carbohydrate. (Technically speak-
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ing, fatty acids cannot be converted into carbohydrate, but the glycerol backbone can. This only represents a few percent of the calories in a triglyceride molecule however.) So you cannot use fat to replenish glycogen stores. Neither can fat be converted to protein. Dietary fat can do two things in your body: it can be burned for energy or it can be stored as body fat. So if you want to try the high fat diet just keep in mind that you have to burn off all those fat grams or else store them in adipose tissue. They can’t end up anywhere else.

Besides providing energy substrate for weight training, there are several other advantages to supplying the bulk of dietary energy as carbohydrate instead of fat. First is that excess carb calories are used to replenish glycogen stores before they are converted to fat. Remember, you can convert carbs to fat, but not fat to carbs. If you’re on the high fat diet and consume too many calories, the excess will appear as body fat. That’s the only metabolic fate available to it. On the other hand, if you consume excess calories on the high carb diet the excess carbs will be converted to glycogen and stored in the muscles and liver. If the glycogen stores are filled up and you still have more excess carb calories around, then they will be converted to fat and stored as adipose tissue. Remember, too many calories from any source can make you fat. The silver lining to this black cloud is that converting a carbohydrate molecule into a fat molecule takes some energy. In fact, about 25% of the energy in a carbohydrate molecule is spent in the process of digestion, assimilation, transport, and conversion to fat. In contrast, only about 3% of the energy in dietary fat is used to get it from your mouth to your waist. Calories from dietary fat are thus stored as body fat much more efficiently than are calories from carbs. Again, carbs sound like a better deal to me.

What got this debate started was the idea that by lowering carbs we could lower insulin. Since insulin promotes fat storage and blocks fat breakdown, this seems like a good idea. What if I told you how to keep insulin levels low but still consume a high carbohydrate diet? Sounds like the best of both worlds. The first thing to do is to choose only complex carbohydrate sources and to avoid simple sugars. The trick is to combine the foods you eat at each meal so you get a slow release of carbohydrate into your system so it won’t be turned into fat. Each meal should contain at least one serving of fibrous vegetables, which are digested and released into the blood slowly. Also, by combining your carbs with protein and CapTri® you can further slow the release of carbs. By proper meal combining, as outlined in the Parrillo Nutrition Manual, you can eat a diet high in complex carbohydrates and low in fat and still keep insulin at a steady, low level. Finally, our carbohydrate supplement “Pro-Carb™” is specially formulated to be slow releasing, based on a complex carbohydrate powder called maltodextrin. We’ve blended 4 grams of protein along with 22 grams of carbs into each serving, which further slows digestion. The product contains no sugar or artificial sweeteners. It is fortified with amino acids which are required in increased amounts during periods of rapid growth. Pro-Carb™ is the ideal supplement to supply high quality complex carbohydrates in a form that digests slowly, thus minimizing the tendency to store as fat. Unlike the other carb drinks on the market, ours contains no sugar. Pro-Carb™ is an excellent way to supply carbs to fuel your workouts, and works very well to replenish glycogen stores after training. Take one or two scoops 30-60 minutes before you train and again immediately when you finish your workout, and see your intensity and recovery ability skyrocket. Pro-Carb™ also is an excellent supplement to add quality calories to your meals when you are trying to gain muscular weight.

References


Carbohydrates: Mega Fuel For Growth and Energy, Part II

by John Parrillo

Last month I explained why the latest diet craze—the high fat diet—doesn’t make any sense. It can contribute to heart disease and cancer. It deprives your muscles of carbs which they require for high intensity exercise like weight lifting. And if you are eating extra calories to gain lean body mass, excess fat calories have a very high tendency to be stored as body fat. Remember, fat cannot be converted to muscle and it cannot be stored as glycogen. The only thing your body can do with excess calories from conventional fat is to store them as body fat.

The theory behind the high fat diet is to use dietary fat as fuel in place of carbohydrates. This results in lower insulin levels. Since insulin stimulates fat storage and blocks fat breakdown, this sounds like a good idea. If we could get around the problems with the high fat diet, it would be great. And we can with CapTri®! The Parrillo diet is very low in conventional fat but instead relies on a special fat called CapTri® which has been specifically formulated for bodybuilders and anyone trying to minimize body fat stores. The Parrillo diet is a more balanced approach, and I think you’ll agree makes a lot more sense. The first consideration is to meet your protein requirement. A good rule of thumb is one gram of protein per pound of body weight per day. Divide this equally among our meals spread throughout the day. Next comes CapTri®.

Start out with ½ tablespoon per meal, mixed with food, until your system gets used to it. Work your way up to one or two tablespoons per meal, depending on your size and level of caloric intake (some people eat as much as five tablespoons per meal). A good rule of thumb here is to try to derive 30% of your calories from CapTri® while limiting conventional fat to 5% of calories. You should see and feel a dramatic effect at this level.

Then make up the rest of your calories from unrefined, complex carbohydrates. Avoid simple sugars, fruit, dairy products, bread, pasta, and other refined carbohydrates. These carbohydrate sources will make you fat. I classify carbs into three groups: simple sugars and refined carbohydrates (one group), starchy carbs, and fibrous carbs. Good starchy carbs are potatoes, sweet potatoes, rice, beans, peas, corn, and oatmeal. Good fibrous carbs are vegetables like lettuce, spinach, cabbage, green beans, and so on. The Parrillo Performance Nutrition Manual contains an extensive list of good foods to eat along with their nutritional content.

How does this compare with the high fat diet? There are two big differences. First, the Parrillo diet uses CapTri® instead of conventional fat. Whereas regular fat found in conventional food has a very high tendency to store as body fat, CapTri® does not. CapTri® is a fat with a specially engineered molecular structure that causes it to be metabolized differently than regular fat (1-7). CapTri® has almost no tendency to store as body fat (1-7). Instead, excess calories from CapTri® are simply released as body heat in a process called thermogenesis (1-7). This is really a bodybuilder’s dream since it allows us to substitute fat calories for carbs in order to decrease insulin levels, while avoiding the pitfalls of regular fats. The second big difference is that on the Parrillo diet you never go real low on carbs. The way the diet is structured, you don’t have to. The high fat diet calls for limiting carbs to 5-10% of calories so that you can enter a fat-burning state called ketosis. With the Parrillo diet you can maintain insulin at low levels and shift your metabolism into a fat burning mode, all while still consuming 40-60% of your calories from carbohydrates. This works because combining protein and fat (CapTri®) and fiber at each meal slows the release of carbs into the bloodstream, resulting in a much lower insulin level.

This approach is far superior to the high fat diet because it supplies the carbs your body needs for top performance. If you’ve ever tried going low on carbs, you know what I mean. You just don’t have the energy without carbs. As I explained last month, weight lifting is a form of anaerobic (without oxygen) exercise. This means that your muscles are working so hard and so fast that the energy requirement cannot be met by the aerobic (with oxygen) energy pathway. The preferred fuel for your muscles to use during anaerobic exercise is carbohydrate. So does it make sense for bodybuilders to go really low on carbohydrates? I don’t think so.

Let’s take a look at some of the
other benefits of carbohydrates. Everyone knows by now that diets based on severe caloric restriction fail (8,9). They fail because the body reduces its level of energy expenditure to compensate for the loss of incoming energy (calories). During very low calorie diets about half the weight which is lost is muscle. And since muscle is the metabolic engine where a lot of calories are burned, if you lose muscle you burn less calories. The number of calories your body burns per hour while you are at rest is called your basal (baseline) metabolic rate (BMR). It has been shown that BMR increases following excess feeding of a mixed diet (i.e., a normal diet that contains carbohydrates) but not if only excess conventional fat (LCT) is fed (8). This means that carbohydrates increase your metabolic rate more than conventional fats do (but not more than CapTri®). How does this happen? It turns out that carbohydrate is converted to ATP (energy in the molecular form which is usable by cells) with an overall efficiency of 75% (8). The other 25% of the calories in the carbs gets released as body heat in the process. Fat is converted to ATP with an efficiency of 90% (8). This means that if you feed your body carbohydrates instead of fat a higher percentage of the calories you eat will be converted to heat, which translates into a higher metabolic rate. The more calories you eat which are lost as body heat, the less left to store as fat. In simple terms, this is just saying that eating a high carb diet instead of a high fat diet results in a higher metabolic rate, meaning that your body burns more calories all the time, even when you’re at rest. These calories which are being burned simply appear as body heat.

Now keep in mind that this does not apply to CapTri®, which is a specially designed MCT. CapTri® is a fat, but follows a different metabolic pathway from regular fats. It’s a whole other animal. CapTri® increases metabolic rate even more than carbohydrate. It’s jet fuel for muscles.

For you biochemists out there who want to know how carbohydrate feeding stimulates metabolic rate: The thermic effect of food (TEF) is defined as the post-prandial increment in energy expenditure above the resting rate and is expressed as a fraction of the energy content of the food consumed (8). A substantial part of the TEF (50-75%) is simply the energy used to digest, transport, and store food (8). This is termed the obligatory component of TEF. Carbohydrate feeding is known to stimulate the sympathetic nervous system, and the ensuing catecholamine-mediated increase in metabolic rate is known as the facultative component of TEF (8). This effect can be blocked by propanolol (a beta-adrenergic antagonist).

From this we can see that body weight, and body composition, depend not only on energy balance (calories in versus calories out) but also on what foods you eat. A person eating a high carb diet will naturally burn more calories than someone eating a high fat diet, because he has a higher metabolic rate. This will make it easier for the person on the high carb diet to stay lean. I think it was explained very well in Bjorntorp and Brodoff’s classic text “Obesity” (8) when they pointed out that the human body very narrowly regulates carbohydrate stores but not fat stores. The body has a limited ability to store carbohydrate (glycogen). The adjustment of carbohydrate oxidation to carbohydrate intake is carefully controlled to result in stable glycogen reserves under a wide range of dietary carbohydrate intakes. This means that if you eat more carbs you burn more carbs, and if you eat less carbs you burn less carbs. This is because it is so important to maintain blood glucose levels to allow proper brain function. On the other hand, body fat stores are not regulated in this way and your body has an almost limitless potential to store fat. You can only store 400-600 grams of carbs no matter how much carbs you eat, but you can store 100 pounds of fat (or more) if you eat enough. Thus, carbohydrate feeding promotes carbohydrate oxidation (burning) but fat feeding does not promote fat oxidation (8). On days when excess carbs are consumed carbohydrate oxidation is increased, but if excess fat is consumed it is simply stored in adipose depots (8). Since 25% of excess calories from carbohydrate are wasted as heat, and since glycogen stores are generally far from full, an excess carbohydrate load of 500g can be accommodated without an increase in body fat (8). This means if you over-eat on the high carb diet the excess carbs get stored as glycogen, but if you over-eat on the high fat diet the excess fat gets stored as body fat. Excess fat calories are not released as body heat, and they cannot be converted to glycogen or muscle. Bummer.

These arguments show that a meal with a high carbohydrate to fat ratio is more thermogenic than a meal with a low ratio. While carbohydrate and protein balance are closely regulated, fat balance is related by the amount of fat in the diet (8). During over-feeding, weight gain is closely related to fat intake (8). The body’s inability to regulate fat stores explains why the incidence of obesity rises as the fat content of the diet increases (8). Is this starting to make the high fat diet sound a little less attractive?

Now don’t go crazy on this information and get the idea you can indiscriminately eat all the carbs you want and never get fat. It just isn’t so. After glycogen stores are full, any more excess carbs get converted to fat and stored as fat. Your body is very good at converting...
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excess carbs into body fat. The point is that body fat accumulation is less likely with the high carb diet than the high fat diet, but it is possible with any diet if you consistently consume too many calories. I’ll reiterate the most important guidelines are to avoid simple sugars and refined carbohydrates. These generate a greater insulin response and therefore are a more potent stimulus for fat storage. Simple sugars are present in sweets and desserts (obviously) and are also found in significant quantities in fruit and dairy products. Pasta and bread are made from refined carbohydrates (sorry, but this includes bagels). Also, but sure to mix your carbs with protein at each meal, and include a fibrous carb with each starch. These things slow the entry of glucose into the blood.

The down side of carbs, as proponents of the high fat diet are quick to point out, is that they induce a big insulin response. This is why I’ve gone to such pains to structure my diet the way I have, using only slow-release complex carbohydrates. If you eat as outlined in the Parrillo Nutrition Manual, you’ll be able to eat a high carb diet while minimizing insulin response. This is also why my carbohydrate supplement, Pro-Carb™, is formulated the way it is. It is based on maltodextrin, a slow release glucose polymer with a glycemic index of 22-26. This is just about as low a glycemic index a carb can have. Plus I’ve added 4 grams of complete protein to every serving to further slow glucose release. It is sweetened with glycinine, a naturally sweet amino acid, instead of sugar or corn syrup. For good glucose and insulin control, it’s probably one of the best carbohydrates available. It was designed specifically for bodybuilders and athletes, with these considerations in mind.

The truth is I can see the logic of the high fat diet and I’ve had great success with it in bodybuilders, the main difference being I use CapTri® instead of conventional fat. The reasons for this have to do with how CapTri® is metabolized and that it has almost no tendency to be stored as body fat (1-7). CapTri® is profoundly thermogenic, meaning that it increases metabolic rate and excess calories from CapTri® are simply lost as body heat instead of being stored as body fat (1-7). This is in stark contrast to conventional fat found in regular foods, which has very little thermogenic potential and has a high tendency to store as body fat. The other main difference is that I never recommend going as low in carbs as the hard-core high fat people do. The high fat diet calls for restricting carbs to 5-20% of daily calories, depending on who you read. Once carbs get below about 100 grams a day, your body starts to break down muscle tissue and uses the amino acids to make glucose in the liver. Intentionally constructing a diet that results in muscle break-down to maintain blood glucose never made much sense to me. Losing a pound of fat doesn’t really get you anywhere as a bodybuilder if you have to lose a pound of muscle at the same time. The other thing is your muscles require carbs to fuel the anaerobic activity of lifting weights. If your muscles need carbs, feed ‘em some carbs. It’s not that complicated.

My experience with top bodybuilders over the last twenty years has taught me that the best diet is one which provides one to one-and-a-half grams of protein per pound of body weight per day, about 30% of calories as CapTri®, and the rest as complex carbs. (And believe me, I’ve taken them from the basement to the Olympia, literally.) This usually works out to be around 30% protein, 30% Cap-Tri®, and 40% carbs, but the percentages vary among individuals depending on their protein and calorie requirements. The ratios also change depending on whether you’re trying to gain muscular weight in the off season or lose fat before a contest. The exact protocols are given in the Nutrition Manual.

My opinion is you’re better off with a high carb diet, with or without Cap-Tri®, than with the high fat diet. I think it works better and an overwhelming body of scientific literature backs me up. Plus, it’s healthier, you feel better, and you have more energy to train.

References


Programmed For Success: Supplementation For Optimal Results, Part I

by John Parrillo

Parrillo Performance is proud to be the only company offering bodybuilders a comprehensive program of nutrition, supplementation, and training optimized to increase muscle mass and decrease body fat. Our program is about results—that’s the bottom line. It’s unfortunate that so many people work out in the gym and try to watch what they eat, but just never seem to get the results they’re looking for. Usually it’s because they’ve left out some part of the formula that’s required for success. How many people in the gym where you workout have truly impressive physiques? Probably not many. If you don’t have the body you want or if you’re not making good progress, that means you’re doing something wrong. Most people take the approach of trying this and trying that, reading muscle magazines and talking to their friends in the gym, hoping that sooner or later they’ll find something that will work. The single most valuable service we offer is our information, and that’s probably what sets Parrillo Performance apart more than anything else. Parrillo Performance makes bodybuilders by teaching people how to become bodybuilders. You can’t get that anywhere else.

Pick up any bodybuilding magazine and you’ll find ad after ad promising that a certain supplement will transform your physique. A lot of young bodybuilders get trapped in the mentality of searching for that magical supplement that will pack pounds of muscle onto their bodies. I’ll tell you up front it doesn’t work that way. If developing a championship physique was as easy as taking supplements you’d see a lot more impressive physiques in the gym. Sure, supplements can help, and we offer, without doubt, the most effective supplement line on the market. But still, supplements are only part of the picture.

Bodybuilding is hard work—in and out of the gym. Your work in the gym is only the beginning. What is bodybuilding about, after all? It’s about taking an ordinary body, or even a less-than-average body, and turning it into something special—something beautiful. That isn’t easy. In my business, I’ve been privileged to see many remarkable transformations, in people of all ages. Seeing people make positive changes in their lives and achieve their goals is my greatest reward.

I do this because I love bodybuilding and I love to see people get results. We’re about education and information because people need the information to get results. That’s why I publish this magazine I publish this magazine. As you might imagine, this is a tremendous expense that eats a huge chunk out of my profits, but I want to stay in touch with my clients and continue to bring them up-to-date scientific and practical information. That’s the way I want to do business. I have a scientist on staff with a Ph.D. in molecular biology to help us with research in nutrition and metabolism. I sent him to medical school and in a few months we’ll be proud to have an MD on staff. And it’s all done in the interest of increasing the knowledge of maintaining a healthy human body.

Bodybuilding is about mastery. Mastery of your body and your life. It’s about discipline and self control. It’s using your mind to control your body, to make it what you want it to be. And before you can use your brain to transform your physique into that of a bodybuilder, your brain has to know what it’s doing. That’s where I come in. I teach people what to do to become bodybuilders. The sense of mastery, of controlling your life and your destiny, is to me what bodybuilding is really about. (And you thought it was just about lifting weights!) People develop a sense of self-worth or self-esteem when they set a goal for themselves and follow through on it. Bodybuilding is a journey. Your destination may be to become a top amateur or professional bodybuilder. Or a fitness star. Or a model. Or the best looking guy on the beech. Or just to finally lose that weight and get in the best shape of your life. Like any journey, you take it a step at a time. You set a goal and then plan out a strategy, or road map, to get you from where you are to where you want to be. The Parrillo Performance Program is your road map to bodybuilding success.

The beauty of our program is that it is a comprehensive approach, and no doubt that’s why it works so reliably. It includes exact instructions on nutrition, supplementation, weight training, aerobic conditioning, and stretching. The Nutrition Program comes with a food scale and instructions on how to pre-
cisesly construct each meal to contain the number of calories and grams of protein, carbohydrate, and fat you need. It includes a food composition guide listing the nutrient breakdown of the foods you should be eating. It contains instructions on how to modify your diet throughout the year to gain muscle or lose fat. It tells you how to carb load and peak for your contest. We provide a Body Stat Kit with skin-fold calipers so you can monitor your body composition. This way you can make sure you’re gaining muscle and losing fat. If things aren’t going the right way, the manual tells you what changes to make. The Training Manual describes the proper execution of the most effective bodybuilding exercises, has suggested routines, and tells you how to stretch each muscle group. All of this is backed up by our technical services line (513-874-3305) where you can call with any questions. We provide a comprehensive line of state of the art supplements to help enrich your diet. Call us if you have questions about which ones are most appropriate for you.

With this comprehensive approach to bodybuilding, we leave no stone unturned. Every element of the program has been tested on top level bodybuilders many times over. During the last twenty years I’ve done just about every experiment with training, nutrition, and supplementation you could imagine. The program is polished and honed—and it works. All of the guesswork is removed. It truly is a formula for success.

My philosophy basically is that, if you work hard, you deserve to be rewarded with results. To achieve a top level bodybuilding physique is not easy. As with any worthwhile goal, it requires dedication, consistency, and hard work. If you make a commitment to those ideals and put forth the effort, I’ll make the commitment to teach you what to do to become your best. I’m a trainer of competitive bodybuilders, and over the years I developed my own line of supplements because I saw in my athletes a need for better products. I was training competitive athletes and experimenting with nutrients a long time before my supplement line came out. I’m a trainer first, and the knowledge of what to do is much more powerful than any supplement could ever be. Parrillo Performance is here to teach serious athletes what to do to become their best. I’ve helped more than a few bodybuilders move up to the professional ranks.

Over the last few years I’ve written a lot of articles detailing the science behind the program. We’ve talked about hormones and how to control them with diet, metabolism of fat, muscle physiology, exercise physiology, biochemistry of nutrients, energy metabolism, and other topics that represent why the program is the way it is. The practical “how-to” information is spelled out in detail in the Nutrition and Training Manuals. What I’d like to do now is give kind of an overview of the program that integrates some of the technical information with the practical information.

The basic premise of the Parrillo Nutrition Program is that healthy foods are the foundation of nutrition. This is in stark contrast to the other companies, who want you to believe that their product is the magical key to success. Supplements can help, but remember that they’re supposed to be used to fortify or enhance your diet. Supplements cannot redeem a bad diet. In other words, a bad diet plus supplements is still a bad diet. Properly used, supplements can boost the levels of specific nutrients beyond what can practically be obtained from whole foods alone. So let’s start with the diet. I advocate a diet low in fat, medium in protein, and high in complex carbohydrates. The way to calculate your diet is simple. Research has shown that intensely training athletes need about one gram of protein per pound of body weight per day to maintain nitrogen balance (1). That means they need that much protein to ensure they have enough to build muscle mass. This amounts to about 2.5 times the RDA for protein, which is based on non-exercising people. For years there was a lot of controversy on this issue, but now it is well understood that intense exercise training increases a person’s need for protein. During dieting I suggest you increase protein intake to 1.5 grams per pound of body weight. Here’s why: Some of the protein you eat is burned for energy. During extreme conditions, such as starvation or prolonged endurance exercise, the protein in your muscles can even be broken down and used for energy. Any form of calories provided by the diet is said to “spare” protein, meaning that the more calories you have coming into your body the less protein it needs to burn (2). When you’re dieting to lose weight for a contest you will be consuming less calories than during the off season. This increases the chances your body will use some protein as fuel. To make up for this you should increase protein intake when you reduce calories.

So start with one gram of protein per pound body weight in the off season or 1.5 grams pre-contest. The next step is to limit fat to 5% of daily calories. The rest of your calories come from complex carbohydrates. That’s a pretty simple formula. It’s impossible to accurately break this down into percentages of calories from protein, carbohydrate, and fat because the numbers work out to be different for every one. As an example, a bodybuilder weighing 200 pounds and consuming 3,000 calories would consume 200 grams of protein, 17 grams of fat, and 510 grams of carbs. This would be 27% protein, 68% carbs, and 5% fat. (Remember that protein and carbohydrate have 4 calories per gram and fat has 9 calories per gram.) The ratios usually work out to be 25-30% protein, 60-65% carbs, and 5-10% fat for most people. The basic rationale is this: The role of protein in the body is to support your lean body mass and to provide the raw materials you need to build more muscle. So protein requirements are determined by body mass. As your muscle mass increases, your protein requirement increases. The role of carbohydrate is as a fuel source, so carbohydrates are used to supply the bulk of calories. The carbohydrate requirement is determined by daily energy (calorie) needs. Dietary fat
is kept to an absolute minimum. Study after study has shown that body fat is more closely determined by dietary fat content than by dietary energy content (2-5). In other words, how fat you are is determined by how much fat is in your diet, and this is more important than how many calories you eat. Dietary fat has a strong tendency to be stored as body fat, whereas lean protein and complex carbohydrates do not (2-5). Excess calories from protein and carbohydrate tend to be lost as body heat instead of being stored as fat (2-5). Excess calories from dietary fat are simply retained as body fat (2-5). Consider this: metabolic studies have shown that your body is constantly burning a mixture of carbohydrate and fat for energy. At rest, most of your energy is derived from fat. As activity level increases, more carbs are thrown into the furnace. So your body burns a certain amount of fat every day as fuel. What would happen if your diet supplied less than this amount? You will burn body fat, that’s what. There are several things about the low fat diet that make it perfect for bodybuilders. I’ll get back to that in the future.

One of the toughest questions is, “How many calories should I consume?” This is a very individual thing, and is determined by your lean body mass, activity level, and genetics. There are several mathematical formulas you can use to estimate your maintenance requirements, but I’m not going to list them here because they don’t work reliably. The individual variation is tremendous. The easiest and best way to handle this is simply to start weighing your food and use the Food Composition Guide in the Nutrition Manual to calculate how many calories you normally consume. Keep a food journal and write down every bite of food you eat. After a week or so, average your daily calorie intake and this will give you a good idea of how many calories you need to maintain your present lean body mass. You can adjust this up or down by 300-500 calories per day depending on whether you want to gain weight or lose weight. Remember that muscle tissue is constantly burning calories to maintain itself, even at rest. So as your muscle mass increases you’ll need to slowly and continually adjust your calories upward. As your muscle mass increases your metabolic rate increases, so your calorie requirements increase too. I call this “building your metabolism.” I introduced this concept six or seven years ago and it revolutionized the way people thought about bodybuilding nutrition. Since then it’s caught on in the popular diet literature too, and now you see info-mercials on TV about it.

You need to feed your body and supply it with all the nutrients it needs to be healthy—even when you’re dieting to lose weight. Caloric restriction sets off a starvation response that shuts down your metabolism to save fuel. By increasing muscle mass you can build your metabolism so that you constantly burn more calories. And by restricting dietary fat you can force your body to burn its own fat for energy. There are also some highly technical aspects about how various fuels are metabolized by your body that factor in here. I explained these concepts in my series about thermogenesis a couple years ago. The bottom line is that the Parrillo diet increases metabolic rate by fostering muscle growth, as well as by direct thermogenic effects of the nutrient profile.

So we’ve talked about how many calories to consume and how to divide those up among protein, carbohydrate, and fat. The next major concept is how to structure your meals. Simply put, you should divide your daily requirements for calories, protein, carbs, and fat into six equal portions and eat six small meals spaced about three hours apart throughout the day. An important part of the diet is its effect on hormone levels, especially insulin, glucagon, and growth hormone. The diet is specifically designed to control these hormone levels to maximize muscle mass and minimize body fat. It won’t work if you eat only protein at one meal and only carbs at the next meal. Each meal must be properly balanced. Also, it’s important not to eat too many calories in any one meal. Six small meals will make you much leaner and more muscular than three large ones, even if you consume the same total number of calories during the day. Too many calories at one meal will elevate insulin levels too high and will promote fat storage. Also, muscle can only grow so fast and it does better with a more constant and uniform supply of nutrients instead of three big doses. Another important factor is the thermic effect of feeding, or TEF. Every time you eat, your metabolic rate increases as a result of stimulation of the sympathetic nervous system by nutrients and by hormones released from the gut after feeding (2). Frequent, small feedings increase TEF and decrease fat storage. The only time to change this is the last few weeks before a contest you may want to decrease carbs in your last meal of the day to promote fat burning at night, but that’s a small technical point we don’t need to worry about now.

Finally we need to talk about which foods to eat and which foods to avoid. The best lean protein sources are skinless
chicken breast, skinless turkey breast, egg whites, and most fish (including tuna packed in water). Carbohydrates are divided into two groups: starchy and fibrous. Good starchy carbs include potatoes, sweet potatoes, rice, beans (all varieties are okay), lentils, corn, peas, oatmeal, grits, and cream of wheat. Fibrous carbs are basically any and all fresh or frozen vegetables. Examples are salad greens, lettuce, spinach, broccoli, cauliflower, asparagus, cabbage, eggplant, mushrooms, onions, peppers, tomatoes, carrots, celery, and so on. Each meal should contain one serving of protein, one serving of starchy carbohydrate, and one fibrous vegetable, in the appropriate ratios. Combining fiber and protein with the starch slows the rate of glucose release so you get a slow, steady insulin release, which helps channel the calories to muscle and not fat. If you combine your foods in this way you really don’t have to worry about glycemic index. White potatoes have a relatively high glycemic index when eaten alone, but when combined in a meal like this the overall glycemic index of the meal is very low. As far as dietary fat goes, you don’t have to add any fat source at all to the diet. Your 5-10% fat calories will come along naturally with the other foods. You may want to add one teaspoon to one tablespoon per day of flax oil to provide essential fatty acids (EFAs), or take an EFA supplement such as evening primrose oil. Fish oil supplements (for the omega-3 fatty acids) are fine too, but you won’t need these if you eat fish several times a week.

You’ll notice these are all whole, natural, unprocessed foods. You’ll get much better results eating healthy foods like this that you prepare yourself. Part of the commitment to this program is the willingness to fix your own food and take it with you in a cooler where ever you go. At first this will be a major chore, especially if you’re not used to weighing your food and calculating its nutrient values. For the first month or so this will take more time than working out. Soon, however, you’ll learn what portions you need and the process will become second nature. An experienced bodybuilder may even spend less time on food preparation than the average person, and yet construct precisely engineered meals. It just takes a little practice. The results will make it worthwhile, believe me. You can prepare meals in bulk and put them in Tupperware dishes in the freezer, so all you have to do in the morning is throw a few bowls in the cooler.

To attain the physique of your dreams, one of the sacrifices you have to make is to avoid certain foods. I wish I could say all things are okay in moderation, and there are no forbidden foods, but it just isn’t so. Foods you should avoid are butter, margarine, mayonnaise, salad dressings, oils, shortening, nuts, seeds, peanut butter, jelly and jam, all sweets, desserts, candy, cake, pie, cookies, muffins, ice cream, pizza, cheese, hamburger, hot dogs, processed meats and deli meats, olives, avocados, crackers, pretzels, and chips. You should avoid all fast food, junk food, convenience food, snack food, all fried food, and anything in a vending machine. In general you should not eat in restaurants. It is possible to get a low fat meal in a restaurant, but difficult. You should avoid refined carbohydrates such as bread and pasta. You should also avoid fruit and dairy products (including low fat dairy products) because they derive most of their calories from simple sugars. Bread, pasta, fruit, and dairy products are perfectly healthy foods and they’re great for most people, but they just don’t work for bodybuilders. You’re better off with unrefined, unprocessed, natural, complex carbohydrates.

This sounds like a long list of “don’ts” but you’ll see what they have in common is they are all either high in fat, sugar, salt, or refined carbohydrates. These are things you want to avoid to be healthy anyway. Please notice that if you omit fruit and dairy products from your diet you’ll have to take a vitamin and mineral supplement. These are the only supplements which are truly required on the Parrillo diet. Pay special attention to get enough calcium. You need 1,000 mg per day, and the typical one-a-day formulas out there don’t come close to that. The Parrillo Performance Essential Vitamin and Mineral Electrolyte Formulas were designed specifically for bodybuilders following this diet. Four tablets of the mineral formula per day will meet your calcium requirement.

So that’s a summary of how many calories to eat, how much protein, carbohydrate, and fat to eat, how to divide it up into individual meals, how many meals to eat, which foods to eat, how to combine foods at each meal, and which foods to avoid. Like I said, Parrillo Performance is about information. If you want a champion level physique, I can teach you what to do to get it. The Nutrition Manual is available for those who want more information and more detailed instructions. It comes with a food scale and a food composition guide, so you can construct meals precisely to meet your exact nutrient needs. It also contains a lot of sample diets, with all the calculations already done for you. Until next month—happy eating!

References


Programmed For Success: Supplementation For Optimal Results, Part II

by John Parrillo

In the last bulletin I presented a general overview of the Parrillo Nutrition Program, and this month I want to extend that discussion by talking about strategies to maximize your results by adding nutritional supplements to your diet. People often ask if nutritional supplements are necessary.

The answer here is based on an individual’s diet, training intensity, and goals. If you are eating a well-balanced diet, supplying all the nutrients your body needs through food, and your level of training activity is such that you never deplete certain nutrients, you may find that supplements are not necessary. However, many people, whether they are eating healthy or not, do not receive all the nutrients necessary to support intense training and growth. And that extends all the way to the bodybuilder, whose nutritional needs far exceed those of the average, sedentary person. So supplements can be used to prevent deficiencies in the diet. But there is still another level of supplementation. That is, are supplements required to achieve optimal results? Are supplements needed to reach your ultimate potential? The answer to this question for most hard-training athletes is yes!

Few bodybuilders (if any) make it to an advanced level without using nutritional supplements. They can’t afford not to. Let’s face it, if two men eat the same diet and train the same way, but one of them enriches the nutrient density of his diet by adding high quality supplements, which one do you think will get better results? When you’re training that hard and that much, you’re really pushing your body to it’s limit. The goal in training is to apply a maximum stress, so that your body is forced to adapt and grow. This kind of training pushes your recovery ability to its limit, and your ability to recover is what determines how fast you can grow. Rest and nutrition are what your body needs to recover from intense workouts. Supplements allow you to increase the cellular levels of nutrients beyond what can be obtained from whole foods alone. Supplements are simply ultra-concentrated nutrients, and adding them to a healthy diet of natural foods increases the nutrient density of your diet. It makes sense that increasing the amount of nutrients delivered to your muscles will help them recover and grow faster.

When I started putting together my formulas for supplements, I conducted my own experiments with bodybuilders and other athletes. During this experimentation process we introduced certain nutrients into the athletes’ diet, then pulled them back out, all the while noting the action and reaction this had in their training and physique. This is how I found out what worked and what didn’t in competitive athletes. Nothing fancy, just simple trial and error. But by trying different combinations of nutrients, we were able to optimize the formulas for maximum effect in lean muscle mass.

To incorporate supplements into your diet, Essential Vitamin Formula™ and Mineral-Electrolyte Formula™ are the starting point. My vitamin and mineral formula is the only one designed to be taken at each meal. One reason I did it this way is very simple: Since you need the vitamins and minerals to assist and control the molecular processes associated with metabolizing and synthesizing food, it only makes sense that you provide those vitamins and minerals with the food you are eating. Makes sense, right? Another reason I did it that way was because the water soluble vitamins (the B group and vitamin C) are excreted from your body in your urine within 3-4 hours after you take them, so levels drop back down again. By taking vitamins with each meal, this provides a more steady and constant blood level. It also ensures you’ll have all the vitamins around you need to help incorporate dietary protein into new muscle tissue after each meal. This makes more sense to me than taking a huge dose of vitamins every morning and excreting most of them by noon. Each Mineral-Electrolyte™ tablet contains 250 mg of calcium per tablet, so that by taking four a day you can meet the RDA for calcium. I also fortified my vitamins with large amounts of the anti-oxidants: vitamin C, vitamin E, and beta-carotene. These seem to help aid recovery by neutralizing free radicals (reactive oxygen species) generated during exercise. Free radicals are reactive molecules containing oxygen, which can damage cells and protein molecules. The anti-oxidant vitamins prevent this damage by binding to and neutralizing the free radicals. Each Parrillo Essential Vitamin tablet has 500 mg vitamin C, 200 IU vitamin E, and 5,000 IU beta-carotene. Each Mineral tablet contains 25 mcg chromium picolinate to stabilize blood sugar and optimize insulin function. Again, it makes more sense to take a small dose of chromium with each meal instead one big dose once a day. Of course, our Formulas contain a complete and balanced array of all the other vitamins and minerals your body needs for optimum health and maximum gains.

The core supplements on the Parrillo Nutrition program are vitamins and minerals, CapTri®, Hi-Protein Powder™, and Pro-Carb™. These are the most important ones for gaining lean mass. Liver-Amino Formula™ could probably fit into this group as well, but is not a major source of calories. Let’s talk about how to incorporate these into your diet.

CapTri® is a remarkable supplement and should be at the center of any bodybuilder’s supplement program, whether you’re trying to gain lean mass or lose body fat. Think of CapTri® as a source of pure energy—calories. The special thing about it is that it’s used immediately by
the body as a preferred source of energy and has almost no tendency to be stored as body fat. It’s a way (and probably the only way) you can greatly increase your caloric intake without risking getting fat. That is, of course, if the rest of your diet is good. CapTri® is absorbed by the body and burned for energy almost instantly—faster, in fact, than glucose (1). Since it’s converted into energy so rapidly it has virtually no tendency to contribute to body fat stores. Here’s the deal: adding pounds of muscle mass to your body takes calories. You could supply the extra calories from regular foods, such as complex carbs and lean proteins. And this will work, but the problem is regular foods are more prone to be stored as fat than CapTri® is. So by increasing calories from regular food you can add muscle mass, but you’re more likely to put on fat at the same time. CapTri® itself is not converted to muscle—that’s not what’s happening. How it works is CapTri® supplies the energy your body needs to function and the energy cost required to build more muscle. The protein foods that you eat supply the raw materials (amino acids) that are used to build new muscle. CapTri® spares the oxidation of amino acids, meaning that it blocks the use of proteins as fuel (2). This helps dietary protein be incorporated into muscle tissue more efficiently, as well as having an anti-catabolic effect to block muscle breakdown. The net result of increasing calories in this way is more muscle mass, without the increase in fat that comes from eating an excess of regular food. What happens if you eat too much CapTri®? The excess energy gets converted to body heat instead of being stored as fat. Also, excess calories from CapTri® can be lost as ketone bodies in the urine, something that doesn’t happen with regular food. Start by adding one-half tablespoon of CapTri® directly to your food at each meal. Every three days, increase your intake by another one-half tablespoon, until you’re gaining weight. Increasing the amount of CapTri® gradually helps avoid an upset stomach, which can occur because CapTri® is digested so rapidly. Usually between one and three tablespoons per meal works well for most athletes, although some use as much as five or six.

How can a supplement so rich in calories help you lose body fat? Simple. To use CapTri® while dieting replace some of your carbohydrate calories with an equivalent amount of calories from CapTri®. CapTri® contributes less to body fat stores than does carbohydrate, because it’s immediately converted to energy without being stored by the body (1,2). Metabolically speaking, this is called the thermogenic effect. Every time you eat, some of the food energy is converted to heat. The more energy that’s lost as heat, the less there is remaining to be stored as fat. Conventional fats found in regular food are not converted to heat much at all, and that’s why they contribute to body fat stores so much. About 3% of the calories in regular fat is lost as heat. About 15% of the energy from carbs is converted directly to heat, and about 20-30% of the energy in dietary protein is lost as heat. CapTri® has the most profound thermogenic effect of any food known, so it’s basically all burned for energy. You may be wondering, if this stuff is just converted into energy and lost as body heat, isn’t that a waste? Why not just eat less food? Two reasons. Eating less food will help you lose weight, but a significant proportion of it will be muscle mass. Also, decreasing calories slows down your metabolic rate, so you burn less calories, which means burning less body fat. The thermogenic (heat-producing) effect we just talked about actually works to increase your metabolic rate so you’ll burn fat faster. Plus, as mentioned above, it blocks protein breakdown so you won’t lose muscle while you’re losing fat. Of course, not all of the energy in CapTri® is lost as body heat—most of it is used to fuel activity and maintenance of the body.

The point is, the energy from CapTri® is more prone to be used as body heat (energy) than are the calories from regular food, which is why CapTri® is less prone to be retained as body fat than regular food. Adding CapTri® to your diet increases the thermogenic effect of feeding (TEF), and if you’re producing more energy, you have a higher metabolic rate. And if you increase your metabolic rate, your body needs more energy, so it burns more body fat. By incorporating CapTri® into your diet, you’re reducing what is called the “food efficiency” of your diet, which is the proportion of dietary energy available for retention as body weight. The CapTri® diet helps you lose fat because more of your dietary calories are lost as heat, causing your body to draw on fat stores as fuel. Cutting calories also causes your body to draw on it’s fat stores for fuel, but this approach leads to muscle loss and slows down your metabolic rate, which slows down fat loss. CapTri® shifts your metabolism into a fat-burning mode without cutting calories and slowing your metabolism. Many bodybuilders go on CapTri® to lose body fat and are surprised to find they actually gain muscle at the same time. The last important reason why CapTri® helps you lose fat is that by substituting CapTri® for carbs you decrease insulin levels. Insulin is released in response to carbohydrate feeding and blocks the breakdown of body fat. With CapTri® you can decrease carbs to lower insulin levels and promote the use of body fat as fuel without sacrificing your energy level and lowering your metabolic rate. You can learn more about regulating the Glucagon-Insulin ratio by consulting the Parrillo Sports Nutrition Guide.

In the next bulletin, we’ll talk more about the benefits of supplements in your nutrition program.

References


Programmed For Success: Supplementation For Optimal Results, Part III

by John Parrillo

In the previous bulletin we discussed the importance of nutritional supplements in an individual’s diet and reviewed the benefits of Parrillo’s Essential Vitamin and Mineral-Electrolyte Formulas as well as CapTri. In this bulletin we will review the importance and relevance of several other nutritional supplements.

We’ll start with the tandem of Hi-Protein Powder and Pro-Carb. Hi-Protein is formulated from a base of casein and whey proteins, two of the best protein sources known. The highest efficiency protein of all is whole eggs, but obviously whole eggs wouldn’t make a very good supplement. So what we did was start with casein and whey (which are milk proteins) and add purified amino acids to adjust the amino acid profile of the formula to match that of whole eggs. This way we’ve generated the highest efficiency protein in a way that supplies no fat or cholesterol. It mixes easily with a spoon and tastes great. Hi-Protein Powder is very rich in essential amino acids, branched chain amino acids, and glutamine. These are the aminos your body needs the most to build muscle. Each scoop provides 20 grams of ultra-high efficiency protein along with six grams of carbohydrate. The carbs are included to provide a small, steady insulin release, which helps muscle cells absorb the aminos. Pro-Carb is formulated with maltodextrin, a slow release glucose polymer. Pro-Carb contains 22 grams of carbohydrate per scoop and four grams of protein. So how do you use Hi-Protein Powder and Pro-Carb? These products are designed as an easy and convenient way to increase the protein and carbohydrate content of your diet. Many of our athletes are eating 5,000 - 6,000 calories a day (or more) to maintain their muscle mass, and are looking for a way to eat more. Supplying nutrients in liquid form is an easy way to increase calories and nutrient levels to support more growth. If you find yourself at a plateau in your training and are having a hard time gaining more muscle, the first thing to try is increasing your calories. Muscle is metabolically active tissue, meaning that it burns a lot of calories, even at rest. It takes a lot of energy to maintain muscle, which must constantly be repaired after each workout. The more muscle mass you have, the higher your metabolic rate. This means your body needs more calories every day just to maintain itself, let alone get bigger. So with every pound of muscle you add to your body, your daily energy requirement increases. This is why you need to slowly and constantly increase calories as you gain more and more muscle. A lot of people hit a plateau and don’t gain any more muscle, simply because their existing muscle mass is using up all of their dietary energy (calories), leaving none left to support growth. If you’re at such a plateau there are three places to look: not enough rest, not enough calories, or a problem with your training program. The most common problem is not enough calories. If somebody is training hard, with heavy weights to failure, and eating a solid diet, there’s no reason they shouldn’t be gaining muscle. Bodybuilding is not supposed to be about getting good gains for a year and then staying at a plateau for the rest of your life. If you’re not gaining muscle, you’re doing something wrong. Change something. If you can’t get it figured out, give us a call. That’s what we’re here for.

Obviously, as your muscle mass increases your need for protein and calories increases as well. Hi-Protein and Pro-Carb were specifically designed to meet this need for quality nutrients. One scoop of each mixed together provides 210 calories, 24 grams of protein, 28 grams of complex carbs, and less than a gram of fat. A great way to flood your muscles with nutrients is to take a scoop of each mixed in water with each meal or between meals. If you do this five times a day, this will supply 1,050 extra calories, 120 grams of protein and 134 grams of carbohydrate. By taking it between meals you maintain a constant supply of energy and nutrients for your muscles. It’s very easy to put a scoop in a shaker bottle and drink it down when you don’t have time for a meal. Liquid nutrition is an easy way to supply more calories without feeling full and bloated. If you’re stuck at a plateau, adding Hi-Protein and Pro-Carb to your diet may be all you need to do.

The Parrillo Bar has proven to be one of our most popular supplements, probably because they taste so good. They’re another great way to supply quality nutrition when you’re in a hurry. Each Bar contains 12 grams of high...
heme iron, which is iron complexed to the molecule heme. This complex is found in hemoglobin in red blood cells and is responsible for transporting oxygen in the body. Heme iron is found in red meat, but red meat unfortunately contains a lot of saturated fat and cholesterol so I don’t recommend it on my diet. Liver-Amino Formula has been specially prepared so all of the fat and cholesterol is removed, leaving a good source of quality protein and heme iron.

It’s fortified with pre-digested amino acids to further improve it’s amino acid profile, and also has added B-12. This is a core supplement for many strength athletes. The iron helps build red blood cells, and increased oxygen transport improves energy and endurance. It doesn’t contain many calories, so it’s not used for weight gain. It’s real benefit is in increased strength and endurance. This should be a core supplement for all endurance athletes and hard-training bodybuilders. If you’re looking for a nutritional product to give you increased performance, this is it.

Essential Vitamin Formula, Mineral-Electrolyte Formula, CapTri, Hi-Protein Powder, Pro-Carb, Parrillo Bars, and Liver-Amino Formula are the core supplements. The vitamins, minerals, and CapTri are really the entry level products. Beyond that your needs depend on your diet and level of training. If you’re stuck at a plateau, try Hi-Protein and Pro-Carb. That combination alone will usually add several pounds of muscle in a month or two. If you need more energy to train, try Liver-Amino. This should be considered an essential supplement for serious endurance athletes. If you’re having trouble eating all of your scheduled meals or getting in your required amount of calories, the Bar is a great answer. If you’re trying to lose fat and have hit a fat-loss plateau, cut back on 100 grams of starchy carbohydrates a day (400 calories worth) and use one-half to one tablespoon of CapTri at each meal. This will get your fat loss going again. To get in contest shape you may have to cut back on carbohydrates further, increase CapTri, and increase aerobics to an hour a day. I have yet to meet a person who could not get exceptionally lean by following this protocol. The exact details of how
I’ve tried to summarize how to intelligently incorporate supplements into your nutrition program for best results. Remember that the proper diet is the foundation of everything. If you’re not making the progress you want, look at your diet and training program first. A healthy diet of wholesome food is the foundation of good nutrition, and you need to be eating right in order to derive the maximum benefit from your supplements.

I’ve also tried to describe a rational approach to designing your own individual supplement program. Start with the basics: vitamins, minerals, CapTri, and Hi-Protein. Strength athletes should add Liver-Amino. Endurance athletes should add Liver-Amino, Pro-Carb, and the Bar. Advanced endurance athletes should add Max Endurance Formula. If you want to gain muscular weight use CapTri, Hi-Protein, Pro-Carb, and the Bar. If you want to lose body fat use CapTri and Advanced Lipotropic Formula. Competitive bodybuilders should add Muscle Amino. Professional bodybuilders should add Muscle Amino and Ultimate Amino.

If you’re at a plateau in gaining muscle, add Hi-Protein Powder and Pro-Carb to your program. If you hit a plateau while losing fat, cut back on carbs and substitute an equivalent amount of calories from CapTri. If you want to improve strength or endurance, add Liver-Amino.

Call for a free supplement catalog (800-344-3404), which includes a list of all the ingredients and the amounts in each formula, as well as suggested usage guidelines. More information about maximizing your results from supplements can be found in the Parrillo Performance Nutrition Manual and our Sports Nutrition Guide, which includes technical and scientific information. Our technical services line (513-531-1311) is staffed to answer any questions you may have in optimizing your program and selecting the best supplements for you. We’re here to support you and you strive to achieve your training and nutrition goals.

References


# Supplement User's Guide

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We are excited to announce a new product to our supplement line—Parrillo Performance Creatine Monohydrate™. During the last year several reports have appeared in the scientific literature documenting the effectiveness of creatine in increasing muscle mass, strength, and endurance (1-6). We’ve been doing our own trials here as well and have seen impressive results.

What is creatine, and how does it work? You’ll recall last year I did a series of articles about cellular energy metabolism and explained the biochemistry involved in some detail. Briefly, the immediate source of energy for all cellular activity, including muscle contraction, is a molecule called ATP. This stands for adenosine triphosphate, which is the nucleoside adenosine with three phosphate groups attached. The phosphate groups contain negative electrical charges, and since negative charges repel each other the molecule is inherently unstable. In other words, the negative charges push against each other and try to tear the molecule apart. When one of the phosphate groups breaks free, energy is released. During the process of muscle contraction this energy is transferred to the actin and myosin filaments which make up the muscle fiber. This results in a change in the three dimensional configuration (i.e., the shape) of the filaments, causing them to slide past each other. When this happens the muscle contracts. When ATP loses one of its phosphate groups it forms adenosine diphosphate, or ADP, plus a free phosphate group. Thus muscle contraction is powered by the breakdown of ATP to ADP.

Food provides two basic purposes for the body. It provides the building blocks that body tissues are made from, and it supplies energy to fuel the body. The chemical energy contained in food is used to form ATP. As you know, food is oxidized, or burned, in the body to release energy. This energy is used to form ATP, which then goes on to power cellular activity. The body’s stores of ATP are very limited. In fact, each muscle cell contains only enough ATP to power contractions for a few seconds. Therefore, ATP must be continuously regenerated. That’s where creatine fits in. Creatine itself binds a phosphate group, forming creatine phosphate, or CP. When ATP is broken down to ADP, creatine phosphate steps in and donates its phosphate group to ADP, regenerating an ATP molecule (1). This allows high energy muscle contractions to continue. After about 45 seconds to 2 minutes (depending on the intensity of effort) the creatine phosphate is also used up, and power production by the muscle rapidly declines. This is what happens when you fail at the end of a set - you’ve used up all your ATP and CP, which means you’re out of fuel. This is also why high intensity weight lifting sets usually last about a minute before you fail. After the CP is used up, ATP cannot be regenerated fast enough to maintain a high level of intensity. Lower intensity exercise (aerobic exercise like bike riding) can be continued almost indefinitely because you can generate CP and ATP fast enough to keep up with the energy demands of the activity.

You’ll notice our creatine is in the form of creatine monohydrate. Why don’t we just use creatine phosphate or ATP itself as a supplement instead? Simply put, because it doesn’t work. Triphosphate molecules such as CP and ATP are not absorbed through the intestine. To reach the bloodstream nutrient molecules must first cross the membranes of the cells lining the gut and then the cells forming the capillaries. Cell membranes are made of lipids, which are hydrophobic. This means they repel molecules with a strong electric charge like ATP and CP. If you feed someone ATP or CP it must be broken down before it can be absorbed. Creatine monohydrate is readily absorbed, however, and does in fact reach the muscle cell when administered orally (2). This is why it can be used as an effective supplement. Once inside the muscle cell it is converted to creatine phosphate. What about the sublingual route? This is bogus, since the molecule still has to cross cell membranes to reach the circulation. What about liquid creatine? Doubly bogus, since creatine tends to break down when stored as a solution.

Creatine occurs naturally in meat, especially red meat. This is probably the main reason red meat has a reputation for increasing strength. No other foods are a good source of creatine, and this is why vegetarians are often creatine deficient. The problem is to get a significant amount of creatine you would have to eat a lot of red meat, which would bring with it a ton of fat. Creatine supplementation allows you to get much higher levels of creatine in your muscle than you could ever get from conventional food, and without supplying any fat.

Though much of the creatine used by our muscles is obtained through diet, it has also been found that the body can
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create its own creatine in a two-reaction extramuscular sequence. Starting in the kidney, arginine and glycine undergo transamidination, creating guanidinoacetic acid and ornithine. The guanidinoacetic acid is then methylated by S-adenosylmethionine in the liver, creating creatine, which is then shipped off for usage in the muscle. So the creatine pool in the muscle is really a composite of the amount synthesized by the body, which is about one gram/day, and the rest received through dietary sources, most notably from meat (1,2,3).

So how does creatine increase muscle size and strength? It increases strength by increasing the intracellular levels of creatine and creatine phosphate, which allows more rapid ATP production. This means more energy is available to the cell, allowing it to work harder. This same mechanism explains why creatine increases endurance performance too. If you increase the creatine pool inside the muscle this increases the cell’s energy reserve, allowing longer, as well as more powerful, contractions. Creatine is very popular among endurance athletes, and is widely used in track and field.

Creatine increases muscle size because it attracts water. Creatine is absorbed into the muscle cell and pulls a lot of water along with it, causing the muscle to swell. This results in larger, firmer muscles and a better pump. Please realize that creatine itself does not directly increase muscle protein. As with all supplements, it is vital that you use creatine in conjunction with a solid bodybuilding diet. You need protein to build muscle tissue and carbohydrates to provide energy. Creatine itself is not burned to produce energy, rather it acts as an energy buffer to transfer the energy derived from carbohydrate and fat oxidation to ATP. Creatine is not incorporated into protein. It will, however, indirectly increase the protein mass of muscles over time by allowing you to perform higher intensity workouts. That is, of course, if you are eating enough lean protein and quality calories to support muscle gains.

What can you expect from creatine? Typically in hard-training bodybuilders, we observe an increase of 4-14 pounds of lean mass during the first month of using creatine. This is remarkable. This does not mean you have to consume 4-14 pounds of creatine. Remember, most of the weight gain and size increase comes from water. Creatine is stored in muscle cells, where it attracts water. The more muscle mass you have to start with, the more creatine you can assimilate and the more weight you will gain from using creatine. Small bodybuilders usually gain 4-6 pounds and the really big guys gain 10-14 pounds. We have verified that this weight gain shows up as an increase in lean body mass when you do body composition testing. Remember that lean mass is a measure of everything in your body that’s not fat, including the skeleton and muscle, including water. It’s hard to imagine anybody happier than a bodybuilder who gains 10 pounds of lean mass in one month.

Regarding performance, we’ve seen athletes experience a 5-15% increase in strength on their maximum lifts, and an increase of about 2 reps per set with their working weight. This increase in training intensity allows you to put a greater load on the muscle, which will indeed increase your gains in muscle protein mass over time. The amount of strength gain each individual can make may differ considerably, because the strength of your tendons also determines how much weight the muscle can lift. While it seems clear that creatine will allow faster and greater gains in size and strength over the long-term, firm numbers cannot be attached at the onset. A lot is dependant on whether you are eating enough protein and calories to support gains. Remember, creatine itself has little impact on gaining muscle when taken alone. The building blocks (amino acids) and extra calories must also be present in the muscle for serious gains to be made. Most people will see a significant increase in size and strength when using creatine, but a lot of this depends on the amount of protein and quality calories you are eating. If you don’t eat enough to support muscle gain, you won’t see any, it’s that simple. But with a solid, high-calorie, high-protein diet and intense training, your muscle gains can be incredible. Regarding endurance exercise, we’ve seen athletes experience a 5-10% increase in speed and a 10-20% increase in time to fatigue.

What’s the down side? As explained, most of the immediate weight gain resulting from creatine supplementation happens during the first month when you’re loading the muscle cells with creatine. You will experience an immediate gain in strength at the outset because of the increased leverage advantage from the increased water gain as well as the creatine phosphate stores. At some point the creatine pool becomes saturated and the muscle can’t hold any more. So you can expect a very rapid and dramatic gain in lean mass (muscle + water) for the first month, but after that creatine supplementation is mainly maintenance. Remember, proper nutrition from food, increased calories and nutrients from supplements and intense training are the keys to packing on more muscle month after month, year after year. By using creatine you can improve the intensity and duration of your training for better overall workouts. And when you add to this proper nutrition, which includes plenty of high quality protein and increased calories, you’ll be right on track to gain one pound of lean mass each week.

How do I use creatine? As with nearly all supplements, actual usage will
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vary from person to person and will likely change as your body and training changes. To start out we recommend for the first one to two weeks you use 20-30 grams a day divided into even servings taken with each meal, or with a Hi-Protein™/Pro-Carb™ drink. This is the loading phase. One scoop or heaping teaspoon is five grams, so one of these with each meal is about right. Use the lower end of these ranges if you’re 150-200 pounds, and the upper end if you’re over 200 pounds. We recommend one to two weeks, but the loading phase may take as many as four weeks. When you find that you’re really getting a good pump, the loading phase has filled the creatine stores in your muscle. After that, 5-10 grams a day is enough to maintain your creatine stores. Cycling creatine is of no advantage. If you stop taking creatine you simply deplete your existing store, which takes 4-8 weeks. The best way to take creatine is to mix it with a scoop of Hi-Protein Powder™ or Pro-Carb™ and drink it immediately. It’s also fine to mix it in plain water. Don’t be concerned that creatine doesn’t dissolve fully; just drink the suspension. Even though it doesn’t dissolve completely, it gets absorbed very well. Don’t mix creatine in water too far in advance of when you take it, since it begins to break down. A great way to pack creatine is to take a shaker bottle with a scoop of Hi-Protein™ or Pro-Carb™ plus a scoop of creatine and put it in your gym bag or cooler. Then just add water, shake, and drink. Another convenient way to use creatine is to mix it into oatmeal. Creatine has no flavor, but it is a little grainy.

Are there any medical concerns with taking creatine? Creatine is nontoxic even when taken in huge doses. The only known side effect is stomach upset if you take too much at once. Five to ten grams shouldn’t bother you. If you take 30 grams at once you might feel stomach cramps or nausea, but usually not. Excess creatine is converted into creatinine (note the similar spelling) and excreted in the urine. If you take too much creatine you’ll just lose the excess in your urine. If you have any blood work done you might find that creatine elevates your creatinine level. Doctors use the creatinine level in the blood as an index of kidney function. If your doctor notices an increase in your creatinine level and expresses some concern about your kidneys, tell him or her that you’re using creatine. Creatine does not damage the kidneys in any way, but is contraindicated if you have pre-existing severe kidney disease (for example, renal dialysis or kidney transplant patients). People with severe kidney disease have trouble eliminating creatinine, and creatine supplementation would increase creatinine levels further.

How does creatine fit into your supplement program? Creatine should absolutely be a core supplement for any serious bodybuilder, powerlifter, or endurance athlete. Bodybuilders and powerlifters should use it year round, and definitely before a contest. I guarantee your competition will be using it. Endurance athletes should use it during training and competition. If you’re not a serious athlete but simply someone trying to lose fat and stay in shape, then you don’t necessarily need it. There’s no evidence that creatine, by itself, aids fat loss. But as you gain extra muscle and increase you metabolism, you ultimately will burn more body fat. So indirectly, it can help in body fat loss. The core supplements for bodybuilders and strength athletes are Essential Vitamin Formula™, Mineral-Electrolyte Formula™, CapTri®, Creatine Monohydrate™, Liver-Amino™, and Hi-Protein Powder™. Pro-Carb™ should be added for those bodybuilders with trouble gaining weight. GH Formula™, Muscle Amino Formula™, and Ultimate Amino™ are appropriate for competitive bodybuilders. Liver-Amino Formula™ should be increased for strength athletes, especially in the months leading to a contest. The core supplements for endurance athletes are the Vitamin and Mineral Formulas™, Liver-Amino Formula™, CapTri®, and Creatine Monohydrate™. The combination of Liver-Amino Formula™ and Creatine Monohydrate™ is key for endurance, and I would go as far as to say they are essential for an endurance athlete to reach his ultimate potential. Hi-Protein Powder™ should be strongly considered for any endurance athlete who’s losing weight or training at the edge. Extreme training can elevate the protein requirements of endurance athletes above those of even bodybuilders. Endurance athletes experiencing over-training or a decrease in performance likely need more protein. Collegiate level and professional endurance athletes should add Max-Endurance Formula™. The core supplements for people on the fat loss program are the Vitamin and Mineral Formulas™, CapTri®, and Advanced Lipotropic Formula™. Of course, the diet is fundamental to everyone. The Parrillo Bar works well on any of these programs as a meal replacement or as a source of extra calories for athletes.
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trying to gain weight or who need more energy. Endurance cyclists also find the Parrillo Bar very useful. Finally, creatine should be considered a core supplement for all vegetarian athletes. Although the human body makes about one gram of creatine a day by itself (creatine is endogenously synthesized in the kidney and liver) vegetarians have a reduced creatine pool because their diet does not provide any additional creatine (1,2,3). Vegetarians stand to benefit greatly from creatine supplementation (1,2,3).

With this background on what creatine is, how it works, and how to use it, let’s take a brief look at some of the studies of creatine use in athletes. One test looked at the effect of creatine versus placebo on performance of 5 bouts of 30 maximal voluntary contractions on an isokinetic dynamometer (4). The group receiving 24 grams of creatine a day for 5 days experienced greater torque production in the creatine group, with an improvement of 5.5 seconds during the last run. Another placebo-controlled trial showed an increase in anaerobic capacity on a cycle ergometer after 4 days of creatine at 20 grams per day (6). These studies demonstrate a measurable increase in peak power production and endurance performance during intense exercise following as little as 4-6 days of creatine supplementation. The effects of creatine seem to be most pronounced during very intense exercise. Not much of an effect has been noted in prolonged, low intensity exercise. This is just what you would expect given the role of creatine in cellular energy production. During low intensity exercise, energy production from carbohydrate and fat oxidation can keep up with the rate of energy expenditure. Creatine increases exercise performance by sustaining energy production, and thus work production, during high intensity exercise (2). Creatine supplementation has been shown to reduce the rate of ATP depletion during maximal exercise while simultaneously increasing work output (2).

Sure, creatine is a terrific supplement for increasing lean mass and strength. But creatine is not some magic potion for muscle gains. Not too long ago I began working with a bodybuilder who was spending a large portion of his limited budget on creatine. Sure, his workouts were great, but his gains were insignificant compared to the effort he was putting into his training. Why? Because his caloric base was too low. Everything he was eating was being used for energy to fuel his workouts, with little to nothing left for lean mass gains. So what did we do? First, we got his diet in order, increasing his protein and calorie intake with good food. Next, we took the money he was spending on creatine and put that into CapTri®, Hi-Protein™ and Pro-Carb™. These supplements increased his caloric base even more than the food alone, providing his body with the necessary energy and amino acids for growth. So much so, he was able to gain 30 pounds of lean mass in three months time.

The reason I tell this story is not to discourage you from using creatine. But rather, to put it into perspective as far as your nutrition and training are concerned. If you’re not eating enough and providing the necessary nutrients for growth, your body will not be able to maximize the potential effectiveness of this supplement. But if your nutrition is good, if you’re providing your body with the calories and protein it needs for energy and growth, and if you’re training hard, creatine can be of great benefit in terms of increasing size, strength and performance.

In summary, creatine has been shown in placebo-controlled clinical trials to improve exercise performance, both in terms of power output and endurance (1-6). We know from our work here that it increases lean body mass as well. Creatine is stored in the muscle and does not contribute to fat stores. Any weight you gain on creatine will be in the lean compartment. We’ve seen many athletes experience dramatic gains in muscle size and strength during their first month of creatine use. And when you look for a good creatine supplement, make sure it is 100% pure, like our Parrillo Performance Creatine Monohydrate™ supplement. Make sure to look at the nutrient content on the label and not just the price when you’re considering which creatine supplement to take. Parrillo Performance Creatine Monohydrate™—one more nutritional tool to help you push your physique and performance envelope.

References


Evening Primrose Oil and the Importance of Essential Fatty Acids

by John Parrillo

Parrillo Performance is proud to introduce another new supplement for bodybuilders - a concentrated source of essential fatty acids. I have recommended fatty acid supplementation for bodybuilders for years, long before it became so popular. The details of fatty acid metabolism are quite complicated - far more complex than protein or carbohydrate metabolism - but the basic concept is simple. Everybody knows that vitamins and minerals are required by the body in small quantities, (thus the name “Micronutrients”) which provide for vital metabolic functions. Certain fats are similarly required by the body in relatively small quantities. Since the body cannot manufacture these fats by itself, it is essential that they be obtained from the diet, and are therefore called essential fatty acids (EFAs). The main function of EFAs in the body is to provide building blocks for a class of hormones called eicosanoids. The broad category of eicosanoids is further subdivided into prostaglandins, prostacyclins, leukotrienes, and thromboxanes. The eicosanoids are a complex group of hormones (over 100 different prostaglandins have been identified so far) which are involved in controlling many metabolic processes such as blood pressure, inflammation, fat metabolism, and blood clotting, to name a few. Eicosanoids are made by all cells of the body and their central function is to communicate messages to nearby cells to help coordinate and regulate the body’s metabolic activity. EFAs are also important structural components of cell membranes and thus are important for healthy skin. But before we get too deep into the details, let’s talk about the basics.

Since everybody makes such a big deal about making sure to get enough vitamins and minerals, why don’t we hear more about EFAs? Aren’t they just as important? Essential fatty acids are very important but they don’t get much attention because EFA deficiencies are relatively rare in America. Why? Because the average American gets about 40% of his calories from fat, which is more than enough to supply adequate amounts of EFAs. About the only people you hear of suffering from EFA deficiency are burn or trauma patients, patients who have had some sort of intestinal bypass surgery or intestinal resection, people with a fat malabsorption syndrome (that is, they can’t absorb dietary fat very well), malnourished children, patients receiving prolonged fat-free intravenous feeding, and during high-protein, low-fat dietary supplementation to treat kwashiorkor (protein deficiency) (1,2). Wait a second - what was that about high-protein, low-fat supplementation? Does that sound like your diet?

Normally people don’t have to worry about EFA deficiency in this country because the typical diet contains so much fat. Furthermore, EFAs can be stored in body fat so a dietary deficiency won’t show up for a long time. Extremely lean athletes, however, who follow a low-fat diet for a prolonged time are definitely at increased risk for fatty acid deficiency. Have I ever actually seen any bodybuilders with the clinical symptoms of essential fatty acid deficiency? You bet. Did their symptoms resolve after fatty acid supplementation? Yes - rapidly and dramatically. I remember one female bodybuilder in particular who had a problem with her skin getting dry and breaking out, and it got worse at contest time. After one week of Evening Primrose Oil (EPO) supplementation her skin was completely clear. It was very dramatic, and you can imagine how happy she was.

So what are the symptoms of EFA deficiency? In adults the first symptom is dermatitis - red, dry, scaly skin, especially on the face (1-3). This condition will not be relieved by lotions or moisturizers - you’ll simply have red, scaly skin with lotion on it. The EFAs are required for the formation of some components of normal, healthy skin, so moisturizers really won’t help. Other problems include increased loss of water (from the skin), infertility, kidney disease, liver disease (including decreased ATP production), decreased capillary resistance, increased fragility of red blood cells (which can result in anemia), increased susceptibility to infections, and decreased contractile strength of the heart (1,2). In infants EFA deficiency is even more serious and can include decreased growth, dermatitis, and degenerative changes in the kidney, liver, and lung (1,2). Recent evidence suggests that EFAs are also required for normal development of the nervous system. Usually the problem doesn’t get that far. If you have any skin problems or a poor complexion you may want to consider trying EFA supplementation.

Lately there has been some speculation that EFA supplementation may improve muscle and strength gains during weight training, or decrease muscle loss during catabolic conditions. In my opinion the jury is still out on this issue; there’s just not enough information to know for sure yet. However, it would not surprise me at all if it turns out to be true. I person-
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ally haven’t seen any dramatic changes in muscle mass or strength following EFA supplementation. I think the main nutritional issues here are calories and protein intake.

So what are the EFAs and what are some good food sources for EFAs? Most dietary fat, as well as most fat stored in the body, is in the form of triglycerides, also known as triacylglycerols. These large molecules are comprised of three fatty acids linked to a glycerol backbone. Fatty acids themselves are long hydrocarbon chains (the fatty part of the molecule) with a carboxylic acid group attached at one end (the acid part). Fatty acids are classified according to their length and their degree of saturation. Short chain fatty acids are 2-4 carbon atoms in length, medium chain fatty acids (like CapTri) are 6-12 carbon atoms in length, and long chain fats are 14-24 carbons long. The degree of saturation describes how many double bonds the molecule has. If the fatty acid molecule contains no double bonds, it is said to be “saturated.” This term describes the idea that the carbon atoms are saturated with hydrogen atoms; if a fatty acid molecule contains carbon-carbon double bonds it must give up some of the hydrogens, and is no longer “saturated.” Anyway, fats can be either saturated, monounsaturated, or polyunsaturated. Saturated fats are found in animal fat and some vegetable sources, and are the kind most prone to be converted to cholesterol and clog up your arteries. There is no requirement for saturated fats in the diet and it’s best to limit these as much as possible. As you can tell from the name, monounsaturated fats contain one double bond. These fats are not essential in the diet, but do not contribute to heart disease. The best source of monounsaturated fat is olive oil. Have you ever wondered why the Mediterranean diet does not cause heart disease even though it contains as much fat as the American diet? The fat in the Mediterranean diet is supplied as olive oil, which does not promote heart disease. The American diet is much higher in saturated fat (from meat, butter, and eggs). Keep in mind that while olive oil doesn’t cause atherosclerosis, it will still make you just as fat as eating animal fat.

There are two essential fatty acids, and both are polyunsaturated. This means they contain multiple double bonds. One is called linoleic acid (an omega-6 fatty acid) and the other is linolenic acid (an omega-3 fatty acid). The terms omega-6 and omega-3 describe the location of the first double bond from the methyl end of the molecule. Many vegetable oils contain linoleic acid (omega-6), including safflower oil, corn oil, soybean oil, and flax (linseed) oil, among others. The omega-3 fatty acids are abundant in fish oils; flax is the only vegetable source containing a significant amount of omega-3. You can find these oils (except fish oil) in the grocery store, but if you’re going to take them as a source of essential fatty acids you should be sure to use “cold pressed” oils. This means the oil was extracted without the application of heat, which can damage (oxidize, to be specific) the oil. The oils you see at the grocery store are extracted by pressing with heat which increases the extraction efficiency, but damages the EFAs. Also, if you’re using one of these oils as a source of EFAs don’t cook with it - this also can oxidize the oil and destroy its biological activity. Just use the oil straight, or you can make salad dressing out of it. You can find cold pressed oils at good health food stores. Most bodybuilders eat fish regularly, and fish are a great source of omega-3’s. If you don’t like fish, omega-3 capsules are available at health food stores. When you buy EFA supplements don’t shop for bargains, shop for the best. EFAs are delicate molecules and are easily damaged during preparation. There is a difference in quality and purity between brands.

There’s nothing wrong with using the cold-pressed oils mentioned above as a source of EFAs, but it’s not the ultimate way to go. I’ll explain why. First, these vegetable oils are not pure EFAs, but merely contain EFAs along with a bunch of other fat (and calories) you don’t necessarily want. A table of fatty acid composition of various oils is included for your information (from Linder, reference 3). The best source of omega 6 is safflower oil, which is 74% linoleic acid. The others are around 50% or less. The second problem is that EFAs are not the final biologically active compound (such as eicosanoids) but are merely the building blocks the body uses to make these hormones. To form eicosanoids from linoleic acid, the first thing that happens is the linoleic acid is converted to gamma-linolenic acid (GLA). This conversion is carried out by an enzyme called delta-6-desaturase. No problem, except for the fact that your body makes less and less of delta-6-desaturase as you age. The activity of this enzyme declines markedly, making this conversion inefficient. This is why I recommend Evening Primrose Oil (EPO) as a better source of EFAs. The evening primrose is a small flowering plant that grows in England. Evening Primrose Oil contains GLA and therefore bypasses the delta-6-desaturase step. This turns out to be a way to provide EFAs in a minimal amount of fat calories, so it doesn’t upset your per-contest diet strategy. So EPO is a more potent source of EFAs than even safflower oil for two reasons: it’s more concentrated in total omega-6, which means there’s less “garbage” fat, plus it bypasses the limiting delta-6-desaturase step by supplying GLA directly. Each 500 mg EPO capsule provides 45 mg GLA and 365 mg linoleic acid, so it’s almost pure EFAs.

How do I take EPO? Take from two to six capsules a day with meals. What do I look for? You may notice an improvement in the appearance of your skin, especially if you were deficient in linoleic acid or if your level of delta-6-desaturase is low. It’s kind of like taking vitamins. A vitamin deficiency produces a characteristic disease state which is reversed when the deficiency is corrected. However, if you already have adequate vitamin levels then taking extra doesn’t really make any difference. (The exception may be the anti-oxidants, vitamin C, beta-carotene, and vitamin E, where there is some evidence that taking more than the minimum amount required to prevent a deficiency state may actually
Prostaglandins are a family of hormones whose levels are determined by diet (3). Prostaglandins have potent functions in regulating blood pressure, inflammation, and platelet aggregation (blood clotting). The levels of various prostaglandins are determined by the balance of essential fatty acids in the diet and by the balance of insulin to glucagon (which is in turn determined by the ratio of carbohydrate to protein in the diet).

Prostaglandins, prostacyclines, thromboxanes, and leukotrienes form a class of hormones collectively known as eicosanoids, derived from unsaturated C20 fatty acids (C20 describes a fatty acid molecule 20 carbon atoms in length). Prostaglandins are made in all tissues of the body and experience very high turnover, which means they are rapidly made and subsequently destroyed. Prostaglandins have potent effects in regulating blood pressure, inflammation, smooth muscle contraction, and erythrocyte (red blood cell) deformability. Prostaglandins are cyclopentanoic acids which differ from one another in the structure of the substituted cyclopentane ring (1,3). Prostaglandins fall into three general categories based on the number of double bonds they contain, which in turn is a consequence of the degree of saturation of their parent fatty acids. Class 1 prostaglandins (PG1) contain three double bonds and are derived from C20:3 (an omega-6 fatty acid). Class 2 prostaglandins (PG2) contain four double bonds and arise from C20:4 (also an omega-6 fatty acid). Class 3 prostaglandins (PG3) are made from C20:5 (an omega-3 fatty acid) and contain five double bonds.

There are many different prostaglandins which exert a variety of effects. The most predominant and best characterized of the class 1 prostaglandins is PGE1. It is a very potent vasodilator and it increases cAMP levels. Thus it has the effect of lowering blood pressure and increasing free fatty acids (EFA). This means it promotes release of fatty acids from body fat stores, thus increasing use of stored body fat as energy. It also possesses anti-inflammatory properties. Class 2 prostaglandins are derived from arachidonic acid (C20:4) and are the most abundant class of prostaglandins. Some PG2’s act as vasodilators while some are vasoconstrictors. A vasodilator increases the size of blood vessels thus reducing blood pressure, while a vasoconstrictor makes blood vessels smaller and increases blood pressure. Many class 2 prostaglandins promote inflammation. Class 3 prostaglandins generally have less potent effects than classes 1 and 2, so will not be emphasized in this discussion.

Arachidonic acid (AA) serves as the precursor for class 2 prostaglandins. While necessary for life, this family of prostaglandins produces undesirable effects when overproduced. These include an increase in blood pressure and inflammation. Once arachidonic acid is formed, it is difficult (if not impossible) to control
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the balance of vasodialators and vasoconstrictors which will be produced from it. PGE1, on the other hand, has the effect of lowering blood pressure and has no undesirable side effects. The strategy of the Parrillo diet is to provide the fatty acid precursors which will allow some arachidonic acid (and thus PG2’s) to be formed, but to tip the balance in favor of PGE1. As with all matters of homeostasis, balance is the key. By favoring production of PGE1 desirable results can be achieved in terms of lowering blood pressure and reducing inflammation.

The ultimate precursor for both class 1 and 2 prostaglandins is the omega-6 fatty acid linoleic acid. This is converted to gamma-linolenic acid (GLA) by delta-6-desaturase. Since many individuals lack optimum levels of this enzyme (delta-6-desaturase activity decreases with age), it may be prudent to supplement the diet with GLA directly (from Evening Primrose Oil). Optimal doses probably range from 30-120 mg GLA/day. GLA is then converted to dihomo-gamma-linolenic acid (DGLA) by an enzyme called elongase. DGLA serves as the direct precursor of PGE1. Alternatively, DGLA may undergo conversion to arachidonic Acid by delta-5-desaturase. Conversion of DGLA to PGE1 and arachidonic acid to PG2 is catalyzed by the enzyme cyclooxygenase, the target of aspirin and other nonsteroidal anti-inflammatory drugs. These drugs work by acetylating (and inactivating) cyclooxygenase, limiting the production of class 2 prostaglandins. This is how aspirin and Motrin work to relieve headaches and muscle soreness.

The delta-5-desaturase activity is stimulated by insulin and repressed by glucagon and eicosapentaenoic acid (EPA, an omega-3 fatty acid in fish oil). The proper balance of insulin to glucagon (controlled in response to the ratio of carbs to protein in the diet) will thus serve to inhibit arachidonic acid synthesis. Furthermore, consumption of EPA also limits AA production. The effects of omega-3 fatty acids (fish oil) in reducing blood pressure, increasing erythrocyte deformability, and reducing platelet aggregation are probably mediated by their suppressive effect on arachidonic acid synthesis.

As mentioned, PGE1 is a potent vasodilator and thus reduces blood pressure. PGE1 also activates adenylate cyclase and thus acts to mobilize fat stores. Adenylate cyclase makes the intermediate cyclic AMP, or cAMP, which stimulates use of fat for energy. This is the same way the hormone adrenaline (epinephrine) and drugs like epedrine, caffeine, and clenbuterol mediate their fat-burning effect. PGE1 decreases blood viscosity by increasing erythrocytes (red blood cells) deformability. PGE1 reduces platelet aggregation (blood clotting). These all confer a protective effect against coronary artery disease. In addition, PGE1 stimulates growth hormone release, which in turn promotes use of fat for energy and partitions nutrients into the lean compartment (4-7). Among the class 2 prostaglandins, some are vasodialators and some are vasoconstrictors. Many promote inflammation and have an immunosuppressive effect. Since it is impractical to direct the synthesis of “good” class 2 prostaglandins and repress the “bad” ones, the strategy of the Parrillo diet (high protein, moderate carbs) involves simply limiting arachidonic acid synthesis. By increasing the balance of class 1 to class 2 prostaglandins, beneficial effects can be achieved while avoiding the undesirable effects of excess class 2 prostaglandins.

Glucagon promotes use of fat for energy and generation of PGE1, while inhibiting synthesis of series 2 prostaglandins. The balance of essential fatty acids in the diet (ratio omega-3 to omega-6) influences the balance of prostaglandins produced. Omega-3 fatty acids provide EPA which also inhibits delta-5-desaturase. By consuming a high protein, moderate carbohydrate diet you can control the ratio of insulin to glucagon so as to favor the production of PGE1 while limiting excess formation of class 2 prostaglandins.

I warned you, the metabolism of EFAs is very complicated. I’ve just covered some of the basics. All you need to remember is that EFAs are required for your body to make some very important hormones which are involved in controlling blood pressure, blood clotting, inflammation, and fat metabolism, among other things. People following a low fat diet may be at risk for developing essential fatty acid deficiencies.

Parrillo EPO is a high-tech EFA supplement designed to provide EFAs without excess non-essential fats. It provides a way for bodybuilders and other athletes to optimize their EFA metabolism while still maintaining a low fat diet. Parrillo EPO - another tool to help you optimize your nutrition.

References


Gain Muscle & Lose Fat: Breakthrough News For CapTri® Users

by John Parrillo

If there were a nutritional supplement that could dramatically—and naturally—elevate your levels of growth, would you want to take it? You bet you would! So hold onto your hat, we’ve got some exciting news that may change the way you think about your diet and the kinds of supplements you use.

Researchers in Spain have released a study proving that dietary manipulation with special lipids, like CapTri, can cause more than a 900 percent increase in growth hormone levels—a peak that is reached two hours after ingestion and is maintained for over three hours (1).

Just think: If you’re eating every two or three hours like you should be on the Parrillo Nutrition Program and supplementing with CapTri®, you can keep your growth hormone levels naturally elevated each day.

So that’s why CapTri®, a powerful medium chain triglyceride oil formulated by Parrillo Performance, works so well when used in conjunction with proper nutrition. But you’re probably saying, “Hold on, isn’t CapTri a supplement for adding calories to your diet or replacing a portion of carbohydrates when dieting?”

Yes, you’re right, but there’s even a bigger picture to look at when using CapTri as part of your nutrition program.

There is evidence that by combining the right foods and supplements you can actually manipulate the body’s hormones. This is called “Dietary Endocrinology” and it’s an area we’ve been working in for years. But now there’s research to prove that this method of regulating the hormones does work and is being used in the field of medicine as well.

So let’s find out more about how CapTri® can help increase your body’s ability to regulate its own hormones. So let’s start with growth hormone.

In case you’re not familiar with the physiological benefits of increasing GH levels, let’s review them. Growth hormone acts to channel the protein portion of your meals to muscle tissue for growth and repair of tissues. It works by increasing nitrogen retention, meaning that more of the protein you eat is turned into metabolically active muscle tissue instead of being broken down and excreted as waste products in the urine. In effect, GH switches on the cellular machinery that makes muscle proteins.

At the same time, it shuts down the use of glucose for energy, helping to spare muscle glycogen stores. GH literally shifts the body from a carbohydrate-burning mode into the fat-burning mode. By sparing muscle glycogen, GH helps yield more energy for muscle-building workouts.

What’s more, GH promotes fat burning. This powerful hormone stimulates “lipoly-
glucose transporter present on cell membranes so that glucose can be ferried into cells to be burned as fuel or stored as glycogen. Insulin also does two other things: It drives amino acids into cells and stimulates protein synthesis—both powerful and anabolic actions (3).

Insulin, however, is a double-edged sword because it acts to increase fat synthesis and fat storage (3). Fortunately, this fat-storing activity of insulin is kept in check by glucagon. The primary action of glucagon is to trigger the breakdown of fat and glycogen for energy. The key is to keep insulin and glucagon in proper balance to get the muscle-building effect of insulin and the fat-burning effect of glucagon.

As it turns out, the ratio of insulin to glucagon is a consequence of the ratio of carbohydrate to protein in the diet (2,4). Furthermore, additional research has shown that the insulin to glucagon ratio is a major determinant of the set point—the amount of fat your body is programmed to carry (5). Too much insulin will make you fat, while more glucagon will make you lean, all on the same number of calories (5). In simple terms, this means that not only the number of calories, but the type of calories, will determine whether you get fat or lean.

Precise dietary control of insulin and glucagon through manipulation of the carbohydrate and protein ratios, plus the use of CapTri, is no doubt why people have such great success on the Parrillo Performance Nutrition Program. Often I see people eating more calories on our diet than they diet before, yet they’re still losing fat at a rapid rate. Our program is structured to cause a hormonal response in your body that turns on the muscle-building and fat-burning metabolic pathways. Dietary energy is thus channeled toward muscle-building, while causing the body to use stored fat for energy.

Besides protein and carbohydrate, your other major source of calories is fat. Dr. Sears, in his work in dietary endocrinology recommends a ratio of 30 percent protein, 40 percent carbohydrate and 30 percent fat (as energy) for optimal muscle growth and fat loss. These are essentially the same numbers we use in our Nutrition Manual, which contains detailed instructions on how to adjust this ratio to meet your individual needs.

An important difference, however, is that we have found a tremendous increase in fat loss when CapTri® is used in place of regular oils and fats. CapTri simply works differently than conventional fats. It is burned very rapidly, more like a carbohydrate than a fat. Conventional fats go through a complicated metabolic pathway, requiring incorporation into protein substances called chylomicrons which transport through the lymphatic system. Furthermore, before be stored as body fat, in marked contrast to other fats and oils (6).

Add those beneficial actions to the ability of CapTri to elevate GH levels, and you’ve got a very potent supplement. CapTri and the Parrillo Performance Nutrition Program are like a metabolic switch, that, when flipped on, lets you turn on muscle growth and fat-burning at the same time. Let’s face it, if foods and nutritional supplements like CapTri can exert such a powerful effect on the body, then who needs drugs? Dietary endocrinology is the future of sports nutrition, and the future is here at Parrillo Performance.

References


I still get a lot of questions about fructose, the sugar that occurs naturally in fruit. Recently I saw an article advertising a supplement bar based on fructose, explaining why this low glycemic index carb is great for bodybuilders. I decided it was time to revisit this issue and try to set the record straight. I hate to see people be misled and work hard in the gym just to have their results ruined by eating the wrong thing.

The problem is simple: fructose is converted to fat in the liver. That’s really all there is to it. Some people point to the fact the fructose has a low glycemic index (which it does) and that it generates a small insulin response, suggesting that this makes it a good carbohydrate source for athletes. The reason fructose has a low glycemic index is because a large proportion of it is released from the liver as fat instead of carbohydrate.

Can you eat some fruit now and then and still have a good physique? Sure you can. But the athletes I work with want THE BEST RESULTS POSSIBLE. Professional bodybuilders don’t want good physiques - they want perfect physiques. Of course, fruit is generally a healthy food - high in fiber, vitamins, and minerals, and low in fat. But try to think of fruit as nature’s candy, because that’s exactly what it is. If your goal is to build a lean and muscular physique, then you don’t want to eat candy. Sugar and fat are natural, but that doesn’t mean they’ll make you lean and muscular.

I originally learned that fruit makes you fat not by reviewing the biochemical pathways of metabolism, but by actually doing nutritional experiments with real bodybuilders. Rather than being some theory out of a book, this is an experimental fact. For a long time I didn’t understand it - I just knew from our work in the gym that certain foods made bodybuilders get in better shape while other foods made them get fat. The experiment goes like this: As a bodybuilder gets close to a contest, his body fat level gets very low - maybe 4-5% for a male and 8-9% for a female. At this point his skin is paper thin (in the human most fat is stored just under the skin). You can see the striations of his muscles clearly through his skin. As you can imagine, any little change at this point really shows up. This is why I like to use competitive bodybuilders for the most demanding nutritional experiments - they are a very sensitive indicator of what works and what doesn’t. With the athlete in contest shape, we measure his body weight and percent body fat every couple of days. We weigh his food and calculate how many calories he is consuming, and break it down into calories from protein, carbohydrate, and fat. If his weight doesn’t change, this means caloric intake exactly balances caloric expenditure, so we have a direct measurement of his total daily energy expenditure. Everything is measured and controlled, and nothing is left to chance.

Okay, here’s the deal: Let’s say we remove 300 calories worth of complex carbohydrates from his diet in form of brown rice, and replace it with 300 calories worth of fruit. His total caloric intake remains the same, as does his percent of calories from protein, carbohydrate, and fat. His training program remains exactly the same. The only change is the type of carbohydrate supplying 300 of the calories: rice has been replaced with bananas. You expect his body weight and percent body fat to remain the same, right? To every one’s surprise, the bodybuilder starts to gain fat.

We let this go on for a couple of weeks and the athlete continues to gain fat. Now we pull the bananas out of the diet and put the rice back in - i.e., go back to the original diet. Guess what? He loses the fat. Amazing, but true.

We’ve done countless experiments like this with just about every food imaginable. That’s how we came up with our diet - by finding what really works. The Parrillo Performance Nutrition Manual tells you which foods work to build a lean, muscular physique, and which foods don’t. The competitive bodybuilder is our laboratory.

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Fructose: The Ideal Carbohydrate Source For Gaining Fat

trying to lose fat. They think that if they reduce calories they will automatically lose weight. This is true, but only for a little while. And if you lose weight by drastically reducing calories, about 50% of the weight lost will be muscle. What people fail to realize is that the types of foods you eat is just as important as how many calories you consume. If cutting calories was the answer, then those low calorie weight loss drinks would work, but they don’t.

The key point is that different foods have different chemical compositions and therefore have different effects inside your body. Of course, all food is fuel, but what type of fuel it is matters a lot. Try putting kerosene in your car sometime and see how it runs. For any machine to run optimally, including the human body, it requires the right kind of fuel.

The problem with fruit is that virtually all of the calories it supplies come in the form of simple sugars. The most abundant sugar in fruit is fructose (commonly known as fruit sugar), although some fruits (oranges and grapes for example) also contain a lot of glucose. The problem with fructose is that it bypasses the enzyme phosphofructokinase-I (PFK-I), the rate limiting step of glycolysis, the pathway responsible for the conversion of carbohydrate into energy (1). In other words fructose bypasses the control point that decides if a dietary sugar is going to be stored as glycogen or fat. Complex carbohydrates such as rice, oatmeal, and potatoes, are preferentially stored as glycogen until glycogen stores are full. Fructose, on the other hand, gets directly converted to fat in the liver, then gets whisked off in the bloodstream to be stored in fat cells (1).

As you know from our previous articles about carbohydrate metabolism and thermogenesis, the dietary energy (calories) supplied by carbs is used for several purposes. Some of it is simply lost as heat during its digestion and metabolism in a process we know as diet-induced thermogenesis. You can loosely think of this as “friction” in the metabolic pathway, and this energy loss contributes to the generation of body heat. Most of the dietary energy is used to maintain the basal metabolic rate (BMR) - the energy cost of keeping your body alive. Some of the energy is used to perform work, like exercise and just tending to the activities of daily life. After that, any energy left is stored as glycogen in muscles and in the liver. If you consume too many calories from carbohydrate, after glycogen stores are full the rest will be converted to fat (triglycerides) in the liver, and transported by the blood to fat cells (adipose tissue) for storage.

So after glycogen stores are full, excess calories from any type of carbohydrate can be converted to fat. The enzyme that regulates whether dietary energy supplied by carbohydrate is stored as glycogen or fat is PFK-I. It shuttles carbs into glycogen stores until they’re full, then it switches the flow of carbohydrates from glycogen synthesis to fat synthesis. Glycogen is the storage form of carbohydrate in animals, and the amount of glycogen you can store is quite limited. The upper limit is generally believed to be 250-400 grams, depending on the amount of skeletal muscle mass you have. (Very massive bodybuilders may be able to store as much as 600 grams.) This amounts to only 1000-1600 calories - not even enough energy to fuel your body for one day. The deal with fructose is that it totally skips the enzyme PFK-I, which is the regulatory step responsible for making sure glycogen stores are full before fat synthesis is switched on. Instead of being stored as glycogen, fructose gets directly converted to fat by the liver. Now I think you can see why I have a problem with recommending fruit for bodybuilders.

To get a detailed understanding of fructose metabolism we should start at the beginning. Fructose is absorbed from the small intestine and transported to the liver by the portal vein. You have to realize that fructose itself is not released from the liver into the bloodstream to reach the rest of the body. Any carbohydrate source you ingest is first converted to glucose by the liver, and glucose (“blood sugar”) is the carbohydrate source used by muscles and the form of carbohydrate which is converted into glycogen. The first enzyme to act on fructose is fructokinase, which adds a phosphate group to the sugar to form fructose-1-phosphate (F1P). Glucose is similarly phosphorylated at the 6 position by the enzyme hexokinase, forming G6P. All cells have hexokinase, and thus have the ability to phosphorylate glucose. This means that all cells can metabolize glucose for energy. On the other hand, fructokinase is virtually confined to the liver (1). So while glucose is a general substrate for all body tissues, fructose represents a carbohydrate load targeted for the liver (1). The next thing that happens is F1P is split by the enzyme aldolase to form glyceraldehyde (GA) and dihydroxyacetone phosphate (DHAP). This means that the
products of fructose metabolism enter the glycolytic pathway at the triose phosphate level (i.e., as three carbon sugars). Glucose, on the other hand, is phosphorylated to yield G6P, which may proceed directly to glycogen synthesis (1). To be broken down for energy glucose must first pass through the rate-limiting PFK-I step. Fructose metabolites enter below this step, and thus bypass an important point of regulation. Fructose therefore is more prone to be converted to fat, while glucose is more prone to be converted to glycogen.

The biochemistry is much more complex than is appropriate for this article, but I have pointed out the salient features of the pathway to explain why glucose-based carbohydrate sources are better than fructose, especially for people trying to minimize body fat stores. Scientific studies have proven that starch (glucose polymer) is much more efficient at replenishing skeletal muscle glycogen stores than fructose (2). Now you understand why — muscle cells don’t have the enzyme needed to phosphorylate fructose, so its metabolism is essentially limited to the liver.

When we were designing the Parrillo Performance Bar, we surveyed every available sports supplement bar we could find. We found that 25 out of the 26 bars had fructose in either the first or second ingredient. (If you use somebody else’s bar, go read the label.) Why? Because corn syrup and fruit juice (good sources of fructose) are real cheap, and they’re also very sweet. We pioneered the use of a new carbohydrate source in the Parrillo Bar called rice dextrin. It’s a short-chain glucose polymer made from rice. This gives you the quick energy you want from a sports bar, but without the fructose. Each Bar also contains CapTri® (which is legendary by now) and an ultra-high efficiency protein source.

As we discussed in an earlier article about carbohydrate metabolism, complex carbohydrates (such as starch and maltodextrin) are more effective in replenishing glycogen stores than simple sugars (3). This makes sense because complex carbs are released into the bloodstream slowly whereas simple sugars are released very rapidly, potentially overwhelming the glycogen synthesis pathways and “spilling over” into fat stores. Furthermore, the increased insulin release resulting from simple sugars causes more of the sugar to be converted to fat.

This is why Parrillo Performance ProCarb™ is based on Low DE maltodextrin instead of sugar, like most other carbohydrate supplements. Maltodextrin is a medium-chain glucose polymer. It has been found that maltodextrin is 15% more efficient at restoring muscle glycogen levels than conventional carbohydrate foods like rice and pasta (4). This makes ProCarb™ ideal for glycogen supercompensation (carb loading). Maltodextrin beverages like Pro-Carb™ have also been demonstrated to increase blood glucose levels during exercise and to increase exercise time to exhaustion (4,5).

At this point, I think I can anticipate a question from the biochemists in the crowd. You’ve probably heard that fructose is low on the glycemic index, which means it raises blood sugar very slowly and elicits only a small insulin response. From your reading of our series on endocrinology, you know that a slow, steady insulin response is good. Since insulin is a potent stimulus for fat storage, we want to keep insulin levels fairly low, so by this reasoning it seems like fructose would be good. The problem is that the REASON fructose has a low glycemic index and results in a small insulin release is that it is converted to fat in the liver. It doesn’t raise blood sugar very much because it is released from the liver as fat instead of sugar. Fructose has a MUCH greater tendency to be converted to fat than other carbohydrate sources, so why use it? Now you understand the biochemistry behind my controversial stance on fruit.

Now I’d like to go into a little more detail about carbohydrate metabolism and glycogen storage. After exercise is completed dietary carbohydrate is directed toward restoring muscle and liver glycogen and returning blood glucose to normal levels. Dietary starches and sugars are digested to simple sugars (glucose and fructose) which are then available for glycogen formation (2). Until recently it was believed that glycogen was made just from glucose extracted from the blood by the liver and muscle, but the actual dynamics of glycogen restitution turn out to be much more complicated. In fact, glucose serves primarily to replenish muscle glycogen stores, while the liver is more versatile in its choice of substrates (building blocks) for glycogen synthesis. The liver is able to make glycogen from fructose, lactate, glycerol, alanine, and other three-carbon metabolites (2). Amazingly, most glucose absorbed from the gut actually travels through the liver without being absorbed and preferentially is used to replenish muscle glycogen stores (2). This is cutting edge stuff, folks, that you probably won’t hear anywhere else. I don’t know of anyone besides Parrillo Performance who researches nutritional biochemistry and metabolism at this level of molecular detail to instruct bodybuilders on exact techniques to control the flow of energy and nutrients through the metabolic pathways. Who else teaches you how to control the metabolic pathways to optimize bodybuilding results?

Anyway, what happens is this: After...
exercise liver and muscle glycogen (carbohydrate) stores are depleted. The liver is a very versatile metabolic engine and is able to recover its glycogen stores from many different sources, including lactate, fructose, glucose, and amino acid metabolites. Muscle tissue, on the other hand, has a specialized function (contraction) and doesn’t have all of the various enzymes the liver does which allow the liver to inter-convert so many different metabolic intermediates. Muscle tissue relies on glucose to recover its glycogen store, so the liver is kind enough to let the glucose pass on through so it can be delivered to muscle. The liver makes due with other carbon compounds which muscle is unable to use. What does this mean for us bodybuilders? Think about it - the answer is right in front of you.

What this means is if you feed your body glucose - the form of carbohydrate in starch, Pro-Carb™, and the Parrillo Bar™ - the carbohydrate will be directed to your muscles and stored there as glycogen. Dietary carbohydrate in the form of glucose will be directed to your muscles until muscle glycogen stores are full. This will make your muscle full, hard, and pumped. Also, this will give you more energy and strength during your workouts, since muscles rely on their internal glycogen stores as fuel for anaerobic exercise. After muscle glycogen stores are full additional glucose will be used to restore liver glycogen. Only after both muscle and liver glycogen stores are fully repleted will further excess glucose be converted to fat. (Studies have shown that overfeeding as much as a 500 gram carbohydrate load leads to practically no fat synthesis, because the carbs are stored as glycogen.) The story with fructose is very different, indeed. Muscle does not have the enzymatic machinery needed to convert fructose into glycogen, so fructose represents a dietary carbohydrate load targeted for the liver (1,2). In the liver, two things can happen with fructose. First, fructose can be absorbed by the liver cells, converted to glucose, and then stored as glycogen. Second, the fructose can be converted to fat. You remember what I said earlier about the enzyme PFK-I. This is the “rate limiting” enzyme that operates as a switch to decide if a sugar gets stored as glycogen or converted to fat. Fructose completely bypasses this enzyme and is readily converted to fat by the liver. This is why ordinary table sugar increases blood triglyceride levels and makes you fat. Table sugar is a disaccharide known as sucrose, and is made from one molecule of glucose connected to one molecule of fructose. Recent thought on carbohydrate metabolism suggests that it is the fructose portion of sucrose that is responsible for making sweets so fattening.

So a large portion of the fructose simply gets converted directly to fat and released into the bloodstream. Bam. You get a dose of fat. But the damage doesn’t stop there. The rest of the fructose gets converted into liver glycogen. That sounds okay, until you stop to think about it. You see, once liver glycogen stores are full the liver says, “We’ve got all the glycogen we can hold, so any more carbs coming in here we’ll just convert to fat.” Fructose preferentially repletes liver glycogen instead of muscle glycogen (2) and shifts the liver into fat-storing mode. This is exactly what we don’t want. We need some liver glycogen, to be sure, because this is what keeps blood sugar levels steady. But when liver glycogen stores are full, this is when dietary carbs start to “spill over” into fat stores.

The third problem is that fructose cannot be used to replenish muscle glycogen, so on a high fructose diet liver glycogen stores are filled and we start converting carbs into fat without ever filling muscle glycogen stores. This scenario is a carbohydrate nightmare. Fructose is the worst carb source for bodybuilders you can imagine. If you wanted to design a supplement to ruin a bodybuilder’s physique, it would be a fructose-based energy bar. Unfortunately, the vast majority of the bars out there rely on fructose as their major carb source, because it’s cheap and tastes sweet.

In summary, fructose does three things: a large portion of it is converted directly to fat by the liver, it preferentially fills liver glycogen stores so that even good carbs are more prone to spill over into fat, and it cannot be used by muscle to recover glycogen. Calorie for calorie, the only nutrient that will make you fatter than fructose is fat itself. Besides that, I don’t have a problem with it.

Glucose then has some special metabolic properties that you can use to your advantage. Exercise induces muscle to be more sensitive to the effects of insulin, so blood glucose is shuttled preferentially to glycogen-depleted muscle (2). Interestingly, and fortunately for the bodybuilder, high blood glucose and insulin levels do relatively little to stimulate hepatic (liver) glycogenesis (glycogen production). Instead, most glucose passes on through the liver and is extracted by skeletal muscle. This means that if you supply your body with carbohydrate in the form of glucose post-exercise that the calories will be preferentially stored as muscle glycogen. An excellent recovery trick is to eat a Parrillo
Bar™ or a scoop of Pro-Carb™ right after your workout. These are essentially “free” calories which you know will end up in muscle and not be converted to fat. If you eat a fructose-based supplement bar, however, the calories just stay in your liver and get converted either to liver glycogen or fat. It won’t help recover muscle glycogen.

In closing I’d like to talk about the kinetics (time course) of glycogen storage. Glycogen recovery following exercise is highly dependent on the carbohydrate content of the diet, up until 500-600 grams of carbohydrate are provided. Above this intake, glycogen synthesizing pathways appear to be saturated (2). Interestingly, not only is the absolute carbohydrate content of the diet important, but the type of dietary carbohydrate consumed is key also. A study by Costill (reviewed in reference 2) compared the relative efficacies of simple sugars versus complex carbohydrates in restoring muscle glycogen following exercise. Both were equally effective during the first 24 hours of glycogen synthesis, but by 48 hours post-exercise the complex carbs resulted in significantly better recovery of muscle glycogen stores. Another study looked at the effects of different carbohydrate types on liver glycogen, and demonstrated that fructose was more efficient than glucose at replenishing liver glycogen. The question is, do you want your carbs to be stored in muscle or in your liver?

Basically, this means if you rely on simple sugars or fructose, within 24 hours your muscles will have stored as much glycogen as they can, and any further carbohydrate you consume will be converted to fat. On the other hand if you use starches (complex carbs made from glucose polymers) not only can you achieve higher levels of muscle glycogen storage, but also less of the carbs will be converted to fat. In other words, if you store more of your dietary carbs as muscle glycogen, less will be available for conversion to fat. Pretty neat, huh?

You know that weight lifting is an anaerobic exercise that relies on muscle glycogen as the primary fuel source. You also know that muscles fully loaded with glycogen are bigger, harder, and stronger. What can you do to target dietary carbohydrate to muscle? Use complex carbohydrates made from glucose polymers as your carb source. This is the type of carbohydrate found in starchy foods (potatoes, rice, beans, oatmeal, etc.) and in the Parrillo Bar™ and in Pro-Carb™. Eat a high carbohydrate diet; as many as 60-70% of your calories can come from complex carbs. Eat a high carbohydrate meal immediately after training, when muscles are glycogen depleted and are primed to store carbohydrate. A convenient way to do this is to put a Parrillo Bar in your gym bag or else a shaker bottle with a serving or two of Pro-Carb™ in it. This is also an ideal time to consume some protein to provide amino acids to rebuild your muscles. If you’re trying to pack on a few more pounds of muscle it may be as simple as eating a scoop of Pro-Carb™ plus a scoop of Hi-Protein Powder™ or 50/50 Plus™ drink right after your workout. Do this for a month and I can virtually guarantee you’ll see a difference. After a workout, these calories will go straight to muscle with virtually no risk of being converted to fat. Finally, avoid fructose. Most of the supplement bars out there (probably 90% of them at least) use fructose, high fructose corn syrup, or fruit juice as one of their main ingredients. Beware. These products are not effective in recovery of muscle glycogen and instead are targeted to the liver. If you’re looking for a good way to replenish your fat stores after exercise, fructose would be an excellent choice.

Parrillo supplements are made the way they are for a reason. We use rice dextrin in the Parrillo Bar™ and low DE maltodextrin in Pro-Carb™. Both are glucose polymers. Sure, high fructose corn syrup or fruit juice concentrate would be cheaper, but we’ve designed our supplements to be the best, not the cheapest. Our supplements are designed for the professional bodybuilder whose career depends on his (or her) physique. You might be surprised that a seemingly small difference like using glucose instead of fructose would be important, but it can make the difference between winning and losing. Now you know how to control the traffic of carbohydrates through the metabolic pathways of your body and direct carbs to muscle while minimizing their conversion to fat. You also know when somebody starts telling you how wonderful their fructose bar is, you’d better put on your hip waders and remember that all those starchy and fibrous glucose based carbs you’re supposed to eat are as high or higher in vitamins, minerals and fiber than fruit.

References
Nutrition and Training 101
by John Parrillo

I get more questions about fat loss than any other single topic because everyone wants a lean, athletic looking body. Whether your goal in bodybuilding is to compete or just to look and feel your best, control of body fat is a central issue. Over the years the Parrillo Performance Nutrition Program has earned a reputation for being the best way to gain muscle and lose fat, simply because it works. The concepts of our nutrition program are used by the vast majority of competitive bodybuilders around the world. This month I want to explain some basic concepts about how to structure your diet and training program to achieve your physique goals.

Concept #1. Food is the foundation of nutrition. A healthy diet of natural, low-fat foods is the best approach to body fat control. You’ll get better results from eating the right foods than you could ever get from some “meal replacement powder.” Several supplement makers suggest that you should use their product to form the core of your nutrition program, and then add regular food as needed to supply the rest of the calories. They’ve reversed the roles of foods and supplements. Food is always more important. The number one rule for getting lean is to eat a clean diet of healthy food.

Concept #2. Build your metabolism. This key Parrillo concept means that through proper training and nutrition you can steadily increase muscle mass, thereby increasing your metabolic rate and fat burning capacity. Metabolic rate is proportional to lean body mass, so the more muscle you’re carrying the more food you have to eat.

Concept #3. What to eat and what not to eat. Good protein sources are skinless chicken breast, skinless turkey breast, egg whites, and most fish. Use protein powder as needed to meet your daily protein requirement, but don’t fall into the trap of using “meal replacement powders” in place of real food. Good carbohydrate sources are oatmeal, rice, beans, potatoes, sweet potatoes, corn, peas, salad greens, and vegetables. Stay away from salt, sugar, and fat. Avoid fruit, dairy products, bread, and pasta. These contain simple sugars and refined carbohydrates that are easily converted to fat. Prepare your food yourself and take it with you in a cooler.

Concept #4. How much protein, carbs, and fat. One gram of protein per pound of body weight per day is a good general rule. Limit dietary fat to 10% of calories. The remainder of calories are derived from complex carbohydrates.

Concept #5. How to construct your meals. Each meal must be balanced with one protein source, one or two sources of starchy carbohydrate, and one or two fibrous vegetables. For example, for dinner you could have a grilled chicken breast, a baked potato, and some steamed broccoli. Adjust the serving sizes appropriately to generate the grams of protein, carbs, and fat you need at each meal. Divide your total daily requirements roughly evenly over six small meals.

Concept #6. How to use supplements to build your metabolism and lose fat. By far the most effective supplement in the world for fat loss is CapTri. Of course, to get the results you want you have to use it correctly. CapTri has a special molecular structure and follows a unique metabolic pathway in the body. CapTri is preferentially burned for energy (burned in preference over regular food) and has virtually no tendency to be stored as body fat. To use CapTri to help you lose fat, use it in place of an equivalent number of calories from starch. For example, at each meal eat 30 grams less of starchy carbohydrate such as oatmeal, rice, or potato (about 120 calories) and add one tablespoon of CapTri instead (114 calories). CapTri has a higher thermogenic effect than carbs (it increases metabolic rate more than carbs) and is less prone to be converted to fat than carbs (3). This change also lowers the insulin response of the meal, which encourages use of body fat for energy. Advanced Lipotropic Formula supplies metabolic cofactors used by the liver and muscle to metabolize fat. This ensures that all of the biochemical pathways involved in fat metabolism are operating at peak efficiency.
Putting it all together: The first order of business is to faithfully follow a clean diet. Set a specific goal, map out a plan, and stick to it. Dedication, consistency, and hard work are the ingredients of a champion bodybuilder’s physique. Put more effort into eating the right foods and less thought into worrying about supplements. A lot of bodybuilders call me for advice on high tech supplements and it often turns out they’re not even eating right. They wonder why they’re not getting the results they should. Not infrequently a young bodybuilder will call me, depressed because he can’t afford a lot of supplements. If you’re a bodybuilder on a budget, don’t worry. You can get tremendous results from good old fashioned hard training and a solid bodybuilding diet. In fact, I believe a one time investment in a Parrillo Nutrition Manual will get you better results than all the supplements in the world.

If you’re not making good progress in attaining your bodybuilding goals, either you’re not training right or you’re not eating right. It’s that simple. Don’t talk to me about genetic limits unless you already look like Dorian Yates. Don’t be afraid to make changes in your program or to call us with questions. That’s why we’re here. To fine tune your nutrition program for fat loss, consider increasing your protein intake and decreasing your carbohydrate intake. This increases thermogenesis and affects the insulin-glucagon axis so as to favor use of stored body fat for energy. Using CapTri in place of an equivalent amount of starch will have a dramatic effect. You may want to eliminate starch entirely from the last meal of the day. Limit conventional fat to 5-10% of calories. An overwhelming amount of scientific evidence shows that conventional dietary fat contributes much more to body fat stores than do carbohydrates or protein (1,4,5,6). Some researchers even think that dietary fat content is just as important as calorie content (if not more important) in causing obesity (7,8). Excess carbohydrate is stored as glycogen whereas fat consumed in excess of energy need is simply stored as adipose. Limit any reduction in energy intake to a maximum of 500 calories per day less than your maintenance requirement. In other words, don’t ever cut calories by more than 500 below what you need to maintain constant body weight. Any more energy restriction than this tends to result in decreased metabolic rate and muscle loss. If you hit a weight loss plateau, increase calories by about 300 per day for a week or two. This will stimulate your metabolism and get you going again. I have worked with a lot of people who have used repeated bouts of starvation to lose weight. After prolonged periods of energy restriction their metabolic rates are so low they just can’t lose any fat. In this case it actually works better to increase calories. This works by increasing lean body mass and metabolic rate, and shifts the body from a fat-hoarding mode to a fat-burning mode. It sounds paradoxical, but sometimes the trick to stimulating fat loss is to increase calories (of course, from a very clean diet). A couple of good rules are never to reduce calories by more than 500 below maintenance and not to lose weight for more than ten consecutive weeks. After ten weeks or so of dieting it is often helpful to increase calories for a week to add some muscle mass and get your metabolism going again. You may want to try this if you hit a plateau in your fat loss.

What about training for fat loss? That’s a big topic in itself, but it’s worth briefly mentioning a few key points. You’ll hear some people say to train heavy to gain muscle but do a lot of reps to lose fat. Basically, that’s wrong. You need to keep training heavy while losing fat. Muscles are very plastic, which means they adapt to whatever level of stress is placed on them. Muscles hypertrophy (grow) in response to a heavy training stimulus. To get your muscles to grow you have to constantly push them a little beyond their previous limits. When you take a heavy set to failure, you actually do some damage to the muscle at the cellular and molecular level. This serves as a stimulus for the inflammation response, which sets about to repair the damage. Each time this happens the muscle builds itself up a little bigger and stronger than it was before, so the next time it is subjected to that stress it won’t get damaged. If you keep using the same weight, pretty soon the muscle will get as big and strong as it needs to be to withstand that level of stress, and muscle growth will cease. Then it is time to increase the weight, to force the muscle to grow even bigger. If you eliminate your heavy sets and start doing a lot of reps to burn fat, your muscles will shrink. You should strive to keep training as heavy as possible even as you diet down for a contest to provide the stimulus needed for muscle hypertrophy. Furthermore, weight training for high reps just isn’t a very effective way to burn fat. Weight lifting is fueled mainly by burning carbohydrate from muscle glycogen. Aerobic exercise is much more effective for fat loss because it burns many more calories than you ever could by lifting weights and a higher proportion of those calories are derived from body fat. So while losing fat keep training heavy but do more aerobics.

Here are some very rough guidelines for suggested programs. Note these may require modification for each individual, but are presented just to give you an idea.
Nutrition and Training 101

of how to make changes to your program as your goals change.

1. Program to gain lean mass: Train heavy and get plenty of rest. Recovery is key. Most people do best with three to five weight training sessions per week, although some people can do more. After warm ups, take each set to failure. Do some work in the 8-10 rep range, and some work in the 3-6 rep range. Continually try to increase the load as you’re able. Consume one gram of protein per pound body weight per day. A representative breakdown might be around 30% protein, 60% carbs, 10% fat (as energy). If your goal is to gain body weight, you’re going to have to increase calories. Generally, these extra calories should come from starchy carbohydrates. If you put on fat easily, use CapTri to supply the extra calories you need to gain weight. This will reduce fat accumulation as you gain weight (3). Limit aerobics to 30 minutes three days a week, preferably on non-weight training days. This will help you avoid over-training. Increase calories by around 300 per day until you’re gaining weight. Try to gain between one pound per week to one pound per month. Use the Body Stat Kit to follow your percent body fat. If you’re gaining a significant amount of fat, cut back on calories and gain more slowly or else use more CapTri and less carbs. (You could do more aerobics, but your body will adapt to this as well. It’s probably best to save your maximum effort at aerobics until your fat loss program.) Try not to let body fat exceed 10% for men and 15% for women.

2. Program for fat loss: Continue to train heavy. Consider increasing training volume until you’re just at the edge of over-training. You really have to push it to the limit to get into contest shape. Decrease calories by about 300 from what you were using to gain weight. This will put you somewhere close to your maintenance requirement. This is the time to add Advanced Lipotropic Formula to your supplement program. Increase protein intake and decrease carbs. Some people go as high as two grams of protein per pound of body weight. A representative breakdown might be around 40% protein, 50% carbs, and 10% fat (as energy). This is a great time to use CapTri in place of starch. An extreme cutting diet would be 40% protein, 30% CapTri, 20% carbs, and 10% fat. This diet isn’t very fun, but you’ll be shredded. Drink a lot of water to prevent ketosis. Pay attention to absolute carbohydrate intake. At no time should carbohydrate intake drop below 100 grams per day, because this leads to rapid muscle loss. A lower limit of 150 grams per day is probably safer, and you’ll have more energy to train. Increase aerobic exercise to 30 minutes seven days a week. As your contest approaches increase it further to 45-60 minutes a day. Adjust caloric intake as needed to lose about one pound per week. Limit weight loss to a maximum of one-and-a-half pounds a week, and one pound per week is better. If you lose weight more quickly, you’re likely to lose muscle. This means you have to plan ahead to know when you need to start your diet. Use the Body Stat Kit to follow your body composition as you lose weight. If you’re losing a significant amount of muscle, make a change. If you don’t know what to do, call me. This can be a complicated period. If you’re losing muscle you’ve probably reduced calories too much. The first thing to try is usually to increase carbs. A lot of people get confused about how to balance the amount of aerobics to do with how many calories to consume. A good starting place is to work up to 60 minutes of aerobics a day, and then adjust calories as needed to lose about one pound per week. The optimal amount of aerobics is highly individualized, and you’ll have to experiment to find what works best for you.

3. Program to gain muscle and lose fat at the same time: Most novice and intermediate bodybuilders need to both gain muscle and lose fat. Done properly, this approach can result in a rapid and dramatic change in body composition and appearance. This is where most people should start out. If you’re already extremely lean, then follow the program for gaining lean mass. If you already have enough lean mass and want to prepare for a contest, follow the fat loss program. On this program your goal is to keep overall body weight relatively constant while increasing muscle mass and decreasing body fat. Since overall body weight is to remain constant, your caloric intake should be approximately equal to your maintenance energy requirement. You will be building muscle tissue at the expense of body fat. In other words, the energy cost of building new muscle tissue will be derived from fat stores. Simply adjust calories so that your body weight remains the same. By keeping a daily record of your diet, it’s easy to determine your maintenance energy requirement. Consume one gram of protein per pound of body weight each day. Limit dietary fat to 10% of calories. The rest of your calories come from complex carbohydrates. Follow your body composition with the Body Stat Kit to make sure you’re making progress. If a month goes by without any improvement, make a change. Train heavy and get plenty of rest. Avoid over-training. Perform aerobics for 30 minutes three to five days per week. As your lean body mass increases you will have to gradually increase calories. An increase in lean body mass will
increase your metabolic rate and your maintenance energy requirement. This is where many, many bodybuilders fail. They make good progress for the first six months or a year, and then hit a plateau and seem to stay stuck there forever. The most common problem is that they fail to increase their caloric intake as they gain lean muscle tissue. If you never increase calories, your muscles will grow as big as they can on that level of energy intake and then stop. If your body burns 2400 calories per day to maintain itself and fuel your exercise, and you eat 2400 calories per day, that doesn’t leave anything left over to build and maintain new tissue. This approach works well as long as you have enough body fat left to supply energy to fuel growth, but as you lose fat your progress will grind to a halt unless you increase calories.

Here’s the idea: Start off by consuming your daily maintenance energy requirement. If you’re eating and training right you’ll automatically gain muscle and lose fat. Follow your body composition. Stay on this program until you reach about 8-10% body fat for men, and 12-15% for women. This may take two months, or it may take a year depending on how fat you are when you start out. When you reach your target body fat percentage, it’s time to increase calories by about 300 per day. You will gain weight. Most of it will be muscle if you’re following the diet faithfully. (Most of it will be fat if you’re not.) At this new level of energy intake, your body will reach a new steady state (constant level) body weight. You will gain muscle for awhile, until your metabolic rate rises to equal your new level of energy intake. Then it’s time to increase calories again. If you think about it, basically what you’re doing here is staying on the maintenance energy program until your body composition drops to your target body fat percentage, and then you’re switching to the program to gain lean mass. Many bodybuilders hit a terminal plateau because they fail to recognize it’s time to increase calories. Many bodybuilders fail to reach their goals because when they do increase calories, they put on fat. This means they’re not being strict on their diets. So then they cut calories and just diet back to the same place they started from.

These examples illustrate my concept of building your metabolism. I hope I have given you some insight into how the program works and what to do to achieve your particular goals. You CAN have the physique of a bodybuilder - you just have to want it bad enough to do what it takes. It’s not really that complicated. Train heavy, eat right, and do your aerobics. If you’re not making progress you have a problem in one of these areas. The most common problems are getting sloppy on your diet or getting lazy in the gym. If you’re ready to take your physique to the next level, I can show you how. Get out your Parrillo Nutrition Manual and re-examine your diet. Are you really eating the way you need to to look like a bodybuilder? Have you let some foods creep back into your diet that you shouldn’t be eating? Are you attacking the weights in the gym? You should be increasing your weights in each lift at least every month, if not more frequently. Have you fallen into a rut and just lift the same poundages every workout? You HAVE to lift more weight. You can’t wait for your muscles to grow and then lift heavier weight. You have to lift more weight now or else your muscles won’t get any stronger. I don’t want any people on the Parrillo Program to be stuck on a plateau. Next time you walk into the gym, add some more weight to the bar. Every month your goal should be to get a new personal best in at least one of the basic lifts. You’ll never do it if you don’t try.

I’ve recently developed a new tool to help you structure your diet: The Parrillo Nutrition Computer Program. It includes a variety of menu-driven features to help you plan and keep track of your diet. It helps you figure out your calories, and grams of protein, fat, and carbs. You tell it what foods you like to eat and then it plans out your meals for you, and even generates a shopping list. No more tedious calculations. Basically, it does everything except cook your food.

References


Exploring the High Fat Diet, Part I

by John Parrillo

Over the last two or three years several “new” dietary strategies have been advanced which are specifically designed to help bodybuilders get extremely lean for contests. These diets have in common a fairly high protein intake, around 25-30% of calories. Another common feature is that they advocate reducing carbohydrate content in favor of increasing dietary fat consumption. Some of these plans call for limiting carbs to 30-50 grams per day, or even less, and providing around 70% of calories from fat. This low carb regimen is carried out over a five day (or so) course to deliberately induce ketosis and a fat-burning metabolism, to promote the use of stored body fat as energy. This is followed by two or three days of carbing up to provide an anabolic growth phase. Another program is more moderate, suggesting a diet of 30% protein, 40% carbs, and 30% fat, without cycling. There is a lot of science and theory behind these diets, although the high fat recommendation is quite controversial. Without getting too bogged down in the biochemical details, the fundamental idea behind these approaches is to reduce carbohydrate intake in order to reduce insulin levels. Insulin is a potent inhibitor of lipolysis, or fat breakdown. By reducing insulin levels (and, less importantly, by increasing glucagon) we can take the brakes off fat metabolism and encourage the use of stored body fat for energy.

If you’re familiar with my work at all, you will know that I advocate, in general, a diet high in protein, high in complex carbohydrates and very low in fat. I agree that hard-training athletes need more protein than sedentary people, at least one gram to 1½ grams per pound of body weight per day. You might expect me to flame the authors of these programs (to borrow a little Internet jargon), but I’m not going to. These people all are very knowledgeable about nutrition and have put a lot of thought and research into their programs, and so have I. They all can point to numerous examples of great success they’ve had with their programs, and so can I. They have all worked with bodybuilders and have generated champions, and so have I. So who’s right?

Nutrition is a fascinating field. It’s one of the few areas of science where highly trained experts with vast clinical experience can completely disagree about even fundamental concepts. This disagreement about fundamentals suggests that nutrition science is still in its infancy. Why is nutrition still in its infancy? Because nutrition (at least optimum nutrition) is very complex. Let me explain. On one hand, nutrition seems ridiculously simple. If you just eat a fairly balanced diet, you will live and probably do okay. You don’t even need to know what a carbohydrate is. If you just get some food to eat, you probably won’t have any problems. At another level, however, nutrition can get very complex. At this level, we’re not concerned merely with sustaining life, but with promoting a state of optimal health, increased energy, enhanced muscularity, and extreme lean-ness. At this level, nutrition becomes one of the most complex sciences there is because it incorporates every biochemical and metabolic pathway in the body. We have to know exactly how every nutrient is metabolized and how this affects cellular physiology. We have to understand how food affects hormones which in turn control fat and muscle metabolism. At this level food is not merely fuel thrown into the furnace, but rather the raw materials we use to sculpt our bodies. To attain a truly top physique, such as that of a champion bodybuilder, you will find that nutrition is the most critical variable. It is the area where the worst mistakes are made, because it is the most complicated aspect of bodybuilding. At this level, everyone is training hard and heavy and using proper technique. You won’t even get close to a bodybuilding stage if you don’t train hard. All competitive bodybuilders know how to train. Whether you do an extra set of incline flyes or not won’t make the difference in if you win or lose the contest, but whether or not you eat an extra bowl of rice the day before the show very well could.

Races are won or lost by a fraction of a second; bodybuilding shows can be won or lost by a bowl of rice.

The point of this is not to get into arguments with other experts on bodybuilding nutrition. The point is not to call people names or exchange insults. The point of this is to figure out what is the best diet for bodybuilders (and anyone else, for that matter) to gain muscle and lose fat and be healthy. I’m always reading and studying to learn new things, and I am receptive to new ideas and new approaches. If the high fat, low carb approach worked better, then I’d switch horses. So back to the basic question: Who’s right?

The fact that some people have had success with the high fat diet and that others (actually the majority of bodybuilders) have had success with the higher carb diet proves that both approaches can work. So the answer to the question is that both camps are right, at least partially. How can two opposite approaches to nutrition both give good results? Does one approach give better results? Is one approach healthier? Here’s where the discussion starts to get complicated.

Back in the early days, before there was a Parrillo Performance, I tried all sorts of diets – everything you can imagine. High carbs, high fat, even a liquid protein fast without carbs or fat (that didn’t work). I varied macronutrient ratios (percent of calories from protein, carbs, and fat), food choices, meal frequency, meal structure, protein only meals, carbs only meals, amino acid combinations, you name it. All the while I was charting people’s body weight, body composition, and strength levels. I tried all sorts of various food combinations to see what would work to help bodybuilders lose the last ounces of fat. During this time I read every medical book I could find about nutrition, protein metabolism, and fat loss. Through many years of experimentation and plain old trial and error, I arrived at the Parrilo diet, now published as the Parrillo Nutrition Manual, as being the diet which simply gave the best results for most bodybuilders.
So how can two very different approaches to bodybuilding nutrition (high fat versus low fat) both give good results? One thing I found during my years of experimentation was that different body types respond somewhat differently to different nutritional structures. There are three very general body types, classified by general appearance. Ectomorphs are naturally skinny people, mesomorphs are naturally lean and muscular, and endomorphs are naturally fat. (You know which you are.) Obviously, mesomorphs have the easiest time becoming bodybuilders. These are the people we all envy. They were lean and muscular before they ever started training. They gain muscle easily. They can eat like crap and still look good. All they have to do is cut the junk out of their diet a month before the show and they’re in contest shape. If you’re an ectomorph or an endomorph you can still become a good bodybuilder, but it will be harder because you’re working against your natural genetic tendency to be either skinny or fat.

Ectomorphs get lean easily but have a hard time putting on muscle. They can eat a lot and don’t gain much weight. I found that these individuals do better on a high carb diet with moderate to high protein, maybe somewhere around 25-30% protein, 65% carbs, and 5-10% fat. (The actual percentages aren’t important, but they usually work out close to those above. These are given just as an example.) Basically, they need to get one to 1.5 grams of protein per pound of body weight per day, and then keep increasing carbs until they gain weight. The problem with using conventional fats for weight gain is that when your body is in a calorie surplus (gaining weight) virtually all excess fat calories you consume from food will simply be stored as body fat (1-13). Ectomorphs will find that adding some fat to their diets will help them gain weight, but they’ll gain more fat along with the muscle than if they had followed a low fat diet. It is extensively documented in the medical literature that excess feeding of carbohydrates results in less body fat gain than excess feeding of dietary fat (1-13).

Endomorphs gain muscle more easily, but are naturally fat and have a hard time getting lean. They seem to be very sensitive to the carbohydrate content of the diet. Again, for weight gain the body must be in an energy surplus (excess calories) and the bulk of these excess calories should come from carbohydrates, because this results in less body fat accumulation than if the excess dietary energy is supplied as fat (1-13). However, during weight loss I found that these people do better if they reduce their carbohydrate intake. While ectomorphs need to maintain a high carb diet even while losing weight to help prevent muscle loss, endomorphs just can’t seem to lose all their fat without reducing carbs. They seem to be very sensitive to insulin, and high insulin levels block the burning of stored body fat for energy. (To be more precise, they usually have mild insulin resistance, which results in increased insulin levels and a hard time burning fat.) Just as an example, some representative numbers for an endomorph might look like this: For weight gain, 30-40% protein, 50-60% carbs, 5-10% fat. For weight loss, 50-60% protein, 30-40% carbs, 5-10% fat. Again, it’s not the actual percentages that are important, I’m just trying to illustrate the idea that you can shift around the structure of your diet to achieve different metabolic effects. Changing the ratio of protein to carbs to fat in your diet can have a big effect on the insulin-glucagon axis and nutrient partitioning.

On the Parrillo Nutrition Program you start by calculating your daily protein requirement. One to 1.5 grams of complete protein per pound of body weight each day is a good general guideline for hard training athletes, especially during weight gain. As you decrease calories to lose fat, it helps to increase this to as much as 1.5-2 grams per pound per day. The higher dietary protein intake helps prevent catabolism of muscle protein during energy restricted diets. Next you allot 5-10% of daily calories to come from fat. The remainder of your calories come from complex carbohydrates, which I divide into starches (potatoes, rice, beans, etc.) and fibrous carbs (vegetables and salad greens). You adjust carbohydrate intake appropriately so that you’re either gaining muscular weight or losing body fat, as desired. So when you structure your diet this way the percentages take care of themselves. The times when I cite various nutrient percentages as examples are merely to illustrate how the balance of your diet can change as you’re working to achieve different goals.

So I have found that reducing carbs does indeed help to promote fat loss, especially in people who have a hard time getting lean. I don’t have a problem with that. The thing I don’t like about the high fat diets is that dietary fat is VERY prone to be stored as body fat. I have literally dozens of research articles from the medical literature demonstrating this and explaining the biochemical reasons why. Several studies have even demonstrated that body fat percentage is more highly determined by dietary fat intake than by calorie intake (1,2,3,4,6,8,9,10). This is a concept I’ve been talking about for years. So my disagreement is not about reducing carbs – that works. My problem is with supplying so many calories as dietary fat. Not only does dietary fat contribute more to fat stores than protein or carbohydrate (1-13), but dietary fat (especially saturated fat) increases your cholesterol level and increases your risk for heart disease.

So how do we do the low carb diet at Parrillo? I’ve developed a very special energy supplement called CapTri® which allows you to utilize the power of the low carb diet without resorting to using regular fat as a food source. CapTri® is a specially engineered fat with a unique molecular structure which causes it to follow a different metabolic route than regular fats (14,15). It behaves more like a carbohydrate in the body, except that it doesn’t increase insulin levels. This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. This is very similar to the strategy of the high fat diets except without relying on conventional fat as an energy source. CapTri® has virtually no tendency to be stored as body fat, which is in marked contrast to regular fats (14,15). Regular fat is metabolized very slowly and is very easily stored as body fat. CapTri® is burned (converted to usable metabolic energy) very rapidly – in fact, as rapidly as glucose. This energy is used to fuel the body, which spares protein and glycogen. Since CapTri® is rapidly and completely used as fuel, this means it won’t be stored as body fat. (Of course, CapTri® does not defy the laws of thermodynamics, and if you eat too many calories too fast you will gain fat, even if you’re using CapTri®. The point is that CapTri® results in much less fat gain than conventional foods, because
Increasing aerobic exercise activity on the other hand has the benefit of burning fat without slowing metabolic rate. In fact, aerobic exercise causes metabolic adaptations that make the body more efficient at burning fat. In general, it is advised that weight loss be limited to about one pound per week. If you lose weight faster than this you will be more likely to lose some muscle along with the fat. Since one pound of body fat contains 3,500 calories, to lose one pound of fat per week you need to achieve a calorie deficit of 500 calories per day (3,500 per week). You could do this by cutting 500 calories worth of food from your diet, or by doing 500 calories worth of aerobics a day, or by some combination of both. I’ve found the combination approach works best for most people. Try not to cut your caloric intake by more than 10% below maintenance. (Your maintenance intake is the number of calories you consume everyday to maintain constant body weight.) A good rule of thumb is to reduce energy intake by 10% below maintenance and then do enough aerobics to meet your 500 calorie deficit for the day. For example, if you normally eat 2,500 calories a day, cut that down by 250 per day (10%) and do 250 calories worth of aerobics a day (that’s about 30 minutes on a stationary bike). That equals a deficit of 500 calories a day, enough to lose one pound of fat per week. This strategy is not an absolute rule carved in stone, but is a good general guideline that works well for most people. Other people do better simply by increasing aerobic exercise without reducing calories. With a little experience you’ll find what works best for you. If your weight loss plateaus it is better in general to do more aerobics rather than further reducing calories, because that will likely slow your metabolic rate and thus your rate of fat loss. From body composition studies (use the Parrillo BodyStat Kit) calculate how many pounds of fat you have to lose, and that’s roughly how many weeks your diet will last. If you need to lose more than 10 pounds of fat (the diet will last for more than 10 weeks) plan on taking a couple of weeks off your fat loss diet after every 10 weeks and gain a pound per week. This will help you put on some muscle and boost your metabolism and get fat loss going again. In general, it doesn’t work too well to maintain a continuous energy deficit for more than 10 weeks because your body adjusts to this new level of caloric intake and your metabolism slows down. This reduced level of intake will eventually become your new maintenance if you stay on it too long.

All right, so now we’ve decided to lose some fat and that we’re going to do more aerobics and very modestly reduce calories. Now you have some choices to make, and things can get complicated. We could simply reduce calories across the board – a 10% reduction in protein, carbs, and fat will obviously equal a 10% reduction in total calories. Or alternatively we could alter the ratios of protein, carbs, and fat in the diet. As you reduce caloric intake, you should supply relatively more of your calories as protein to prevent or reduce skeletal muscle catabolism. So your reduction in energy intake should come from carbs or fat, but not protein. As we’re dieting to lose fat we still need at least one gram of protein per pound of body weight each day, and 1.5 grams may be better. Once you’ve decided on your protein intake the question then becomes should you supply the remainder of your dietary energy requirement as carbohydrate, fat, or some combination of both. Any of these approaches will result in weight loss, provided you maintain your caloric deficit. Which approach will work best?

The VAST majority of medical research indicates that a low fat diet achieves better fat loss results than a high fat diet (1-13). Several studies even show that reduction of dietary fat content is as important, if not more important, than reducing caloric intake. Notably, and in fairness to the high fat diet, I have not seen any formal medical studies using diets comprised of approximately 70% fat and essentially no carbs. I imagine doctors are reluctant to carry out clinical trials using a diet so high in fat out of concern for it’s attendant health risks. Most of the medical clinical trials comparing diets still include a significant carbohydrate load even in their “high fat” protocol, so they’re not really comparable to the extremely high fat – low carb diets which are currently being advanced for bodybuilders.

So what’s going on here? By reducing carbs to near zero levels (5-10% of calories per day) insulin production decreases dramatically. This eliminates its inhibitory ef-
ffect on lipolysis. Human body fat is stored in the form of triglycerides in fat cells (adipocytes). Release of fatty acids from fat cells is controlled by enzymes called lipases, which break down the triglyceride into free fatty acids and glycerol. Once released from fat cells, the fatty acids are bound to a serum protein called albumin and transported in the blood to the liver and muscles where they are used for energy. The lipases are activated by the catecholamines epinephrine and norepinephrine (adrenaline and noradrenaline) which are released by the adrenal glands and the sympathetic nervous system. The most important activator of lipolysis is release of norepinephrine by the sympathetic nervous system. Lipolysis turns out to be the rate limiting step in fat catabolism. (The rate limiting step in a metabolic pathway is the slowest step, which acts to limit the rate of the overall pathway. It also is frequently the key point of metabolic control for turning the pathway on or off.) The catecholamines, in turn, are released when blood sugar gets too low and during exercise. Another lipase is activated by glucagon, which also promotes fat burning. Glucagon is a hormone produced by the pancreas which has essentially the opposite actions of insulin. Insulin promotes glucose transport into cells, promotes the use of glucose as energy, promotes storage of excess glucose as glycogen, promotes transport of some amino acids into cells, promotes protein synthesis, promotes fat synthesis and storage, and prevents fat breakdown. Insulin is released from the pancreas when blood glucose levels are high, such as after a meal, and acts as a storage hormone promoting storage of nutrients as glycogen, protein, and fat. Glucagon is released when blood sugar levels are low, with the primary purpose of increasing blood glucose levels to provide fuel for the brain. Glucagon stimulates breakdown of glycogen and release of glucose into the bloodstream, fat breakdown (lipolysis) and release of fatty acids into the blood (this use of fat as energy helps spare glucose for the brain), and protein breakdown with release of amino acids into the bloodstream which can be converted into glucose by the liver.

So lipolysis and the use of stored body fat for energy is controlled by lipases which are in turn stimulated by catecholamines and glucagon. Glucagon turns out to be a minor player since virtually all of the glucagon released by the pancreas is retained by the liver, and essentially none escapes into the general circulation to reach peripheral fat depots. (The small amount of glucagon which reaches adipose cells is too low in concentration to have an effect.) So glucagon is primarily concerned with glycogen and fat metabolism in the liver. These same lipases that govern fat loss are inhibited by insulin, which means if insulin levels are high you won’t be able to use body fat for energy. The high fat diets take this strategy to the extreme by virtually eliminating carbohydrates from the diet in order to minimize insulin levels. The body can only store enough glucose (as glycogen) to last about one day, so by eliminating carbs from the diet you force the body into a fat burning mode.

Our discussion is far from over. Next month I’ll dig deeper into these diets and show you why I believe bodybuilders who want the best results possible should be eating a low-fat, moderate- to high-carb diet.

References

As I mentioned in Part I of this series last month, any energy deficient diet will result in fat loss. So the high fat diet will work for weight loss, providing you eat fewer calories than you burn (it has to). The biggest problem comes during weight gain. There are several big theoretical problems with using the high fat approach for weight gain. First is the fact that insulin is the most important anabolic hormone in the body, and on these cyclic diets we only get the benefit of insulin around two days every week. Second is that during energy excess (that is, during weight gain) excess dietary fat is preferentially stored as body fat. There is no biochemical pathway in the human body for converting fat into carbohydrate, so excess dietary fat cannot be stored as glycogen. Fatty acids cannot be incorporated into protein either. Possibly the carbons derived from fatty acid metabolism could be used to build the carbon skeleton of nonessential amino acids, but since fatty acids do not contain nitrogen, a nitrogen from the pre-existing amino acid pool would have to be donated to form a new amino acid molecule. Therefore, net protein synthesis cannot occur from fat. Thus, dietary fat really has only two quantitatively significant metabolic fates: to be used as energy or be stored as body fat. (Of course, dietary fats are also used to form structural components of cell membranes, steroid hormones, eicosanoids, and many other extremely important biologically active molecules, but this accounts for only a tiny fraction of ingested fat, especially during a high fat diet.) Since dietary fat cannot be converted to protein or glycogen, excess dietary fat can only be stored as fat. By definition, during weight gain we must be in a calorie surplus. This means that not all of the ingested fat can be burned as fuel, since we are by definition consuming an excess of fuel. To gain weight you must consume more calories than you expend (simple thermodynamics) and if those excess calories are supplied in the form of dietary fat, then it seems inescapable that they must be stored as fat.

So where have we come so far? The high fat-low carb approach has a good theoretical basis for working to maximize fat loss while on an energy deficient diet, but would be expected to result in fat gain during an energy surplus. This leads to a general principle in bodybuilding nutrition: Diet composition is more critical during weight gain than weight loss. During weight loss, you will be in an energy deficit. Over a 24 hour period essentially all of the fat and carbs you eat will be burned as fuel. The protein that you eat will be used to maintain protein tissue and to replenish worn out enzymes and other protein cellular components (that is, for protein turnover). Any extra dietary protein left over will also be used as fuel. Finally, body fat will also be used as fuel to supply whatever amount of expended energy was not supplied by the diet. So when you’re in an energy (calorie) deficit, it does matter that you get enough protein, but after that the preeminent consideration is just how much energy you consume. As a first approximation, it appears as if it doesn’t matter that much if you supply the rest of the energy as carbs or fat or some mixture of the two, because it’s all going to be burned anyway. (Actually, it does matter, but I’ll get to that later.) So during weight loss all of the food you eat will be burned for fuel, and none of it will be retained by the body (except some protein). During weight gain, on the other hand, diet composition is everything. As explained above, if you consume excess energy in the form of (conventional) dietary fat, it is extremely prone to be stored as body fat (1-13). Although I’ve had good success with low carb diets to lose fat, I’ve never had good results from low carb diets in terms of gaining muscle. I think you need insulin, which seems to have a synergistic interaction with growth hormone and testosterone, to get a good anabolic effect.

Now back to the issue of diet composition during weight loss. Like I said above, after meeting your protein requirement the next most important thing is how many calories you consume. You will lose weight regardless of how those calories are supplied so long as you maintain an energy deficit. But not all weight loss is created equal. Really we’re not interested in weight loss per se but in fat loss, and we want to preserve as much muscle during the diet as possible. Serious bodybuilders carefully follow their body composition (using a tool such as The Parrillo BodyStat Kit) during their diets to make sure they’re losing fat and not muscle. Adjustments are made along the way to keep things moving in the right direction. While diet composition has only a minor effect on overall weight loss, it has a more substantial effect on determining how much of that weight is fat versus muscle. What we’re trying to do here is prevent muscle loss. In my experience with bodybuilders, carbs work better than fat to spare protein (the technical term for preventing the use of protein as fuel) during energy restricted diets. In other words, both ap-
proaches (the high fat diet and the higher carb diet) work in terms of losing fat, but the higher carb diet results in less muscle loss during the diet. Overall, you end up leaner (lower percent body fat) because you have more lean body mass remaining after you’ve lost the fat. Why is this? The biochemistry is fairly straightforward. The brain’s preferred fuel is glucose, and your body will go to extraordinary measures to provide glucose for the brain. (After several days of glucose deprivation, the brain can adapt and switch over to use ketones as fuel, but this is not its preferred choice.) Following a very low carb diet, liver glycogen stores are depleted in about a day or two. (Note: muscle glycogen can only be used as fuel by the muscle, and cannot be released back into the bloodstream for use by the brain. Muscle cells lack the glucose phosphatase enzyme needed to release glucose stored as glycogen back into the blood. Therefore, only liver glycogen is available to help maintain blood glucose levels.) Therefore, after a day or so of severe carb depletion blood glucose levels begin to fall. Unfortunately, fatty acids cannot be converted to glucose by humans (although bears can, and this is why they can hibernate). The body has another way of maintaining blood glucose levels, however, and this is to break down skeletal muscle protein (and visceral, or organ, proteins too, for that matter). The muscle proteins are broken down into their constituent amino acids, the amino group is then removed forming an alpha-keto-acid, and these “carbon skeletons” of amino acids are transported to the liver which can use them to make glucose. To sum up, if you use a low fat-moderate carb diet to lose weight your body doesn’t have to break down muscle to convert amino acids into glucose, because you’re getting enough glucose in the diet. If, however, you use an extremely low carb diet you will necessarily break down some muscle. This catabolic process is reduced during ketosis, but it takes about two days or so of carb restriction to get into ketosis. So there will be two days during every seven day cycle when you’re breaking down muscle.

Another problem with the very low carb approach is that energy levels fall dramatically. Recall that anaerobic exercise, such as weight lifting, is fueled almost exclusively by carbs. Fat cannot be used as an anaerobic energy source, it can only be oxidized aerobically. Therefore strength and energy levels fall dramatically without carbs. This results in more muscle catabolism, as the muscles turn to branched chain amino acids as fuel.

Recall that anaerobic exercise, such as weight lifting, is fueled almost exclusively by carbs. Fat cannot be used as an anaerobic energy source, it can only be oxidized aerobically. Therefore strength and energy levels fall dramatically without carbs. This results in more muscle catabolism, as the muscles turn to branched chain amino acids as fuel.

There are also several technical aspects of energy metabolism that suggest severe carb restriction might not be the best way to go. Low carbohydrate diets have been found to reduce thyroid hormone level, which is one of the chief controllers of metabolic rate. After a period of carbohydrate restriction (probably on the order of several weeks to a couple of months) you will likely find your weight loss plateaus. This is probably due to decreased thyroid level and decreased metabolic rate. The only real cure for this (besides taking thyroid medication) is to increase calories and add some carbs back to your diet. Unfortunately, since your metabolic rate is slow and your thyroid hormone level is low, when you do this your body is primed for fat storage and you’ll likely put on a few pounds of fat. Also, there’s the issue of thermogenesis. After you eat a meal some portion of the dietary energy is released as body heat. This process is called diet-induced thermogenesis (DIT) and the amount of heat energy released is called the thermic effect of feeding (TEF). Protein and carbohydrate both have a significant thermogenic effect, but (conventional) dietary fat has virtually no thermogenic effect. Carbohydrate feeding stimulates the sympathetic nervous system which increases metabolic rate. What this means is that for a given level of energy intake (caloric consumption) more of the food energy will be given off as heat if you eat a high carb diet as compared to a high fat diet. With the high fat diet less of the food energy is lost as heat, leaving more available for use as fuel (or even worse, for storage as body fat). If more dietary energy is available for use as fuel, then you’ll burn less body fat as fuel. Energetic and metabolic considerations explain why most people get better results using a higher carb diet.

So are there any useful lessons we can learn from this? You bet there are, some very important ones that can propel you to the next level of physique development. First off, notice that it’s not the carbohydrates themselves that make fat loss more difficult, but rather the insulin release they induce. Insulin inhibits lipolysis, not carbs per se. Therefore, by proper food selection and meal structuring we can do a lot to reduce insulin levels and still be able to eat some carbs. First off, avoid all simple sugars, including not only refined sugar and sweets but also foods that contain natural sugars such as fruit, juice, dairy products, honey, and syrup. Limit your carbohydrate selections to natural, unrefined, complex carbohydrates such as potatoes, rice, and vegetables. Avoid refined carbohydrates such as bread and pasta. Always consume your carbs with protein, and make sure to eat plenty of fibrous carbohydrates, such as broccoli, cauliflower, asparagus,
green beans and other salad vegetables, along with your starches. These measures dramatically slow the rate of release of glucose into your bloodstream, which helps keep insulin levels low. Eat many small frequent meals instead of a few big ones, for the same reason. Also, as you get leaner gradually consume less starches and more vegetables. Start by eliminating starch from your last meal of the day. During the last week or two you may virtually eliminate starches, but you can still eat vegetables.

So does the high fat-low carb approach have anything going for it? You bet it does. The strategy of reducing carbs to lower insulin and stimulate fat burning really works. I’ve used this approach myself and it works very well, especially with endomorph type people who have a hard time losing fat. Like I said in the beginning, my point is not to insult the authors of the high fat diets. But there are theoretical reasons having to do with energy metabolism, thermogenesis, endocrinology, and protein catabolism (see above) which explain why reducing carbs too much is not a good idea. The ideal approach would be if we could combine the best aspects of both diets to generate something even better. Technology has made this possible, with the development of CapTri®. CapTri® is a specially engineered fat, and by incorporating it in the diet in place of starchy carbohydrates we can lower insulin levels and achieve the fat burning effect of the high fat diets. It’s unique molecular structure overcomes the problems of conventional dietary fats, making it the ideal energy source for bodybuilders. For example, CapTri® has virtually no tendency to be stored as body fat (14,15). It is metabolized in the liver where it is converted to ketones which then are used as fuel by muscles (14,15). It has a very high thermogenic effect and is converted into energy much more readily than regular fat. Since it is rapidly used for energy it has very little tendency to be stored as body fat. CapTri® is converted into ketones, which block protein catabolism. In fact, CapTri, unlike other fats, can be digested and converted into ketones even when there are ample carbs already in the system. In short, CapTri® allows us to reap the benefits of the high fat approach without the problems that go along with conventional dietary fat.

To use CapTri® during fat loss, keep your protein intake high at about one to 1.5 grams per pound of body weight per day, then reduce carbohydrate intake and provide an equivalent number of calories from CapTri®. For example, if you normally consume 300 grams of carbs per day (1200 calories worth), reduce that to 150 grams per day and add 5 tablespoons of CapTri® per day (providing 570 calories). A good way to gauge how far to reduce carbs is to gradually decrease them until you find that you lose your pump about one-half to two-thirds of the way through your workout. This means that glycogen stores are depleted, and this is where you want to be for maximum fat loss. The CapTri® diet allows you to reduce carbs without cutting calories, which would slow your metabolism and cause muscle loss. Many people find they don’t need to reduce caloric intake below maintenance while using this regimen since the thermogenic effect of CapTri® provides a “built in” energy deficit (more of the dietary energy contained in CapTri® is lost as body heat than for regular foods). This approach allows you to reduce carbs without having to use regular dietary fat as an energy source. I have a problem going as low in carbs as the other diets recommend. I think you should eat some carbs so you can continue to perform intense training while you diet. Plus, if you’ve ever tried the near-zero-carb diet you know that it makes you feel like death. By reducing carbs and always combining your starches with protein, vegetables, and CapTri® at each meal, you will dramatically reduce insulin levels and maximize fat loss. Unlike conventional fats, CapTri® also works well during weight gain because it doesn’t contribute to fat stores (14,15). The Parrillo Performance Nutrition Manual contains much more detailed information about how to design your diet for maximum muscle gain and fat loss. If you want more information on CapTri® call and request our CapTri® Technical Reports.

I expect over the next few years drugs will become relatively less important in bodybuilding and precision nutrition and supplementation will become more important. The next generation of CapTri® will undoubtedly help propel tomorrow’s competitors to the next level.

References


4. Hill JO, Peters JC, Reed GW, Schlundt


You already know that using CapTri is a great way to lose fat and get in shape. What you may not know is how to use CapTri to improve sports performance. In the most basic sense, sports performance is about muscle power output. The ability of a muscle to produce power is limited by its available fuel supply. Specifically, muscle power production is closely related to carbohydrate availability. There is a close correlation between muscle glycogen depletion and muscle exhaustion. The problem is, your body can only store so much glycogen. When it’s used up, you “hit the wall,” as endurance athletes understand all too well.

For all but the most relaxed of exercises (such as walking), carbohydrates is the muscle’s preferred fuel substrate (energy source). Muscles can in fact use carbohydrate, fat, and amino acids as fuel, but these different fuel sources are not equally effective. Carbohydrate can be stored as glycogen right inside the muscle and is immediately available for use as fuel. For brief periods of time (one or two minutes) carbohydrates can be utilized to provide energy without the benefit of oxygen. This is known as “anaerobic metabolism,” and can provide short bursts of energy for very intense exercise activity, such as weight lifting. Fats play an important role in energy production during prolonged exercise. However, there are two problems with fat as an exercise fuel. First, fat requires oxygen to be converted into energy - there is no anaerobic metabolism of fat. This means that the rate of energy production from fat is limited by the rate of oxygen delivery to muscles. Second, your muscles can store relatively little fat inside them, so before fatty acids can be burned by muscles they have to be imported from somewhere else. You may have noticed that most fat in humans is stored around the waist and hips, not inside muscles (too bad). This means that fatty acid utilization is also limited by delivery of fatty acids to muscles. The slowest step in transporting fatty acids from your waist to your muscles is the initial release of fatty acids from fat cells in adipose stores. This is a relatively slow process and only occurs at a significant rate when carbohydrate energy stores are already depleted. Before much fat is released from adipose tissue, blood sugar levels must drop, causing a decrease in insulin and an increase in glucagon and catecholamines. The catecholamine norepinephrine (a cousin of epinephrine, or adrenaline) is released from sympathetic nerve endings around fat cells and is the most potent stimulus for fatty acid release.

Obviously, fatty acid utilization is a complicated process and is relatively slow. Fatty acids can supply energy fast enough to keep up with the demands of walking or a slow bike ride, but any exercise more intense relies mainly on carbs as the primary fuel source. Your muscles can also use their own amino acids as fuel (God forbid) but this is a real last resort. After glycogen stores are essentially depleted and fatty acid metabolism is in high gear, amino acid metabolism kicks in to supply a little extra energy. During a long run, amino acid oxidation can account for up to 5-10% of energy substrate, which equates to about 50 grams of protein. This is undesirable (to make the understatement of the year).

Weight lifting is an anaerobic exercise which relies almost exclusively on carbohydrate as an energy source. (This is one reason the high fat - low carb diet doesn’t make much sense to me.) Simply put, fatty acid metabolism is just too slow to meet the energy demands of resistance training. Similarly, intense endurance exercise is also limited by carbohydrate availability. Time to exhaustion in endurance exercise is closely related to muscle glycogen depletion. When an endurance athlete runs out of glycogen he doesn’t have to stop, but he will slow down dramatically.

Weight lifting is an anaerobic exercise which relies almost exclusively on carbohydrate as an energy source. (This is one reason the high fat - low carb diet doesn’t make much sense to me.) Simply put, fatty acid metabolism is just too slow to meet the energy demands of resistance training. Similarly, intense endurance exercise is also limited by carbohydrate availability. Time to exhaustion in endurance exercise is closely related to muscle glycogen depletion. When an endurance athlete runs out of glycogen he doesn’t have to stop, but he will slow down dramatically. The primary role of fat as an exercise fuel is to allow athletes to complete prolonged workouts. It does this by reducing the rate of glycogen utilization by muscle and thereby delaying the onset of exhaustion (1). In other words, an increased supply and oxidation of fatty acids will slow the rate of glycogen depletion and improve endurance.

The question is, how do we deliver greater amounts of fatty acids to muscle during exercise? Fatty acids stored in body fat tissue don’t work very well for this purpose. As explained above, these
fats are not released from body stores to a significant degree until carbohydrate reserves are substantially depleted. Obviously, this won’t help since what we’re trying to do is slow the depletion of body carbohydrate stores in the first place. Another approach is to consume a high fat diet. Believe it or not, this has been tried and is called “fat loading” (2). As you might imagine, it doesn’t work very well, unless your idea of fat loading is just to get fat. Apparently conventional dietary fat is digested and absorbed too slowly to really be of much help. The answer is to supplement the diet with medium chain fatty acids. These special fats are digested and absorbed much faster than regular fat, in fact as fast as glucose (1,3). The rapid absorption and metabolism of MCFAs (includes MCTs) provides an energy substrate that can effectively spare glycogen and delay the onset of fatigue during prolonged intense exercise.

Glycerol is a small three carbon compound which can bind fatty acids, one fatty acid to each of it’s carbon atoms. When long fatty acids (16-18 carbon atoms in length) are bound, this is called a long chain triglyceride (LCT). Everyday vegetable oils are long chain triglycerides. If medium chain fatty acids (8 to 10 carbon atoms in length) are bound, this is called a medium chain triglyceride (MCT). Conventional fats (LCTs) are very insoluble in water. This makes them hard to digest and transport. Inside the intestine, long chain triglycerides are cleaved from their glycerol backbone by an enzyme called pancreatic lipase. The long chain fatty acids (LCFAs) are then bound by bile salts (produced by the liver and stored in the gallbladder) for transport through the intestine. When you eat long chain fats they are not released directly into the bloodstream. Once absorbed inside an intestinal cell, the LCFAs are re-bound to glycerol to re-form LCTs, which are then bound by proteins to make tiny particles called chylomicrons. The proteins act like detergent to make the fat more water soluble. The chylomicrons are released into the lymphatic system, another system of vessels in the body separate from the circulatory system. From there the lymphatic system delivers the chylomicrons to the bloodstream via the thoracic duct, which is located on the right side of your neck not far from your spine. The long chain fats are then circulated throughout your body by the bloodstream. Most of these fat molecules are absorbed by fat cells and stored there. A few are delivered to muscle for use as fuel. This is a long complicated metabolic process that takes a long time. Importantly, please notice that the metabolic pathway followed by LCTs ends up by delivering them to fat cells for storage. Thus the old saying “fat makes you fat.”

Medium chain fatty acids (MC-FA)s skip this whole process. Since they are smaller fat molecules they are more water soluble and are therefore easier for the body to process. MCTs are released directly into the bloodstream by intestinal cells, without the need to be incorporated into chylomicrons and carried in the lymphatic system. Nutrient-rich blood leaving the intestine is carried directly to the liver by the portal vein for processing. The liver absorbs almost all of the MCTs from the portal blood and rapidly metabolizes them into ketone bodies. Ketone bodies are very small (two to four carbon atoms) molecules which represent partially broken down fatty acids. The ketone bodies are released from the liver into the bloodstream and are carried to muscles where they are immediately used for energy. This additional energy substrate (MCFA-derived ketone bodies) actually spares glucose oxidation. This delays glycogen depletion and the onset of muscular fatigue.

The process of MCT digestion, absorption, conversion into ketones, and transport to muscle takes place very rapidly. In fact, energy from MCFAs is available as fast as from glucose itself (1,3). This makes MCFAs the ideal energy source for athletes trying to push the envelop of endurance. Notice two other things that make CapTri the ideal fuel for athletes. First, CapTri is not delivered to fat cells for storage. As amazing as it sounds, medium chain triglycerides are not stored as fat. Instead they are preferentially burned as fuel. Does this mean you have “carte blanche” to eat as much as you want, and you won’t get fat as long as you poor some CapTri on top of your food? Of course not. Too many calories will make you gain fat. The point is that conventional fats are preferentially stored as fat (that’s the natural result of the metabolic pathway they follow) whereas CapTri is preferentially burned as energy. This means that if you eat a clean diet which includes CapTri you will find it very difficult to gain fat. It’s harder for your body to store CapTri as fat than it is to convert carbohydrate into fat. Between conventional fat, CapTri, and carbohydrate, CapTri has the least tendency to be stored as body fat. For any given level of caloric intake, you will have less body fat the more CapTri you are using.

The other fact that makes CapTri the ideal energy supplement for athletes is that MCFAs don’t require the carnitine shuttle for transport inside mitochondria. Mitochondria are the power plants inside cells where food molecules are burned to produce cellular energy. Regular fat molecules have to be carried inside the mitochondria by the carnitine shuttle. The problem is, the carnitine shuttle is not very active until carbohydrate stores are significantly deplet-
Energy Channeling For Ultimate Sports Performance

ed. Carbohydrate metabolism generates a metabolite called malonyl-CoA which inhibits the activity of the carnitine shuttle. Therefore, utilization of conventional fats is severely limited at two places: the release of fatty acids from fat cells and the entry of fatty acids into mitochondria are both inhibited by carbohydrate. This is why regular fats don’t work very well to spare glycogen and improve endurance. Regular fats can’t be used as a significant energy source until the carbs are already used up, and then it’s too late. CapTri bypasses both of these limitations.

While a great deal is known about MCFAs and exercise performance, there has been a limited amount of experimental data in humans to back it up. Until now. A study was performed using six normal subjects who exercised at 40% VO2 max for 60 minutes or 80% VO2 max for 30 minutes on two different occasions (1,4). (VO2 max describes exercise intensity in terms of percent of maximal oxygen consumption.) Either a LCFA or a MCFAs was infused during the study. Using radioactive tracer techniques, the authors were able to calculate the percent of LCFA or MCFAs oxidized (burned) during the exercise. Total free fatty acid concentration was kept the same between the two trials. When the exercise intensity was increased from 40% to 80%, the oxidation of LCFA remained unchanged, while MCFAs utilization increased significantly. It was concluded that entry of LCFA into the mitochondria is limited (presumably by the carnitine shuttle) so that oxidation of LCFA cannot keep up with the increased energy demands of high intensity exercise. On the other hand, MCFAs are readily oxidized more rapidly as energy demand increases. This is exactly what I have been saying for years.

Another study looked at the effects of MCFAs on carbohydrate metabolism and cycling performance (1,5). Six endurance trained cyclists rode at 60% peak VO2 for 2 hours and then performed a 40 km time trial on a laboratory cycling ergometer at 70-90% max on three separate occasions. Subjects drank an exercise drink consisting of glucose alone, glucose + MCFAs, or MCFAs alone. The authors found that the carbohydrate + MCFAs drink significantly improved cycling performance compared to either glucose or MCFAs alone. As expected, MCFAs ingestion reduced glucose oxidation during the 2 hour pre-ride at 60% VO2 max, suggesting that the improvement in performance resulted from sparing of muscle glycogen by MCFAs. Again, just what we expected.

These studies demonstrate three things about MCFAs and sports performance. First, MCFAs apparently work to improve performance by “sparing” muscle glycogen, thereby delaying the onset of fatigue. Second, the effect of MCFAs appears to be greatest during high intensity exercise. During low intensity exercise conventional fats appear to function adequately as an energy source. Third, the effects of MCFAs are likely to be more pronounced near the end of long endurance events (or at the end of long workouts for bodybuilders). This makes good sense, because at the beginning of the race depletion of glycogen reserves is not a threat anyway.

What are some specific recommendations for how to use CapTri to improve athletic performance? First off, don’t wait until the day of an athletic competition and then chug a bottle of CapTri right before your event. Big mistake. You’ll puke and have diarrhea. At the same time. Not good. You need to start using CapTri several weeks out at a minimum, and a few months out would be better. Introduce CapTri into your system slowly, say one-half tablespoon per meal. Mix it with your food and don’t take it by itself on an empty stomach. After a few days, increase your usage by one-half tablespoon per meal. Continue this until you build up to two to three tablespoons with each meal. Take a few days off from training before a competitive event and eat some extra carbohydrates (about 100 grams extra per meal). This will saturate your glycogen stores. The day of your event eat a complex carb for breakfast (oatmeal is probably ideal) along with one to two scoops of Hi-Protein Powder and three to four tablespoons of CapTri. This is probably the perfect pre-event meal. If you don’t like competing with a full stomach, another approach which works quite well is to combine Pro-Carb Formula and CapTri to make a drink. Use one scoop Pro-Carb to one tablespoon CapTri. I’m not kidding, this combination is really quite remarkable. This makes a fantastic pre-workout drink for bodybuilders as well as a pre-event drink for endurance athletes. Finally, perhaps the most popular approach is the Parrillo BAR. It combines CapTri with a medium chain glucose polymer along with a high-efficiency protein source.

If you’re serious about sports performance, you owe it to yourself to experiment with these nutritional techniques. This is cutting edge stuff, which is just beginning to appear in the scientific

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literature. We’ve been developing these techniques over the last few years, and I think you’re going to hear a lot about it in the future. Endurance performance is limited largely by glycogen substrate availability. MCFAs allow us to channel an energy substrate directly to working muscle to spare glycogen and delay fatigue. This means improved performance - Parrillo Performance.

References


Attention to Detail
by John Parrillo

Iron is required to build hemoglobin, the protein in red blood cells responsible for transporting oxygen to working muscles. Iron deficiency is the most common nutritional deficiency in the world, and is even more prevalent in athletes. Many children and adults have inadequate iron intakes. Only about 10% of dietary iron is absorbed. The form of iron found in red meat and liver is called heme iron and is more efficiently absorbed. Iron deficiency can lead to anemia, a condition where the body does not make enough hemoglobin. This results in decreased oxygen carrying capacity of the blood and impairs exercise performance. Athletes have a higher incidence of iron deficiency and anemia than the general population. Iron supplementation, especially in the form of heme iron, can correct iron deficiency and improve exercise performance.

Introduction

It’s been several years since I’ve talked about iron supplementation. Vitamins and minerals aren’t very glamorous, and nobody really gets too excited about them. They are however very important and should form the core of any supplement program. Iron deserves special attention because athletes are at increased risk for iron deficiency, and this can compromise exercise performance. What you need to know is not too complicated: take an iron supplement, preferably one made with heme iron. Alternatively, you can eat a lot of red meat, if you don’t mind the fat, or you could eat a lot of liver, if you don’t mind barfing.

Iron Requirements and Iron Deficiency

Daily iron losses by the adult male average about 1.0 mg per day. Losses through menses increases the iron requirements of women to about 1.4 mg per day. The amount of iron absorbed from food averages about 10%, so that means men need to consume 10 mg and women 14 mg per day.

When a person absorbs less iron than is lost, iron deficiency will result. If left uncorrected, this will eventually progress to anemia. Without enough iron, the body cannot manufacture enough hemoglobin. If you look at anemic blood in a microscope, the red blood cells are small (microcytic) and pale (hypochromic) because they don’t contain enough hemoglobin. This condition reduces the oxygen carrying capacity of the blood. In order to meet the oxygen consumption demands of exercising muscle, the heart has to pump harder and faster to supply the tissues with a larger volume of oxygen-poor blood. (Since anemic blood contains less oxygen, the heart tries to compensate by pumping a larger volume of blood per minute.) During maximal exercise capacity the heart is already producing maximum cardiac output, so oxygen delivery is ultimately compromised (the heart can only compensate so much). This in turn puts an upper limit on exercise capacity.

How would you feel about training like a demon for six months, or longer, and being absolutely strict on your diet, only to have the top shaved off of your performance by less than optimal oxygen delivery? You thought you were doing everything right. Attention to detail is what separates first and second place. You think this is a rare problem and that you don’t have to worry about it? Hardly. At least 11 studies have looked at iron deficiency in athletes (these are summarized in reference 1). I took the results of these studies and averaged them. According to these studies, 35% of female athletes and 10% of male athletes are iron deficient.

There is no question that iron deficiency anemia has a significant negative effect on oxygen uptake and exercise capacity (1). During maximal exercise, cardiac output cannot increase to compensate for reduced oxygen transport (1). That is, the heart is already at maximum output and cannot compensate any further.

Iron deficiency and Performance
There is no question that iron deficiency anemia has a significant negative effect on oxygen uptake and exercise capacity (1). During maximal exercise, cardiac output cannot increase to compensate for reduced oxygen transport (1). That is, the heart is already at maximum output and cannot compensate any further. No one questions the reality of this effect. In fact, some endurance athletes use “blood doping” to improve exercise performance. This practice involves transfusion of blood one or two days prior to an event to increase hemoglobin concentration to above normal levels. A more sophisticated approach is to use erythropoetin. Erythropoetin is a hormone manufactured by the kidneys which stimulates the bone marrow to produce more red blood cells. Recently the gene for erythropoetin has been cloned and the hormone can now be produced in vitro (in a lab) and is available for use as an injectable drug.

What about mild iron deficiency which has not yet progressed to the extreme of frank anemia? Iron is required not only in hemoglobin, but also in myoglobin (an oxygen transport protein in muscle cells) and in several enzymes (including the cytochromes and others) which are involved in energy production. In one study, rats were made anemic by feeding them an iron deficient diet and then the anemia was corrected by blood transfusion. These rats still had decreased exercise capacity even though their anemia had been reversed, demonstrating that iron deficiency can negatively affect exercise performance in the absence of anemia (1). These iron deficient rats were found to have reduced enzyme activities in the energy producing pathway compared to normal rats. Studies in iron deficient humans have demonstrated that a loss of 2 days of iron supplementation therapy can reduce heart rate during exercise, presumably by increasing oxygen carrying capacity of the blood and thus reducing the work required by the heart to supply oxygen to the body (1). Furthermore, iron deficient adults also have higher blood lactate levels following maximal exercise than subjects with normal hemoglobin concentrations (1). Lactate is a product of anaerobic metabolism, indicating that these individuals were not delivering enough oxygen to working muscles, or were not able to optimally produce energy from oxygen. So it appears that even mild iron deficiency which has not progressed to the point of anemia can also impair exercise performance.

**Dietary Iron**

Dietary iron sources are usually divided into two general categories: heme iron and nonheme iron (1). “Heme iron” is iron which is already bound to heme - the red pigment in hemoglobin. Good sources of heme iron are red meat and liver. White meat chicken and turkey breast also contain heme iron, but in lower amounts (2). The form of iron found in plants and conventional iron supplements (ferrous sulfate) is not incorporated into heme and is therefore called “nonheme iron.” Iron from red meat and liver, in the form of heme iron, is much easier for your body to absorb (1-4).

Iron deficiency is associated with vegetarian diets (1). Some vegetables such as beans, corn, and spinach contain a significant amount of iron. Unfortunately, iron from vegetable sources is poorly absorbed (1). For example, while spinach is relatively rich in iron, only 1.4% of iron from spinach is absorbed. Red meat provides much higher amounts of iron per serving than vegetable sources (2). And liver is an even better source of iron than red meat. Furthermore, the iron from red meat and liver - heme iron - is much easier for your body to absorb (1-4). About 15-35% of iron from red meat and liver is absorbed (1,2). The higher iron content of these foods, plus the greater bioavailability of heme iron, makes red meat and especially liver much better dietary iron sources. About 2-8% of nonheme iron is absorbed, depending on the composition of the meal (1). Heme iron is chelated (ionically bound) to a special carrier molecule called a porphyrin, which is in turn bound to the protein hemoglobin. This complex improves iron absorption by the gut to around 15-35% (1). This makes it around 4 times more efficient (on average) as an iron supplement. Obviously, heme iron is the way to go.

**Effects of Iron Supplementation**

It has been extensively proven in many studies that iron supplementation will improve exercise performance in iron deficient anemic athletes (1). Studies of iron supplementation in iron deficient but not anemic individuals have yielded mixed results, some showing improvement and some showing no effect. The studies showing no effect were likely performed using subjects whose iron deficiency had not yet progressed to the point of impaired performance. “Iron status is a common cause of decreased exercise performance in humans, especially in women...It is strongly recommended for serious athletes, those whose performance has reached a plateau, and female endurance athletes to seek medical consultation for determination of iron status. If deficient in any way, iron repletion by dietary manipulation and/or iron supple-
mentation is wise.”

This is a direct quote from reference 1. (I couldn’t have said it better myself.) The lab tests you’ll need include a CBC (complete blood count), an iron level, ferritin level, and iron binding capacity. These tests are necessary to diagnose anemia and to prove whether or not the anemia is due to iron deficiency. The doctor’s office visit will cost about $40.00 and the lab tests will cost about another $200.00 (give or take). While this is the scientific way to go, it turns out to be cheaper just to buy the iron supplement and give it a try. Unless you suspect some medical problem, this is what I generally recommend. You’ll need to give it a trial of about three months to see if it works for you.

What is “Sports Anemia?”

Sports anemia is induced by exercise training - endurance athletes are especially at risk (2,3). Many times, sports anemia is not associated with a true iron deficiency. Skeletal muscle fibers are damaged during intense exercise training and this damage must be repaired during the recovery period following exercise. If dietary protein intake is inadequate, the body will draw on red blood cells, hemoglobin, and plasma proteins as a source of protein to repair the muscles (2,3). If protein intake is limited, repair of muscle tissue may soak up all of the incoming protein and not leave enough left to rebuild new red blood cells at the normal rate. Increased protein intake may be effective in treating sports-induced anemia (2,3). Often times, an athlete experiences a decrease in red blood cell count and serum iron levels during the early phase of training. This could be due to the fact that aerobics training causes an increase in myoglobin (an oxygen carrying protein) and cytochrome content of muscle tissue and the protein and iron required for their formation could be obtained from destruction of red blood cells. In other words, myoglobin (in muscle) may be increased at the expense of hemoglobin (in blood) if protein intake is inadequate.

In summary, sports anemia is a form of anemia seen in hard training athletes who are often not iron deficient. Even though they are getting enough iron, they become anemic do to chronic protein deficiency (2,3). You can’t build blood cells without protein.

What Should I Do?

The best iron supplement is one made from heme iron, because this is much more efficiently absorbed (1-4). The only type of supplement made using heme iron is desiccated liver. Parrillo Performance Liver Amino is made using a special extraction process which removes all of the fat and cholesterol which is found in liver. This is really the only way to get heme iron in a significant amount without getting a boatload of fat along with it. We’ve added a special protein to improve it’s amino acid profile, making Liver Amino a source of high efficiency protein as well as heme iron. There is no other product like it on the market. It is also fortified with dibencozide, a superior form of B-12 which is better absorbed. It also contains other cofactors involved in blood production. To complete the picture you should also be taking Essential Vitamin Formula and Mineral-Electrolyte Formula. In addition to iron, you also need vitamin B-12 and folate to manufacture blood cells. Finally, an adequate protein intake is essential. If you’re in a negative nitrogen balance, the other things probably won’t be able to help.

In summary you need heme iron, B-12, folate, and protein. Liver Amino should be considered a first line “essential” supplement for serious endurance athletes, especially women. Also, any women who are extremely lean, following a strict diet, or who are having menstrual irregularities should strongly consider this supplement.

References

Endurance Performance, Part I
by John Parrillo

The specificity principle states that adaptations to exercise training are specific to the training stimulus applied. This means that athletes predominantly interested in muscle size and strength should focus most of their efforts on resistance training, and athletes interested in endurance performance should perform mostly endurance training. However, certain metabolic adaptations occur as a result of endurance training which are of great interest to bodybuilders as well as endurance athletes. These include increased oxidative capacity, increased work output, increased vascular supply to muscles, and increased fat oxidation.

Endurance training sessions should be performed a minimum of three days per week for 30-60 minutes at moderate to high intensity to achieve this training benefit. Some authors recommend low intensity aerobic exercise for fat loss, because at low intensity a greater percentage of utilized energy is derived from fat. While this is true, low intensity aerobic exercise is not effective in eliciting the metabolic adaptations which bring about a shift in energy substrate utilization patterns. Furthermore, low intensity aerobic exercise does relatively little to improve cardiovascular and respiratory fitness. While bodybuilders appropriately should focus their training on resistance exercise, they will achieve a higher degree of muscularity and leanness if they also include a component of vigorous aerobic exercise.

General Principles

Two general concepts underpin any successful exercise training program. The Overload Principle describes the idea that an exercise stimulus must be of some threshold intensity to bring about a training adaptation (1,2). Exercise represents a form of stress, and the body adapts to that stress by getting stronger. To force the body to continue to adapt, the stimulus must continually become more intense. This is known as Progressive Overload. We can increase the training intensity by increasing the load (the resistance), the workout frequency, the workout duration, or the power output (work performed per unit time). The most effective way to produce increases in muscle size and strength is to increase the load. The most effective way to improve endurance performance is to increase workout duration. The best way to improve speed is to increase power output during the workout. The Overload Principle (sometimes called The Intensity Principle) applies to endurance training as well as to resistance exercise.

The Specificity Principle states that the metabolic adaptations that occur in response to a training stimulus are specific to the type of overload applied (1,2). Resistance training causes increases in muscle size and strength (if it’s intense enough) and aerobic exercise causes improvements in cardiovascular endurance, with surprisingly little carry over between the two (1). Specific exercise elicits specific adaptations creating specific training effects (1).

Metabolic Adaptations

Aerobic conditioning results in metabolic adaptations that improve energy production (1). Mitochondria from skeletal muscle acquire a greatly increased capacity to generate ATP by oxidative phosphorylation. Mitochondria are the small furnaces inside cells where food is burned (oxidized) to produce energy. Oxidative phosphorylation is the biochemical pathway mitochondria use to combine fuel substrate molecules from food with oxygen, resulting in a release of energy which is used to form ATP. Aerobic training makes mitochondria more efficient at this process, which means they can make more ATP to power muscle fiber contractions. This is a benefit of aerobic exercise that you don’t get from weight lifting. Associated with the increased capacity for mitochondrial oxygen uptake is an increase in the size and number of mitochondria and a potential two-fold increase in the level of aerobic energy producing enzyme systems (1). These adaptations are required to sustain a high percentage of aerobic capacity during prolonged exercise sessions. Animal studies have shown that skeletal muscle myoglobin can increase by as much as 80%. Myoglobin is a protein very similar to hemoglo-
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bin, except myoglobin is found in muscle cells while hemoglobin is found in red blood cells. Like hemoglobin, the function of myoglobin is to bind oxygen, and an increase in myoglobin can facilitate oxygen delivery to mitochondria.

Aerobic training causes an increase in the muscle’s ability to mobilize and oxidize fat. This occurs by an increase in blood flow within the muscle and in the activity of fat-mobilizing and fat-metabolizing enzymes (1). At any submaximal work rate, a trained individual uses more free fatty acids for energy than an untrained person (1,2). This is a key point and deserves some emphasis. Aerobic exercise training enhances the muscle’s ability to use fat as a fuel source and causes a shift in energy substrate (fuel) selection such that the trained muscle learns to rely more on fat as an energy source and less on carbohydrate. This is important to endurance athletes because increased use of fat as an exercise fuel has a carbohydrate sparing effect - the more fat we can burn the longer the carbs will last. Since carbohydrate (glycogen) depletion is a major factor limiting endurance, this means improved performance. This is also very important to bodybuilders because it offers a way to shift your metabolism into a fat-burning mode. Aerobic training teaches your muscles to burn more fat and less carbs. This happens at rest as well as during submaximal exercise. (During maximal exercise, carbs are still the main fuel.) Notice what happens if you combine this approach with a very low fat diet. The aerobic training shifts your muscle’s fuel selection into fat-burning mode, and your body becomes a fat burning machine. But there’s no fat in your diet. So where does the fat come from to fuel your muscles? From stored body fat. By combining proper training and nutrition techniques you can teach your body to draw on its own stored fat as a primary energy source.

Cardiovascular and Respiratory Adaptations

The weight and volume of the heart increase with long-term aerobic training (1). This is characterized by an increase in the size of the left ventricular chamber and by a thickening of its walls. The left ventricle is the chamber of the heart which pumps blood out to the body, and intense exercise makes it get bigger and stronger, just like any other muscle. This means it can pump harder and deliver a larger volume of blood per minute to working muscles. This in turn means more oxygen delivery, more energy production, and more muscular power output. The heart’s stroke volume increases significantly at rest and during exercise. Stroke volume is the volume of blood the left ventricle can eject in one beat. Since the left ventricle is larger and stronger, it can pump out more blood in a single beat than before training. Resting and submaximal heart rate are decreased during aerobic training. Since the heart can pump more blood with each beat, it doesn’t need to beat as often and heart rate is decreased compared to before training. Plasma volume and total hemoglobin content of the blood increase with endurance training. This also improves oxygen delivery.

One of the most significant changes in cardiovascular function is an increase in maximal cardiac output (1,2). Cardiac output is the volume of blood the heart can pump in one minute. The increased cardiac output is mediated largely by the increase in stroke volume. Training also produces a significant increase in the amount of oxygen extracted from circulating blood (1,2). This is determined by measuring the oxygen concentration in arterial blood supplying a muscle and in venous blood leaving the muscle. The difference is referred to as the arteriovenous oxygen gradient, and it is increased by endurance training because the muscles become more efficient at extracting oxygen from the blood. This is probably due to the increased capillary supply of muscle fibers, as well as their increased myoglobin and mitochondrial content. Regular aerobic training reduces blood pressure. Endurance exercise increases the ventilatory capacity of the lungs by increasing both breathing frequency and tidal volume (the volume of air per breath). In submaximal exercise the trained athlete ventilates less than before training (marathon runners don’t get out of breath from climbing a flight of stairs).

One of the most important adaptations to endurance exercise is an increase in the number of capillaries surrounding each muscle fiber (2). Endurance training can increase capillary density of muscles by 15% (and probably more, I suspect). This allows greater exchange of gases, heat, wastes, and nutrients between the blood and working muscle fibers (2). This facilitates not only energy production, but also fat metabolism and muscular growth. These increases occur within the first few weeks to months of aerobic training. If you want to grow big muscles, you need to deliver nutrients to them. The nutrients are delivered by capillaries. Do your aerobics.

VO2 Max

Endurance is a term that actually describes two separate components: muscular endurance and cardiorespira-
Endurance Performance, Part I

Muscular endurance is the ability of a muscle or muscle group to sustain high-intensity repetitive exercise (2). Muscular endurance is highly related to muscular strength and anaerobic conditioning. An example is how many repetitions you can do with a given weight on the bench press. Technically speaking, strength is defined as your one rep maximum (1RM). Let’s say your one rep max at bench is 225 pounds. That means you can probably do 185 pounds for 8 reps or so. If you train bench for several weeks at 185 pounds, pretty soon you’ll be able to do 9 reps at 185. This is an increase in muscular endurance at 185 pounds. From a strictly technical point of view, this is not an increase in strength. To demonstrate an increase in strength, you need to increase your 1RM. Going from 8 reps at 185 pounds to 9 reps at 185 pounds probably won’t increase your 1RM by much, if any. However, if you keep training soon you’ll be able to do 12 reps at 185, then the next time you test your 1RM you’ll find you can push up 230 with no problem. So while muscular strength and endurance are separate concepts, they are closely related. Another example of muscular endurance is a static muscular contraction, such as a wrestler trying to pin his opponent to the mat (2). Another example would be holding a leg extension in the fully extended position. Let’s say you can hold a leg extension at 150 pounds fully extended for 10 seconds before you start to fail and lower the weight. After several weeks of training you may be able to hold it for 15 seconds. This is an increase in muscular endurance. (This technique, along with forced negatives, is in my bag of tricks for breaking through plateaus.)

Whereas muscular endurance refers to individual muscles, cardiorespiratory endurance refers to the body as a whole (2). It describes your body’s overall ability to sustain prolonged rhythmic exercise. Rather than being limited by the endurance of a particular muscle, your cardiorespiratory endurance is limited by your body’s energy producing ability, which is in turn limited by your ability to deliver oxygen to working muscle tissue, which in turn is limited by your cardiovascular and respiratory systems. Most exercise physiologists regard VO2 Max as the best indicator of cardiorespiratory endurance conditioning results in an average increase of 20% VO2 Max following six months of conditioning. This is brought about by a combination of two factors. An increase in cardiac output results in more blood, and thus more oxygen, being delivered to tissues. Second, an increase in the arteriovenous oxygen gradient means that more of this oxygen is being extracted from the blood by the muscle. This means that more oxygen is being used by the muscle to produce energy, and more energy production means more muscle power and endurance.

Lactate Threshold

When glucose is metabolized anaerobically (without oxygen) it is converted to pyruvate and subsequently into lactate (lactic acid). Lactic acid buildup inside muscle cells is one of the factors that makes your muscles burn when you train a set of bicep curls to failure. At lower intensity exercise, you really don’t recruit the anaerobic energy system because you don’t need it. (Refer back to our series on cellular energy production.) During endurance exercise, your body can supply oxygen fast enough to the muscles so that you can produce all the energy you need from the oxidation of glucose and fat, without producing lactic acid. As exercise intensity increases, you eventually reach a level where the aerobic energy producing pathway is maxed out, and anaerobic energy production begins. At that point, lactate is produced inside muscle tissue and begins to appear in the blood as a waste product. The lactate threshold is the point where blood lactate begins to appear. Like VO2 Max, this is a measure of cardiorespiratory fitness. Endurance training increases the lactate threshold, which means a higher level of energy production can occur by the aerobic pathway before the anaerobic pathway is called into play. Trained endurance athletes can...
perform exercise at a higher VO2 Max before blood lactate appears. This means that they can exercise at a higher intensity (they can produce more power aerobically) before anaerobic metabolism begins.

At first it might sound like VO2 Max and lactate threshold are really two ways of measuring the same thing, but they’re not. While they both reflect endurance performance, they are looking at different aspects. VO2 Max is a description of the maximal aerobic energy producing ability of an athlete. Lactate threshold describes the percentage of VO2 Max at which the athlete can train before anaerobic metabolism begins. The increase in lactate threshold, at a given percentage of VO2 Max, is probably due to a greater ability to clear lactate produced by the muscle (due to increased capillary density of the muscle tissue bed), an increase in skeletal muscle enzymes involved in aerobic energy production, and a shift in metabolic substrate to a fuel mix involving a higher proportion of energy derived from fat.

These concepts lay the basic groundwork you need for a thorough understanding of endurance exercise physiology. Next month we’ll talk about training intensity, respiratory quotient, fat metabolism, and specific strategies on how to incorporate endurance training into your program to maximize fat loss without losing muscle.

References

To maximize fat burning during aerobic exercise you should do it first thing in the morning before breakfast or else right after weight training. During these times liver and muscle glycogen are relatively depleted and insulin levels are low. These conditions promote the use of body fat as a fuel source. Aerobic exercise should be performed at moderate intensity for 30 to 60 minutes per session, generally. A good way to gauge intensity is that you should be breathing hard and sweating. For maximum fat loss, don’t eat carbohydrates immediately before or during cardiovascular exercise. Even if your only goal is fat loss, it is important to include weight training as part of your exercise program. Also, don’t restrict calories too much and be sure to get plenty of protein in your diet to help prevent muscle loss while burning fat. Consume a low fat diet to ensure that the fat you burn during your aerobic exercise is body fat and not dietary fat.

Scientific Background

Last month I explained the concepts of VO2 max and the lactate threshold. These are simply scientific ways of measuring cardiovascular fitness. Briefly, VO2 max is the body’s maximum rate of oxygen consumption (1,2). This determines the maximal intensity of aerobic exercise which you can sustain. The lactate threshold is the percentage of VO2 max at which lactic acid first appears as a waste product in the blood (1,2). Lactic acid is a byproduct of anaerobic metabolism when glucose is broken down without oxygen. Thus the terms “lactate threshold” or “anaerobic threshold” are often used interchangeably. This represents the rate of energy production which can be sustained aerobically before the anaerobic pathways kick in.

These concepts may sound complicated but a simple example will make them clear. Let’s take a sedentary person who hasn’t exercised in years and put him on a training program. Initially he can only ride the stationary bike for 20 minutes at low intensity because he’s so out of shape. After six months of consistent training he can ride for 20 minutes at high intensity. He has just increased his VO2 max, his maximal level of sustainable exercise. At the beginning of his training program if he tried to peddle against high resistance, after a few minutes his thighs would begin to burn and ache from lactic acid accumulation. After six months of training he can peddle for 20 minutes against high resistance with no thigh pain. He has just increased his lactate threshold.

An aerobic exercise training program will increase both VO2 max and anaerobic threshold. What does this mean? The meaning of an increase in VO2 max is pretty obvious: it means you can exercise harder. An increase in anaerobic threshold means that you can exercise at a higher percentage of your maximal ability before anaerobic metabolism begins to contribute to energy production. So not only can a trained athlete exercise harder, he can exercise more efficiently. He can exercise at a higher percentage of his maximal ability before the lactic acid burn begins to set in. That implies he can maintain a higher percentage of his maximal output for a longer time before reaching fatigue.

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time before reaching fatigue. So now you can see that VO2 max and anaerobic threshold describe somewhat different aspects of endurance performance.

Another fundamental concept we need to understand is the respiratory quotient (RQ). This is defined as the ratio of carbon dioxide produced to oxygen consumed during energy production (1,2). What does this have to do with anything? It has everything to do with fat loss and body composition. Respiratory quotient is measured by analyzing the amount of oxygen a person extracts from the air and the amount of carbon dioxide he exhales into the atmosphere as he breathes. We can learn some very interesting things using this technique. It turns out that if a person is burning pure carbohydrate as his energy source the respiratory quotient is 1.0. If he is burning fat as his fuel source the respiratory quotient is 0.7. This difference comes from the fact that the carbon atoms in carbohydrate molecules are already partially oxidized (the carbon atoms are bound to oxygen in the sugar molecule). In fatty acids the carbon atoms are bound to hydrogen, and are said to be “reduced” (the chemical opposite of oxidized). It makes sense then that fat should contain more calories per gram than sugar, because in sugar the carbon atoms are already partially oxidized before you eat it. In a fatty acid molecule the carbon atoms are not oxidized at all, so when they are burned inside cells more energy is released per carbon atom than for glucose. Also, since the carbohydrate molecule already contains some oxygen atoms built into it, it takes fewer molecules of oxygen to complete its oxidation than for a fat molecule. This is the reason burning fat as your fuel source results in a different respiratory quotient than burning carbs. A typical mixed diet containing protein, carbs, and some fat results in an RQ around 0.8.

Whew! So what does this have to do with bodybuilding and fat loss? By measuring the RQ of people while they are exercising we can determine the fuel substrate which is being used. At rest and during sleep mostly fat is used as the body’s fuel source. During low intensity exercise, such as walking or low intensity biking, still mostly fat is used. At the other extreme, during very high intensity exercise such as weight lifting the predominant fuel source is carbohydrate. And at moderate exercise intensity a mixture of fat and carbs is used for fuel. If you think about the biochemical pathways of energy production this makes perfect sense. High intensity exercise like weight lifting is primarily fueled by the anaerobic pathway. This is because the muscle’s demand for energy is so high that oxygen cannot be supplied to the muscle fast enough to keep up with the demand, so the muscle has to turn to anaerobic metabolism. Anaerobic metabolism can supply rapid bursts of energy very quickly, but cannot be sustained for a very long time. This is why you can ride the bike for hours but can only do squats for about a minute before you fatigue. The body can use carbohydrate as a fuel for anaerobic energy production (glucose is converted to pyruvate in the glycolytic pathway and pyruvate is subsequently converted to lactate). However, there is no such thing as anaerobic fat metabolism. Fat requires oxygen to be converted to usable energy. Simply put, you can’t burn fat fast enough to keep up with the rigorous energy demands of intense weight lifting, so you have to use carbs. On the other hand, the oxidation of fat makes the perfect energy source for lower intensity exercise such as walking.

Many people use this rationale to advocate low intensity exercise (such as walking) as the ultimate exercise for fat loss. At first thought, this makes good sense. It is true that during low intensity exercise a higher percentage of the energy expended is derived from fat. The problem is that during low intensity exercise you burn very few calories, so even if almost all of the calories are derived from fat, that’s still not much fat loss. During moderate intensity aerobic exercise, such as jogging or a brisk bike ride against moderate resistance, a higher percentage of the calories you burn come from carbs, but you burn so many more total calories that the overall result is still greater fat loss. So it’s not just the percentage of energy derived from fat that’s important, but also how many total fat calories you burn. If you do your aerobics at moderate to high intensity you will burn more carbs along with the fat, but you’ll end up burning a greater amount of fat in the long run because you expend more calories.

To put this in perspective, don’t let me leave you with the wrong message. Walking is a great exercise for fat loss, it’s just that you’ll have to walk for hours everyday to see really noticeable results. I’m not against walking, I just don’t think it’s the best choice for serious fat loss. Just as there are plateaus you encounter while gaining muscle, you will also hit plateaus during fat loss. Probably the best way to stimulate accelerated fat loss is to increase the intensity of your aerobics. In your own experience, who’s leaner - the guy who walks three miles a day or the guy who runs three miles a day? The runners I know are leaner than the walkers. I’ve worked with a lot of bodybuilders who could never really get into contest shape until they started running.

Last month I talked about some of the metabolic adaptations that occur as a result of endurance training. One is an increase in the vascular supply to muscles. The harder the muscles are forced to
Endurance Performance, Part II

work, the more blood they need. Another important adaptation is an increase in the fat-burning capacity of muscle cells. Endurance training causes an increase in the cellular content of mitochondria and enzymes responsible for burning fat. I don’t think you get much of a metabolic adaptation to low intensity exercise. Sure, you can burn fat if you walk long enough, but you really won’t increase your capillary density or beef up your fat-burning enzyme pathways significantly unless you train hard. The concept of intensity applies to endurance training just like it does to resistance training. If you want to see a big change in your body you have to force it to adapt by providing an intense training stimulus.

If you still don’t believe me, just try it. It won’t cost you anything and you have nothing to lose. Try doing low intensity aerobics for a month (walking) and measure your body composition before and after. Then do moderate to high intensity aerobics for a month (jogging or fairly strenuous biking) and again measure your body composition. You’ll see. I’ve done this kind of thing with competitive bodybuilders about a zillion times, so I know what will happen.

Practical Applications

How do we put this all together to get the best results? Do moderate to high intensity aerobics for 30 to 60 continuous minutes a minimum of three days a week, and seven days a week is better. You should be breathing hard and sweating. Remember, fat metabolism requires oxygen. If you’re not breathing hard you’re not consuming much oxygen and so you can’t be burning much fat. It’s not that complicated. What about heart rate? If you want to measure heart rate, that’s fine. Probably between 70-85% of your theoretical maximum heart rate is a good goal to both burn fat and accrue the metabolic adaptations of endurance training (increased capillary density and increased fat-burning machinery). Your theoretical maximum heart rate is 220 minus your age. This is a pretty crude way to do it however because how your heart rate responds to exercise depends on your level of training.

Do your aerobic exercise for at least 30 minutes per session. It takes a while to liberate fatty acids from adipose tissue and really start burning much fat. You probably don’t burn much fat until about 15 minutes or so into the exercise session. Do your aerobics on an empty stomach. First thing in the morning before breakfast is a great time. Then your glycogen levels are somewhat depleted from your overnight fast and insulin levels are low. Since insulin blocks fat metabolism, aerobic exercise right after eating carbs is a bad idea. No carb drinks before or during your aerobics. Another good time to do your aerobics is right after weight training. The weight training depletes your glycogen levels so your body will be forced to burn fat instead of carbs. Also, weight training increases catecholamine levels (epinephrine and norepinephrine) which stimulate fat metabolism. So you’ll start burning fat right from the start of your aerobic exercise session that way.

The particular type of exercise you do doesn’t matter. Running, rowing, biking, stair climbing, skiing, in-line skating, and aerobics classes are all okay. Pick something you like and can stick with. I suggest mixing it up for variety. Just make sure you are breathing hard and try to work up a sweat. One technique to help keep the intensity up is circuit aerobics. Five minutes on the stair climber, five minutes on the treadmill, five minutes on the bike, and five minutes on the rowing machine, then repeat the circuit.

So we’ve covered the type of exercise, the training intensity, the training duration, the training frequency, and the timing of the training session. I can’t close without talking a little about nutrition. There are four key points I’d like to make. First, don’t cut calories too much. If you are faithful to the diet as outlined in the Nutrition Manual, you probably won’t have to cut calories at all. If you eat according to the diet, do your weight training, and do your aerobics, you will automatically get lean without having to cut calories. If you do need to reduce calories, do so very modestly. Ten percent below your maintenance requirement is plenty. If you reduce calories too drastically you will lose muscle, and thereby decrease your metabolic rate and your ability to burn fat. Remember, muscle is the engine that burns fat. Maintaining muscle mass is a priority. Second, eat a low fat diet. The aerobics program as described here is designed to maximize fat burning. If you don’t eat any fat in your diet, then the fat you burn during your aerobics has to come from stored body fat. If you have much fat in your diet then when you exercise you’ll simply burn the fat you just ate. You’ll be spinning your wheels and won’t get leaner. If you burn fat during exercise, but don’t eat fat, then you’ll have to lose body fat. It’s that simple. Third, get plenty of protein. This is key to preserving muscle mass while losing fat. During aerobic exercise, especially at high intensity, some of the fuel is derived from amino acids. This can result in muscle loss if you’re not careful. I’ve had very good results using a scoop of Hi-Protein powder before aerobics. This supplies very little carbohydrate and does not raise insulin levels significantly. The Hi-Protein increases the blood levels of amino acids, so that any aminos which are oxidized during the exercise session are derived from the protein powder instead of being extracted from muscle tissue. Here’s the strategy: if you exercise in the morning, get up and have a cup of coffee and a scoop of Hi-Protein powder, then do your aerobics. If you do your cardio work after weight training, then have a scoop
of Hi-Protein between the weight training and the aerobics. This will prevent any loss of muscle tissue and will not inhibit fat metabolism. Fourth, follow your body composition. All serious bodybuilders follow their percent body fat and lean body mass. You have to in order to know what’s going on with your body composition. Scale weight is just not enough. The Body-Stat Kit is an invaluable tool in this regard. It includes a detailed manual that explains how to modify your diet and exercise to keep things moving in the right direction, and discusses specific problems commonly encountered while dieting for contests.

Parrillo Performance. We’re here to show you how.

References


The Parrillo Performance Program

by John Parrillo

I think the basic strength of the Parrillo program, and why it has proven so successful with competitive bodybuilders over the years, is that it is based on solid fundamental principles. The core of the program is our approach to nutrition and training. Think about it. Nutrition and training is really what bodybuilding is all about. The Parrillo nutrition program works so well because it’s based on solid nutrition from healthy bodybuilding foods, not the latest supplement fad. Not only is a proper diet and intense training the best way to attain bodybuilding success, it’s the only way. It just doesn’t matter how many high-tech supplements you take, if you’re not eating right you won’t get very good results.

Getting your diet in order in the first item of business. This is the foundation on which everything else is based. I’ve seen many bodybuilders attain excellent size and conditioning using only a minimal supplement program, but they were eating a lot of muscle building foods. Every week I get calls from young bodybuilders disappointed because the latest miracle supplement they tried just didn’t seem to live up to their hopes. Usually it turns out they weren’t eating a bodybuilding diet. They wonder why adding some supplement to the typical American diet didn’t turn them into competitors.

If you learn one thing from me, remember that food is the foundation of nutrition. Over the last few years a number of very expensive supplements have entered the market and sometimes people get discouraged because they can’t afford to use them. Don’t worry about this. You can achieve great results with just a strict diet and hard training. Many of the top bodybuilders use only a few supplements. Generally, if you spend more effort at eating right and trying to perfect your diet instead of worrying about supplements you’ll be better off. Many supplement programs these days cost $200-$300 per month to follow. A one-time investment in a Parrillo Nutrition Manual will do more for you than a year’s worth of supplements and costs practically nothing in comparison.

In terms of results per dollar, the Parrillo Nutrition Manual is the most powerful bodybuilding tool on the planet.

I’ve talked with countless people, in the hundreds if not the thousands, who have jumped around from supplement to supplement trying to find the magic formula that would work for them. Many of these bodybuilders have struggled in the gym for years with only minimal results. When one of these guys calls for advice, and it happens every day, I suggest the following experiment. For one month don’t buy any supplements. Take the money you would normally spend on supplements and buy a Parrillo Nutrition Manual instead. Read it. Follow it without exception, every meal, every day, for a month. See what happens. What have you lost? Nothing really, since the supplements weren’t producing good results anyway. Plus, at the end of the month you still have the Nutrition Manual. Many of these people are absolutely amazed at what they can accomplish in one month. Most people drop a couple of pounds of fat and gain a couple pounds of muscle just by switching onto the diet - and that’s without supplements! Many people see more progress in this one month than they have in the last year. And the key is, you can keep doing it month after month. If you buy $100 worth of supplements and take them, then that’s all you get. After you get on the right diet, you will find that you need fewer supplements and that you get much more benefit from the supplements you do use.

Be sure, when you go on the Parrillo diet you will be making some changes. It’s a major lifestyle modification for most people. It’s a strict program. It’s definitely not for everybody. It’s for people who are willing to work, to make sacrifices, and to do what it takes to look like a bodybuilder. It’s tough, but it works.

Here’s what you do. Start by consuming one gram of complete protein per pound of body weight each day. Next, limit fat to 5-10% of calories consumed. Finally, the remainder of your calories are derived from complex carbohydrates. How many calories should you eat? Start recording your daily weight and write down everything you eat in a nutrition journal. Measure your food portions so you can calculate how many calories you eat in a day. Initially don’t make any special effort to gain or lose weight, just concentrate on following the diet strictly. After a week or two of keeping records you’ll see how many calories you eat...
each day on average. If your body weight doesn’t change during this period this is your “maintenance energy requirement,” the number of calories required to maintain your present body weight. To gain weight, add 300-500 calories a day. To lose weight, eat 300-500 calories a day less or do an extra 30 minutes of cardiovascular exercise.

You’ll notice that most of the adjustment in diet composition has to do with carbohydrate intake. Your protein requirement is determined primarily by your body weight. If you add extra calories to gain weight, these are supplied by more complex carbs. Extra carbs seem to work best for gaining lean mass. If you reduce calories to lose fat, you’re still consuming the same amount of protein. The calories are reduced by reducing carbs. The way the diet is structured automatically changes the ratio of protein to carbohydrate in the diet. This has been shown to change the ratio of insulin to glucagon in the blood (1) which in turn has an impact on nutrient partitioning and body weight set point (2). The Parrillo diet was designed with a lot of thought as to using food to manipulate hormones in the body to channel nutrients into certain metabolic pathways. The diet is engineered to channel nutrients toward the lean body compartment while partitioning energy away from fat stores. You don’t have to be a biochemist to get the results, you just have to follow the diet strictly. To the letter.

Let’s talk about a few specifics. What is a “complete” protein? This is a protein source which supplies all of the amino acids, including the ones which cannot be manufactured by the body. These are the so-called “essential” amino acids. Complete proteins supply all of the amino acids you need to build new muscle tissue, making them the best protein choices for bodybuilders. Examples of good low-fat protein sources are egg whites, chicken and turkey breast, and many fishes. These should form the basis of your protein choices.

Complex carbohydrates fall into two general categories: starchy and fibrous. Starchy carbs are things like potatoes, sweet potatoes, rice, beans, oatmeal, corn, and peas. Vibrant vegetables are salad greens, broccoli, green beans, carrots, and so on. You should include both starchy and fibrous carbs at each meal.

Each meal should be constructed according to the formula described above. Don’t eat just protein at one meal and just carbs at another. Combining protein and carbs and fiber together in the same meal slows the release of glucose into the bloodstream, helping keep insulin levels from getting too high. This helps channel nutrients to muscle instead of fat. When insulin levels are too high, this stimulates fat storage. Be sure to divide your daily allotment of calories roughly evenly into six small meals. This also provides for better insulin control and also continually bathes the muscle in a nutrient rich environment so growth can proceed continuously.

Again, concentrate your effort on following the diet. Spend as much time thinking about groceries as you used to spend trying to decide which supplements to try. Remember, groceries work better than supplements. Your body was made to eat food. That’s what it needs and that’s what works best.

You will find the Parrillo Nutrition Program shifts your metabolism into fat burning mode. Your body uses a certain amount of fat as fuel every day. Fat is used as a prime fuel source while at rest and is also used during cardiovascular exercise.

If you consume less fat in your diet than you burn every day, that extra fat must be obtained from body fat stores.

You will find the Parrillo Performance Program shifts your metabolism into fat burning mode. Your body uses a certain amount of fat as fuel every day. Fat is used as a prime fuel source while at rest and is also used during cardiovascular exercise. If you consume less fat in your diet than you burn every day, that extra fat must be obtained from body fat stores. This simple sounding concept has caused quite a stir in the metabolism literature recently. Over the last few years it has become clear that what we really care about is not energy balance (calories in versus calories out) but rather fat balance (3,4,5). We want to burn more fat than we eat every day to achieve loss of body fat. Energy balance is not as important as fat balance. Last month I explained the concept of respiratory quotient (RQ). This is a way to determine to composition of the fuel mix the body is burning at a given time. Generally speaking, the body’s energy needs are met by oxidizing a mixture of fat and carbohydrate. In the same way we can define the fuel quotient (FQ). It has been determined that in order for loss of body fat to occur the RQ must be less than FQ. What does this mean? Simply that if you eat less fat than you burn then you’ll lose body fat (3,4,5). It’s that simple. This works because it turns out that under normal conditions your body converts very little (in fact, practically none) protein or carbohydrate into body fat (6). That’s right - almost all body fat is derived directly from dietary fat. Excess dietary carbohydrate and very little tendency to be converted into fat and stored as body fat (6). Over-feeding as much as 500 grams of carbohydrate results in only a couple of grams of fat storage (6). On the other hand, if excess calories in the diet are supplied as fat, they have a very strong tendency to be stored as body fat. In summary, quite a bit of recent research in metabolism has indicated that the fat content of the diet is at least as important, if not more important, than how many calories you eat. As an example, you could eat only a modest number of calories, but if those calories are supplied in a form prone to be stored as fat, then you’ll get fat. Alternatively, if you eat foods which are very difficult
The Parrillo Performance Program

for the body to convert into fat, then you can eat a lot of calories without getting fat. Sounds like science fiction, but it's not. I've been saying this for years, and the science has now finally been done to prove it.

The Parrillo diet is specifically designed to channel nutrients to muscle and to draw on stored body fat as a fuel source. This amounts to using nutrition to direct the flow of dietary energy along certain biochemical pathways to achieve the effect of partitioning dietary energy into the lean compartment while simultaneously drawing on fat stores for energy. I think you can see that setting up this sort of hormonal and metabolic environment in the body is inherently more powerful than supplements could be when thrown in on top of a regular diet. Most people don't know how to use supplements and that's why they don't get good results. You have to have the diet in place to form the foundation. This converts the metabolism into muscle-building, fat-burning mode. Changing the metabolism is the first, most important, step. Then the supplements can do their job.

A question I get constantly is what are the most important supplements and which ones should I be using. Some people think they need to use them all to get results. Not true. For building muscle and gaining strength, the most important ones are Creatine and Hi-Protein Powder. This is a powerful combination. Just these two products alone can boost your growth into the stratosphere. Parrillo Hi-Protein Powder is a special formulation including a mixture of casein and whey protein with free form amino acids added to adjust the final amino acid profile to be optimal for muscular growth.

If you're an ectomorph (naturally skinny person) and want to gain pounds of body weight, use the combination of Pro-Carb and Hi-Protein. These supplements can add quality calories to your diet to help you pack on muscle. I've seen guys gain 20 to 30 pounds in six months on this combination. It doesn't take a complicated program to get results. It takes the right diet and the right supplement. For gaining weight what you need is calories. Keep the fat grams very low to avoid gaining body fat.

For fat loss the best product is CapTri. Be sure to watch your calories. CapTri is a very high calorie product, and if you just start pouring it on your regular food it will not make you lose weight. What you have to do is subtract a given number of calories of starchy carbs from your diet and replace those calories with CapTri. This lowers the energetic efficiency of your fuel mix, meaning that more dietary energy is converted to body heat. This loss of dietary energy as body heat means that those calories are not available to fuel activity, so your body is forced to draw more heavily on stored fat as a fuel source. This low-carb approach also reduces insulin levels which further promotes fat loss.

Endurance athletes should try Liver-Amino and Hi-Protein Powder. You might have thought Pro-Carb would be a better choice, but endurance athletes usually get plenty of carbs from their diet. The surprising truth is that many endurance athletes are protein deficient.

These should give you some ideas to get you started. Whether you want to use supplements or not, be sure to stick to the diet. Often times when one of my long-time clients calls in with a problem, it turns out they've strayed away from the diet or else are having a hard time eating enough calories to support further growth. This is a perfect time to add in a supplement. We're always here to provide advise on your nutrition or supplementation program. Just give us a call.

References


A very common problem among bodybuilders, especially advanced bodybuilders, is hitting a plateau. What to do when you hit a plateau is one of the most frequently asked questions I receive. The answers are highly individualized depending on the specific problem, but I can give you some general guidelines to help you troubleshoot the difficulty. The main point is that if you’re not making progress in your bodybuilding goals, then you’re not doing what it takes to make you better. As obvious as that sounds, many people fail to realize this. A lot of people stick with the same program month after month, sometimes even for years, without seeing any real change in their physiques. They keep waiting for it to start working - for something to happen. A good rule of thumb is that you should see some improvement on at least a monthly basis. Take inventory of your progress at regular intervals, say at the beginning of every month. If you like what you see and you’re making good progress, keep doing what you’re doing. On the other hand, if a month goes by and you haven’t made some noticeable improvement, it’s time for a change. The biggest mistake you can make is to faithfully stick to a program that’s not giving you good results.

These suggestions to “take inventory” and “look for improvement” lead directly to the second major concept, which is that you need to be scientific about analyzing your progress. You cannot achieve greatness in any field by guesswork, including bodybuilding. You need to have some specific, objective goals and keep records to determine if you’re making progress toward achieving them. The basic goals for bodybuilders are to increase muscle mass, to decrease body fat, to increase strength in the basic lifts, and to improve overall size, shape and symmetry. To know if you are making progress toward increasing muscle mass or losing body fat, you need to periodically measure your body composition and keep records. To monitor your gains in strength, you need to keep a training journal and record your performance on basic lifts like squats, deadlifts, bench presses, shoulder presses, and rows. Set some specific goals, such as to gain a pound of muscle per week for the next 12 weeks, or to reach an all-time personal low body fat percentage, or to get a new personal best in the bench press. If you don’t have specific goals, and if you don’t monitor your progress toward reaching those goals, then it’s hard to know if you’re really making any progress or not. Most people in the gym don’t ever bother to formulate specific goals, don’t keep a training journal, and don’t measure their body composition. They’re the ones who lift the same weight month after month and whose bodies never change. One of the best ways to set a goal is to pick a date six to twelve weeks in the future and to plan for a certain body weight and fat percentage at that time. For example, “By next I want to weigh 220 pounds at 6% body fat. This means that by May I need to gain 10 pounds of muscle and lose 8 pounds of fat.” This gives you some specific goals to shoot for, and a timetable to monitor your progress. Of course, you can’t do it without measuring your body composition. The Parrillo Performance Body Stat Kit was made just for this reason, and includes a manual with detailed instructions on how to modify your program to keep making progress.

Bodybuilding is not really all that complicated. If you’re not making good progress you need to make some kind of a change, and the two places to make these changes are in your training or your nutrition. Don’t be afraid to change one or both of these. Let’s consider the muscle gaining plateau first. The most common problem here is with nutrition - people just don’t eat enough calories to sustain further muscle growth. Consider this: your body’s daily energy expenditure - the number of calories you burn in a day - is determined by your muscle mass, among other factors (1,2). Muscle is metabolically active tissue - a pound of muscle requires 25-30 calories a day to maintain and up to 100 calories to build. This means that as your muscle mass increases your daily calorie requirement increases at the same time. As an example, let’s consider a hypothetical 180 pound bodybuilder whose maintenance energy requirement is 2500 calories a day. This means that during an average day, his body burns 2500 calories total. If he consistently consumes less than 2500 calories a day he’ll lose weight, and if he consistently consumes more than 2500 calories a day he’ll gain weight. If he consumes 2500 calories a day, his present body weight will be maintained, and that’s why we call this his “maintenance energy requirement.” Now let’s say he wants to pack on some mass, so he starts eating 2800 calories a day. For several weeks he will gain at about a pound a week, but then the gains stop. Why? Well, if each pound of new muscle burns 30 calories a day just for maintenance purposes, and he gained 10 pounds, that’s 300 more calories he burns every day just to maintain his body. That means his new maintenance energy requirement is now...
2800 calories a day, not 2500 like it used to be. So for awhile he was making good gains on 2800 calories, but the added muscle has increased his metabolic rate so that now he needs 2800 calories a day just to maintain his new weight. So the gains stop. To add the next 10 pounds of muscle he would have to increase calories again.

This is pretty basic stuff, but you’d be surprised how often it’s overlooked. For many people, gaining more muscle is as simple as eating more calories. Many bodybuilders are afraid to try it because they’re afraid they’ll gain fat. The key is to eat clean, lean bodybuilding foods. The Parrillo Nutrition Manual describes how to increase your calories from foods which are more prone to help you build muscle and which are difficult for your body to store as fat. What’s the best way to increase calories to gain more muscle?

Generally speaking, an increase in complex carbohydrates is the best way to go. You also need to increase your protein intake as you gain weight, so that you’re getting at least one to one-and-a-half grams or more of complete protein per pound of body weight each day, but the bulk of your calories should be derived from carbohydrates. By increasing your carbohydrate intake, this will increase your ratio of insulin to glucagon and increase the anabolic drive to build more muscle (3). Increasing your carbohydrate intake actually provides a more potent growth stimulus than increasing protein. Remember this as a general rule: as your body weight increases, increase your protein. As your energy requirement increases, increase your carbs. A growth plateau generally means you need more calories, not more protein (as long as you’re meeting your one to one-and-a-half grams or more per pound per day requirement). And those calories are best supplied as carbohydrates. Be sure to use complex carbs and stay away from sugar or refined carbs, which are easily converted to fat.

A brief word on supplements here: provided your protein requirement is being satisfied, the most potent supplements for gaining weight are probably Pro-Carb Powder™ and CapTri®. A couple scoops of Pro-Carb® taken with or between meals will in itself be enough to help most people pack on several pounds of lean muscle. If you find that you’re putting on fat, consider using CapTri® instead. It supplies calories in a way which is almost impossible for your body to convert to fat (4,5). And if you don’t tolerate carbs too well, CapTri® can give you the added calories and help maintain a more favorable glucagon/insulin ratio.

As you continue to gain lean mass, your metabolic rate will increase, so you’ll have to gradually increase your caloric intake to support further weight gain. It’s not uncommon for big bodybuilders to eat 6,000 calories a day or more. Don’t make the mistake of increasing calories too fast, however. You might be tempted to say that you want to gain 40 pounds, and try to do it all at once by upping your calories by several thousand. If you do that all at once, you’ll gain a lot of fat along with the muscle. You can only build muscle so fast, and if you push your calories up too fast you’ll get fat. On the Parrillo Performance Program, we recommend gaining at a rate of about a pound a week. That way, you know you’re adding solid muscle mass, instead of possibly packing on fat. It’s best to increase your calories in increments of 300-500 a day. Although it takes around 30 calories a day to maintain a pound of muscle, it takes much more to actually build that muscle. That’s why you can’t just add 30 extra calories a day and expect to gain a pound of muscle in a week. Just doesn’t happen that way. And as your maintenance level changes, so will the number of calories you need. Your body just doesn’t gain ten pounds on 300 to 500 extra calories then stop, waiting for that next 300-500 calorie increase. Your growth and caloric needs are constantly changing.

As you eat more you provide your body with the nutrients to gain more muscle, and as you gain more muscle, you’ll need to increase your calories to maintain the muscle you’ve already gained plus the extra calories your body needs to make new muscle. That’s why it’s so important to record what you’re eating on Diet Trac Sheets and check your body composition regularly using the BodyStat Kit. A lot of people think this tool is used only during the pre-contest period. But in actuality, the BodyStat Kit can tell you a lot about your lean mass and body fat and how these percentages
No Limits: How To Break Through Plateaus, Part I

change according to your diet and training.

The other possible problem if you hit a plateau could be in the area of training. Within this category, you could be under-training, over-training, or not training intensely enough. Just as your nutritional needs change as you gain more muscle mass, you will find that periodic variation in your training will help you break through plateaus. Although it’s hard to make generalizations about this, probably the most common mistake here is not training intensely enough. Intensity is the key to productive weight training exercise. Increasing or decreasing the volume of exercise you do won’t make much difference if the exercise you’re doing is not intense enough to stimulate muscle growth in the first place. The key principle here is progressive resistance—you have to lift heavier weight if you want to get bigger and stronger. This is why keeping a training journal is so important. On a monthly basis you should be getting stronger on the basic lifts. Certainly now you should be benching, squatting, and pressing more weight than you were this time last year. If you’re not, you need to make a change. Every workout you should try to lift a heavier weight than you did the last time, or else do more reps with the same weight. It may not be realistic for an advanced bodybuilder to increase the weight at every workout, but if a month or two goes by with no improvement, that’s a sign it’s time for a change.

What do you change? The variables to play with here are endless, but the bottom line is that you want to increase your strength on the basic lifts. This means lifting more weight on squats, bench press, shoulder press, rows, and deadlifts. Training for strength and training for size are not the same, but they do go together. The best way to train for strength is to lift very heavy weights in the 3-6 rep range and keep the volume fairly low. To train for muscle size it’s better to do 8-12 repetitions and to do a higher volume of exercise. It’s important to train to positive muscle failure, so that you can’t perform another repetition. When training for size, it’s also very important to emphasize the eccentric phase of the muscle contraction. That means you need to resist the weight as you lower it while the muscle is lengthening. When you can perform 12 repetitions in good form, it’s time to increase the load. This is where many people fail in the gym. They do the same 3 sets of 10 reps with the same weight every week and never increase the load. They never get any stronger and their muscles don’t grow.

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Your muscles seem to adapt to a given training regimen after about a month. Regarding the questions of specific training routines, training volume, and training frequency, I would have to write an entire book to cover these issues. (Actually, I wrote three books about that - The Parrillo Performance Training Manual, John Parrillo’s Fifty Workout Secrets, and High Performance Bodybuilding.) What I can tell you here are just some basic concepts. Everyone seems to be searching for the “ultimate” workout routine, as if it were some sort of holy grail. The truth is, there is no single ultimate routine, although some are better than others. The key concepts are to emphasize the basic exercises, train hard, train to failure, continually lift heavier weight, and periodically alter your workout to get some variety. Many bodybuilders rotate their body parts five or six days a week, training only one muscle group at each workout. Others do better on a three or four day rotation and training two or three muscle groups at each workout. Experiment with a six day split, training six days a week, one body part per workout, versus a three day split, training two body parts per workout. See what works best for you. The only mistake you can make is to stick with a program that’s not working. Check out my training books if you want more details on designing routines and on exercise performance.

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In the first part of this series I discussed breaking plateaus in your muscular development. Most of the article dealt with nutritional considerations and how to manipulate and regulate your nutrients to spur muscle growth. At the very end I began to delve into adjustments in your training to spark lean mass gains should you reach a plateau. There are several more aspects concerning training and muscle gain that need to be addressed before I move on to the second part of the discussion, breaking through fat-loss plateaus. So if you’re ready, let’s get started.

I get people who call all the time, looking for my “blessing” to take a couple of days off. “What about over-training?” they ask. “Should I cut down on training?” “Should I take a lay off?” Everybody these days is worried about over-training. I would like to respond to this on two levels. First, if you think you will stimulate your muscles to grow bigger by not training them, you’re fooling yourself. It’s the workout that stimulates your muscles to grow. Less workout means less stimulus. Rather than cutting back on your training, consider increasing your nutritional support instead. This is where supplements can really help - when you’re training so hard that you can barely recover. Of course it is possible that you may fail to recover from your workouts, and in that sense you may be “over-trained.” That doesn’t mean that you’re exercising too much however, it means that you’re not recovering enough. This state of “over-training” really describes the state of your body’s balance between stress (exercise) on one hand and recovery on the other. If the level of stress is so high that you’re not recovering, the answer most people give is to train less. Rather than this imbalance being a problem of too much exercise, I view it as a problem of not enough recovery. People are not over-trained, they’re under-recovered. Before you cut down on your training, beef up your nutrition and get more rest. Approach your nutrition with as much intensity as your workouts. Also, make sleep a priority. Eat right, eat a lot, get enough sleep, and you probably won’t feel over-trained any more. What’s the alternative? Train less and eat less. Does that sound like the way to get your body to grow?

Now I would like to respond to the question of over-training at a second level. This has to do with the volume of exercise versus the intensity of exercise. You cannot make up for low intensity exercise by increasing the volume. If you’re lifting half-heartedly without giving it your full effort, then adding a few extra sets onto the end of your workout won’t help. While these low intensity sets will not stimulate muscle growth, they will however use up your recovery ability. If you find your weight training sessions are dragging on for two or three hours and you’re still not growing, I suspect your exercise volume is too high and your intensity is too low. When you enter the gym, you must be very serious and all business. You’re not in there to socialize and have fun. Hit the weights hard at full intensity. Generally, you should be done with your workout in 60 minutes, and 90 at the most. When it comes to over-training, I find that the volume of high intensity exercise is rarely the problem. The problem usually turns out to be a large volume of low intensity exercise. This is not an effective stimulus for growth but will contribute to fatigue. Another area often overlooked is aerobics. When discussing this issue, many people will say if you spend your energy on aerobics then that leaves you with less energy to grow. This is a rather short-sighted solution to the problem. Your muscles need nutrients to grow. They need blood flow. Moderate to high intensity aerobic exercise will increase capillary density and blood flow to muscles, providing for greater nutrient delivery (1,2). This will allow for more growth over the long term. I am convinced that if you include aerobic exercise in your training program this will allow for greater overall muscular development over the long term. You should obviously do more aerobics when preparing for a contest and less while you’re trying to gain weight, but I believe you should do aerobics year round. Twenty to thirty minutes a day on the bike will burn 250-300 calories, so if you’re trying to gain weight just eat a few more calories to make up for it. Think of it this way: in the off season eat a Parrillo Bar and ride the bike for at least 30 minutes. You’ll strengthen your cardiovascular system, have a richer blood supply, and end up with bigger muscles. The other benefit of aerobics is that it helps you burn fat, so while you’re gaining muscle you’ll stay lean. Some bodybuilders are afraid to do aerobics in the off season because they think it will make them lose muscle. This won’t happen if you simply eat enough calories to compensate for those used during the aerobic activity. If you eat enough high quality calories, this will support muscle growth while the aerobics helps you lose fat.

What about supplementation? Can this help me gain more muscle? Yes,
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but I want you to sort out the problems with your diet and training program first rather than hope that supplements will somehow fix everything else. Remember, the foundation of bodybuilding success is hard work, consistency, and dedication to a solid diet and training program. Supplements are the icing on the cake, not the foundation. If you’re eating sloppy and training half-heartedly, supplements will not give you the results you’re after. On the other hand, if you’re eating right and training as hard as you can, supplements can improve your gains over what you could achieve without them.

The single best supplement for gaining muscle is Creatine. This is a molecule stored inside muscle cells and is involved in energy production (1,2,6,7). It increases muscle size and strength dramatically within the first month of using it. Muscle gains of 4-14 pounds and strength increases of 10-15% are typical during the first month of creatine supplementation. That’s quite amazing when you think about it. Most of the muscular weight gain is do to storage of water inside muscle cells. As creatine is stored in the muscle, it attracts water, causing the muscle cell to swell. The strength increases are due to increased energy producing ability of the muscle (1,2,6,7). While muscle gains during the first month of creatine supplementation are miraculous, things slow down after that. After the muscles are saturated with creatine they can’t soak up anymore, and after that it’s a matter of maintenance of creatine stores. For the first 1-3 weeks you should use 20 grams of creatine a day to fully load the muscle, then after that 5-10 grams a day is enough to maintain muscle stores. It stands to reason that muscle protein gain will ultimately be enhanced as well, leading to faster muscle growth, because you’re able to train heavier while using creatine. This, of course, if providing you increase your protein and calories to support this growth.

The next most important supplements are ones which provide these calories and extra protein, since inadequate caloric and protein intake is the most common reason for failing to gain more muscle. The best choices are Hi-Protein Powder™, Pro-Carb™, and CapTri® which are specially formulated to minimize fat accumulation while increasing calories. A scoop of Pro-Carb™ and Hi-Protein™ mixed together in water has the perfect nutrient profile to support muscle growth. I’m working on a new combination product which will contain essentially this same nutrient breakdown. If you’re prone to gaining fat whenever you increase calories, I suggest you use CapTri®. CapTri® is unique in that it is a way to provide more calories with virtually no tendency to be stored as fat (4,5). At the high end of the supplement ladder are the amino acids. Muscle Amino Formula™ supplies pure branched chain amino acids, the most common amino acids incorporated into muscle protein. This supplement is usually reserved for competitive bodybuilders and endurance athletes. It has the effect of making the muscle harder and fuller and is especially useful to minimize muscle loss while dieting for a contest. If you’re training hard and long enough to lose your pump by the end of your workout, this is a tremendous supplement for you. Liver-Amino Formula™ is also a great supplement because it contains 1½ grams of protein per tablet as well as heme iron. Take five to eight with each of your six meals, you’re looking at an additional 45 to 72 grams of protein. For additional calories, the Parrillo Bar is a tremendous addition to your diet. It contains 250 calories per bar, which includes 11 grams of quality protein, 37 grams of complex carbohydrates and five grams of fat.

By losing muscle mass your body can decrease its metabolic rate, or the number of calories it requires to survive each day. This means the fat stores will last longer, since with less muscle the body requires fewer calories to maintain itself each day. So during severe caloric restriction you lose muscle and your metabolic rate decreases. And with a slower metabolism, the rate of fat burning slows down.
You should now have a pretty good idea of the areas you should concentrate your focus on if your goal is to pack on lean mass. Now I want to share some tips on what to do when your progress stalls when you’re dieting to lose fat. Of course, gaining and losing are contradictory by nature. What you’ll find, however, is that the goals in bodybuilding and fitness dictate that you do both at the same time. It’s a crazy thought, but it’s possible. Want to know how. Read on.

When you talk to most people about fat loss, the most obvious way they’ll say to lose weight is to restrict calories. And in fact, the fastest way to lose weight is to stop eating altogether. Unfortunately, when you lose weight by severe calorific restriction about half of the weight you lose is muscle. This is known as the starvation response. When you severely restrict food intake your body thinks it’s starving (which it is) so it makes certain metabolic adaptations to allow it to survive longer without food. Your body fat represents stored energy for just such an emergency, so your body tries to make it last as long as possible. During starvation your metabolism shifts and you end up losing as much muscle as fat. Recall pictures you have seen of prisoner of war survivors or famine survivors. True, they have no body fat, but they have no muscle mass either. By losing muscle mass your body can decrease its metabolic rate, or the number of calories it requires to survive each day. This means the fat stores will last longer, since with less muscle the body requires fewer calories to maintain itself each day. So during severe calorific restriction you lose muscle and your metabolic rate decreases. And with a slower metabolism, the rate of fat burning slows down. All of this makes great sense from the point of view of surviving a famine, but it’s exactly the opposite of what bodybuilders want to achieve.

Bodybuilders don’t want to lose any muscle while they lose fat. Furthermore, we don’t want to slow down our metabolic rate because that would mean slower fat loss. So how do we do it? The key is to continue to feed your body the nutrients and calories it needs to maintain its muscle mass, and to draw on stored body fat as a source of energy. Resist the temptation to cut calories or skip meals. That’s the worst thing you can do. But before we deal with the specifics, we need to lay some groundwork. Some of the basic issues are: How many calories should I eat? Don’t I need to cut calories? How fast can I lose fat? What can I do to make sure I’m not losing muscle?

Many times in previous articles I’ve referred to a concept called your maintenance energy requirement. This is the number of calories you need to consume per day to support your present body weight and activity level. Metabolically speaking, this is known as your total energy expenditure, or TEE. It is the sum of your basal metabolic rate (the amount of energy your body expends while at rest, such as during sleep) plus the energy you expend during activity, including exercise, plus the thermic effect of feeding plus another factor called adaptive thermogenesis. There are several ways that research scientists who study metabolism have of figuring this out. One way is to have a person live in a special chamber called a calorimeter and measure the heat given off by the body. This technique is referred to as direct calorimetry. Another way is called indirect calorimetry and involves measuring the amount of oxygen consumed by the body and the amount of carbon dioxide produced and using this data to calculate the amount of calories expended. These are obviously expensive research procedures and are not available to people who just would like to know what their TEE is. You have an easy way of figuring this out for yourself, however, and it doesn’t cost anything. Simply weigh all your food and record everything you eat for a week sometime while your weight remains constant. Pick a week when you’re doing your normal workout and your normal amount of aerobic activity. Calculate the average number of calories you consume a day during this period and this is your maintenance energy requirement (MER). Most bodybuilders on the Parrillo Nutrition Program weigh their food and record their calories anyway, so it doesn’t take any extra work. Just look over your Diet Trac Sheets from a week when you didn’t gain or lose any weight and calculate the daily average. If you hadn’t done this yet, you need to. It provides a scientific basis for making many decisions about your diet. I can’t tell you how many calories to consume until you know this number. The concept of the MER also provides a useful way to teach you how to construct and adjust your diet.

After you determine your MER, we can talk about calories. If you want to maintain your present body weight, you need to consume the number of calories equal to your MER - this is simply the definition of MER. If you want to gain weight, you need to consume about 300 to 500 calories per day more than your MER. This will result in a positive energy balance, which means that you are consuming more energy (calories) per day than you are expending. These extra calories can be stored as body weight. If you’re eating right and training hard, most of it will be muscle. If you want to lose weight, you need to achieve a negative energy balance. This means that you need to expend more calories per day than you consume.

There are two ways we could go about this. First, we could consume less calories than our MER, meaning that we’re eating fewer calories than our body needs to maintain itself. This will result in weight loss, but as we discussed previously, anytime we reduce calories...
we run a risk of losing some muscle. Alternatively, another way of bringing about a negative energy balance is to increase our energy expenditure. By doing more aerobic exercise you can increase your TEE and achieve a negative energy balance while still consuming your MER. This means enough calories and nutrients will be provided to maintain your present muscle mass as you lose fat. Whereas the weight lost by caloric restriction can be as much as 50% muscle, the weight lost by increasing aerobic exercise activity while maintaining constant calorie intake is almost entirely fat (7,8).

To summarize, in order to lose weight you have to burn more calories than you eat. This is called a negative energy (calorie) balance. You can do this by either eating fewer calories or by burning more calories. The approach I recommend is to eat the number of calories equal to your MER and to increase the amount of calories you burn by doing more aerobics. This will result in more efficient fat loss and less muscle tissue loss than the approach of cutting calories. You still provide ample calories and nutrients to maintain your muscle but draw on stored body fat to fuel your aerobic exercise. Furthermore, aerobic exercise builds the metabolic pathways that burn fat (1,2). It increases the mitochondria and enzyme pathways that metabolize fat. And by NOT cutting calories, your body will not decrease its metabolic rate and enter into the starvation mode. Not only is this strategy logical, but it is backed up by the scientific literature. More importantly, it is backed up by the real life experience of thousands of bodybuilders. It’s just the way that works best.

Now keep in mind we’re talking about your MER here. If you just finished a weight gaining cycle you probably were consuming 300-500 calories in excess of your MER in order to pack on some mass. So you may in fact want to decrease calories from what you had been consuming to gain weight, but don’t decrease them below your MER. This is why it’s important to have some idea what your MER is. This is a useful baseline number that allows you to make some rational adjustments instead of just guessing. Also keep in mind that as you increase muscle mass your MER will increase as well. Muscle is metabolically active tissue and requires energy and nutrients to support. For every 10 pounds of muscle you gain you will have to eat about 300 more calories a day (roughly) just to maintain your new body weight. So don’t forget to keep checking your MER periodically and make adjustments. If you keep a nutrition log and Diet Trac Sheets like you’re supposed to, it will be easy. So when I say not to cut calories to lose weight, what this literally means is don’t reduce calories below your MER, the level you need to maintain your present muscle mass. If you’ve just been in a calorie-excess mode, then reducing calories to your MER is reasonable.

References


So far this series has addressed ways to help you break through plateaus in your muscular development as well as how to spark fat-burning when you’ve seemed to have reached a plateau. This month I’d like to finish up on how to continue fat loss.

So far we’ve covered the most basic concepts of fat loss: eat right and stay strict on your diet (I’m not even going to elaborate on that in this article—we’ve been through it several times lately), don’t cut calories below your MER (maintenance energy requirement), and use extra aerobics to burn body fat. A couple more items of groundwork need to be addressed. How fast should you lose fat? A pound a week is a good general rule. It is possible to lose fat faster than that, but you increase your risk of losing muscle if you do. I have found most people can lose one pound of fat per week without losing much muscle. So plan ahead. If you want to lose 20 pounds of fat plan on 10 weeks of dieting, a two-week break to build your metabolism, and 10 more weeks or dieting, for a total of 22 weeks. If you want to enter a contest, plan on being ready two weeks out, so you have time to fine tune things and fill out a little at the end. Keep in mind that when I say “diet” you still get to consume a lot of calories—your MER. This is not a painful starvation diet.

A pound of fat contains approximately 3,500 calories, so to lose a pound a week that means you need to achieve a negative energy balance of 500 calories a day (multiply that by seven days a week and you get 3,500 calories). Do this by consuming your MER and doing 500 calories worth of extra aerobics a day beyond what you normally do. This could be anywhere from 30 to 60 minutes of extra aerobics a day, depending on how intense your aerobic activity is. When you do your aerobic exercise you should be breathing hard and sweating. This is a more reliable sign that you’re burning fat than your heart rate.

How do I know that I’m losing fat and not muscle? By using the Body Stat Kit once a week. You can determine your pounds of lean mass and pounds of fat every week and make adjustments in your training and diet accordingly to make sure you stay on track. The Body Stat Kit Manual contains detailed instructions on exactly how to change your training and diet to make sure your body composition keeps moving in the right direction. I think one of the reasons the Parrillo Program has been so successful for so many people is that everything is scientifically controlled. How many calories, how much protein, carbs, and fat, how many meals, which foods, how to combine the foods, macronutrient ratios, Diet Trac Sheets, the Training Log, Body Stat Sheets—it’s all in the manuals. Every parameter of your bodybuilding program is covered and nothing is left to chance. If you weigh your food and keep track of your diet and body composition like you’re supposed to, and something’s not working right, we can pinpoint exactly what the problem is and make detailed adjustments to fix it. Otherwise, if you’re just going on what “feels right” or seems to make sense, and you don’t make good progress, you’re not sure what to change.

I have found most people can lose one pound of fat per week without losing much muscle. So plan ahead. If you want to lose 20 pounds of fat plan on 10 weeks of dieting, a two-week break to build your metabolism, and 10 more weeks or dieting, for a total of 22 weeks.

A very successful approach I wrote about a couple of months ago involves alternating one month on a weight gain cycle with one month on a fat loss cycle. This way your metabolism never adapts and you avoid the problem of plateaus altogether. Let’s say one month you gain a pound a week (four pounds) and it’s 75% muscle. That’s three pounds of muscle and one pound of fat. The next month you lose a pound a week and it’s 75% fat. So that month you lose three pounds of fat and one pound of muscle. At the end of the two month cycle the net result is that you’ve gained two pounds of muscle and lost two pounds of fat. After one year you would gain 12 pounds of muscle and lose 12 pounds of fat. I believe these goals are quite realistic and very easily attainable for anyone, and particularly easy for bodybuilders who are giving 100% effort to the training and nutrition program. The beauty of this idea is that you’re constantly making progress, you’re always either gaining muscle or losing fat, and the constant change prevents your metabolism from adapting so you can make continual progress without wasting time being stuck on a plateau and trying to figure out what to do. In principle you could keep this up for year after year. If you’re 20% body fat or more, you may want to devote a few months to getting in shape first, or if you’re really skinny you may want to spend a few months just putting on size. But if you’re somewhere in the middle, maybe around 10% body fat, you might consider giving this program a try. To gain a pound a week increase your calories to 300-500 above your MER, do 20-30 minutes of aerobics a day, and train like a powerlifter with heavy sets in the 3-6 rep range. To lose a pound a week decrease calories to your MER, do 60 minutes of aerobics a day, and train like a bodybuilder with increased volume and moderate weight in the 8-12 rep range. I think this approach may well work better for today’s leaner, cleaner natural

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bodybuilder than the old style of weight cycling, which often involved gaining 50 pounds in the off season, then losing 40 pounds during the pre-contest diet to come into the show 10 pounds heavier than last year. (Although this method also had its pluses, like stretching the fascia.)

Now let’s move on to some specifics. So we don’t want to cut calories, because that can easily lead to muscle loss. Are there any other dietary manipulations that can help? Yes. Continue to eat five, six or more meals spaced evenly throughout the day. This has several beneficial effects. Every time you eat your metabolic rate increases a little due to the thermic effect of feeding (also known as diet-induced thermogenesis). Eating frequently keeps the furnace stoked and keeps your metabolism speeding along. If you go too long without eating your metabolism begins to slow down. Make every effort to eliminate fat from your diet. I won’t go into the details here, but dietary protein and complex carbohydrates have negligible tendency to be converted to fat, whereas dietary fat is very prone to be stored as body fat (1,2,3,4). This is a hot topic in the scientific literature these days and is a matter of debate in the bodybuilding magazines. (It is less a matter of debate in the scientific journals, where actual research is reported.) Very little of your body fat comes from complex carbohydrates or protein being converted into fat; almost all of it comes from fat you eat. How much fat your body stores seems to be more closely related to how much fat you eat rather than how many calories you eat. Admittedly, this is less important during calorie restricted diets. During low calorie diets you are not eating enough calories to maintain your body weight, so all of the calories you eat will be burned, even if some do come from fat. However, in diets which provide enough calories to maintain body weight or even enough to support growth (including the Parrillo Diet) then the fat content becomes very, very important. If you eat a weight maintenance diet or an energy surplus diet to support growth, then the calories supplied as dietary fat will be stored as body fat, not muscle. Part of the confusion in the bodybuilding magazines is due to the failure to distinguish the various experimental designs and improperly applying this information to bodybuilding.

Without restricting calories, there are some things we can do to help shift the metabolism into fat-burning mode. First is to eliminate fat from your diet. Whenever you do aerobics some of the fuel is derived from carbohydrates and some from fat. If you’re not eating any fat or simple sugars which are easily turned into fat, then the fat you burn during aerobic exercise must come from stored body fat. If dietary carbs and protein are not converted to fat (and they’re not under conditions of a diet supplying a number of calories equivalent to the MER) then you will achieve negative fat balance. This means that on a daily basis your body burns more fat than you eat, so you lose body fat. Metabolically speaking, this means your respiratory quotient is less than your fuel quotient. Within the last few years it has been discovered that this condition (RQ less than FQ) must be satisfied for fat loss to occur. What this means is that to lose fat you have to achieve a negative fat balance, not a negative energy balance as is commonly thought. In simple terms: dietary fat matters more than calories.

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Second, decrease your carbohydrate intake. This lowers insulin levels and promotes fat burning. How do you cut down on carbs without decreasing calories? Well, you have to eat more of something else. Fat is not an option, so your only other choices are protein or CapTri®. Either one will work, but a combination of both probably works best. Let’s be brutally honest about this. If
you’re used to getting most of your calories from carbs, cutting back significantly on carbs makes you feel bad, at least for a while. People who cut their carbs dramatically have low energy levels, are irritable and grouchy, and get headaches. Low carbs sucks, basically. You’ll get used to it after a while, but the first few weeks of a low carb diet are not fun. CapTri® is more effective at relieving some of these symptoms than protein because it’s more readily used as an energy source. Protein is not a very efficient energy source. It’s role is to serve as building blocks for repair and maintenance of tissues, not to provide metabolizable fuel. Using protein for energy is kind of like trying to burn a wet log. Carbs, on the other hand, are a great energy source. So if you want to reduce carbs in your diet to manipulate hormone levels and promote fat metabolism it makes sense to replace those calories with another fuel source, namely CapTri®. CapTri® is a good choice because it is readily burned as fuel and won’t be stored as body fat, (5, 6). I suggest you ease into this slowly. Start by eliminating starchy carbs from your last meals of the day. Replace those lost calories from carbs with an equivalent number of calories from CapTri®. CapTri® actually has a higher thermogenic effect than carbohydrate, meaning that more of this dietary energy will be lost as body heat with less energy available for storage. This further promotes additional fat loss. Continue in this way until you reduce your daily carbohydrate grams to about half of what you normally consume. At this point you’ll be eating mostly protein, vegetables and CapTri®.

Recently I did a feature on how to optimize your training to maximize fat loss. One of the most important points is to do your aerobics when you are relatively carb-depleted. This will cause you to burn more fat during your workout (because less carbs are available). The best time is first thing in the morning before breakfast. Your glycogen stores are the lowest they’ll be all day, so you’ll rely more heavily on stored fat. Take two scoops of Hi-Protein Powder™ to prevent muscle loss, then do your aerobics. Another good time is right after weight training, because then you’re relatively glycogen depleted too. You should do moderate to fairly high intensity aerobics, so that you’re breathing hard and sweating. While it’s true you burn a higher percentage of calories from fat during low intensity aerobics, you will burn more grams of body fat if you perform high intensity aerobics, because you’ll burn so many more total calories. Also, if you do reasonably intense aerobics you will get the added benefits of increased vascular density and enhanced fat burning capacity. Increase the volume of aerobics progressively as you get leaner. If your fat loss plateaus the first thing to try is to do more aerobics. If that doesn’t work you should probably back off for a couple weeks, increase your calories, put on some muscle, and get your metabolism going again.

If you want more details than I have been able to squeeze into this article, check out the Parrillo Performance Nutrition Manual and the Body Stat Kit. I go into great detail about which foods to eat, which foods to avoid, and how to structure your meals. The Nutrition Manual contains a three step protocol for reducing body fat levels to contest condition, as well as describing how to manipulate carbs and water at the end. The Body Stat Kit contains instructions on exactly how to modify your training and nutrition program based on your weekly changes in body composition. The Nutrition Manual comes with its own food scale and Diet Trac Sheets to record your calories and grams of protein, carbs, and fat. It even includes a food composition guide that lists the nutrient breakdown of all the bodybuilding foods. The Body Stat Kit includes high quality calipers and everything you need to chart your body composition. Remove the guesswork from your bodybuilding program. Don’t leave anything to chance. We’ve got all the details covered. You want results? Get them with Parrillo.

References

Carbohydrates—The Optimal Fuel For Success, Part I

by John Parrillo

Recently we talked about the benefits of a high carbohydrate diet as compared to the high fat diet in terms of getting lean. Not all calories are created equal. Dietary fat is preferentially stored as body fat, whereas carbohydrates do not significantly contribute to fat stores (1,2,3). Most of your body fat is derived from the fat you eat and very little comes from conversion of protein or carbohydrate into fat (1,2,3). So it makes sense that if you want to reduce body fat the first place to start is to eat less fat. Proponents of the high fat diet say that carbohydrates cause insulin release which in turn stimulates fat storage. On the Parrillo diet we teach you how to select carbohydrate sources and structure your meals so that carbohydrates are released into the bloodstream very slowly, so this isn’t a problem. To look at the big picture, if you consume too many calories from any source for a prolonged period of time some of these calories will end up as body fat. Conversely, if you operate in a calorie deficit for a prolonged period of time you will lose some fat. However, the results you will get in either of these situations are different depending on if you supply the bulk of those calories in the form of fat or carbohydrate. We have found that if you eat a diet higher in carbs and low in fat you will end up being leaner and more muscular whether you are using the diet to gain weight or lose weight.

This month I want to talk about the other half of the story, that carbohydrates are a superior fuel for exercise performance compared to fat. Not only will carbs make you leaner, they’ll also give you more energy, strength, and endurance. We’ll start with a review of energy substrate utilization during exercise, and then talk about dietary strategies to maximize your exercise performance. This discussion will apply equally well to bodybuilders and endurance athletes. Adenosine triphosphate (ATP) is the molecule that directly provides energy for contraction for about two to four seconds (4). So the ATP has to be continually replenished as it is used. There are three energy systems in place for making new ATP so you can continue to exercise beyond four seconds. These are the phosphagen system, the lactic acid system, and the aerobic system. The phosphagen system is comprised of the “high energy phosphate compounds,” which include ATP and creatine phosphate (CP). This is by far the fastest energy system and can provide for rapid bursts of high intensity exercise such as weight lifting, sprinting, football, and some track and field events. Muscle cells contain from three to five times more CP than ATP, and the phosphagen system can sustain maximal exercise for about six to eight seconds. After that, the CP is also used up and we have to activate another energy system. You can see why creatine is such an effective and popular sports supplement. It helps to provide more immediate energy allowing for higher intensity exercise. This is why creatine increases strength in weight lifters. As a nice “side effect” it also attracts water into the cell, making the muscles fuller and harder.

The next energy system is the lactic acid pathway. This can provide maximal energy for periods lasting up to one-and-a-half or two minutes. This pathway consists of the anaerobic conversion of glucose into lactic acid (anaerobic means “without oxygen”). This is actually a relatively long and complicated process involving several steps, and the overall pathway is called “glycolysis.” The end result is that one glucose molecule is broken down to form two lactic acid molecules, releasing energy in the process. This energy is used to form ATP. Where does this glucose come from? By far the most important source of glucose for this process is stored muscle.
gycogen (4,5). Let’s think about that for a minute. How long do most of your sets last in the gym? I’m not talking about the rest period, but the amount of time you’re actually lifting weight with the muscle under tension. Probably anywhere from 30-60 seconds, generally. This is definitely longer than the phosphagen system can hold out without being replenished from some other energy source. Without calling in reinforcements, the phosphagen system by itself could only get you through the first rep or two. So what this means is that for very intense (maximal or near maximal) exercise lasting about a minute or so, such as weight lifting, the lactic acid system is the primary energy-producing pathway at work (4,5,6). And the primary fuel substrate for the lactic acid system is stored muscle glycogen (4,5,6). When you do a set in the gym most of the energy comes from stored muscle glycogen. So muscle glycogen is the most important fuel source for weight lifters, sprinters, football players, and other athletes performing short bursts of maximal exercise. A high carbohydrate diet is best for athletes because it helps maintain a high level of stored glycogen in muscle.

The problem with fat as an energy source for resistance exercise is that fat cannot be converted into glucose or glycogen, at least in humans. So a high fat diet cannot maintain muscle glycogen and therefore cannot support as high a level of exercise performance. You might wonder how people on extremely low carb diets can manage to lift weights at all. While fat cannot be converted into glucose, amino acids from protein breakdown can. So even if you don’t eat any carbs at all you can still get a little muscle glycogen from breakdown of protein and conversion of amino acids into glucose. Also, the high fat diet results in the production of ketones which can be used by muscles as fuel for weight lifting. I suspect that most people who follow the high fat diets have extremely low muscle glycogen levels and in fact are able to perform some degree of resistance training using ketones as fuel. We have seen that when CapTri is used as an energy supplement during low carb “cutting” diets this greatly improves the ability to continue lifting. And we know that CapTri works by being converted into ketones by the liver. So I suspect the same process is going on with the high fat diets, except that it doesn’t work nearly as well with conventional fats as it does with CapTri because CapTri is converted into ketones much more rapidly and completely than are conventional fats. On the Parrillo Program even when we use CapTri in this way, the bodybuilder is still eating some carbs, just not as much as usual. So he still has a significant store of muscle glycogen. The problem with the high fat diet is not only that you have virtually no muscle glycogen, but also that the ketones which are available are not stored to any appreciable extent in muscle cells. So on low carb diets you have no muscle glycogen, meaning that you’ve knocked out the primary energy pathway used in weight lifting-type exercise. You do have ketones, but these can’t be stored inside the muscle. You have less strength, less endurance, and since glycogen stores are depleted your muscles are flat and you have no pump. Not a very good way to go. There can be no doubt that carbohydrates are a much better fuel source for bodybuilders and endurance athletes than fat, and this is backed up by biochemistry, by the scientific literature, and by our own testing here at Parrillo Performance.

The third energy pathway is the aerobic system. This system can provide energy continuously for hours, but at a lower level of intensity compared to the other pathways. This pathway can use both carbohydrate and fat, and in fact is the only energy system that can use fat as a fuel substrate. As explained above, very brief and intense exercise such as weight lifting and sprinting is fueled by the lactic acid system (an anaerobic energy-producing pathway) and very long, low intensity exercise such as walking is fueled by the aerobic system. Moderate intensity exercise such as jogging or biking is fueled by a combination of both pathways. When the energy requirement demanded by the exercise does not exceed the ability of the aerobic system to supply ATP, then this is the primary energy system. A leisure walk is powered by the aerobic pathway, and you can sustain this level of activity for hours. If you pick up the pace and start jogging at a comfortable pace you can maintain for some time, this is still fueled by the aerobic pathway. If now you begin running fast, the aerobic energy system can no longer supply enough ATP to meet the energy requirement of your muscles and the lactic acid system kicks in. You can keep up this pace for several minutes - longer than the 2 minutes the lactic acid system could last by itself because it is being supplemented by the aerobic system. Now if we move up one more notch of intensity, such as weight lifting or an all-out sprint, the lactic acid system is operating at full bore and when muscle glycogen becomes depleted (among other factors) the exercise will stop. The aerobic system simply cannot supply energy fast enough to keep up with the demands of the muscle.

Now let’s discuss how your body selects energy substrates during exercise. After we understand the patterns of energy substrate utilization we can design effective dietary strategies to maximize our results. Glucose stored as glycogen in muscle and liver, and fatty acids stored as triacylglycerols (fat molecules) in adipose
Carbohydrates—The Optimal Fuel For Success, Part I

By far the most important thing you can do to prevent use of protein as fuel is to make sure your muscle glycogen stores are always “topped off.” That’s another serious draw-back of the very low carb diets. Glycogen levels are so low the muscle protein is very vulnerable to be broken down so that the amino acids can be converted to glucose and used as fuel. Adequate glycogen availability “spares” amino acids, meaning that if your body has carbs available to use as fuel it won’t need to use any protein. The next thing you can do is to use a scoop of Hi-Protein Powder right before your aerobics so that if any amino acids are going to be used as fuel they will be derived from the protein powder instead of your muscles. The Hi-Protein is probably superior to regular food for this purpose since it is digested rapidly and the aminos are released into the bloodstream faster than from whole, solid protein foods. I recommend doing your aerobics first thing in the morning before breakfast, because it’s at that time that blood sugar levels are low and muscle glycogen is at the lowest level it will be throughout the day. This results in greater use of stored body fat as a fuel source during your aerobics since less carbohydrate energy is available. This does however put you at some risk for breaking down muscle, so that’s why it’s a good idea to have a serving of Hi-Protein Powder before your morning aerobics. Keep in mind however that this condition of relative glycogen depletion I’m talking about is a far cry from the near-zero levels resulting from low carb diets. Even first thing out of bed before breakfast, Parrillo bodybuilders have a lot of glycogen on board. This just turns out to be the time which it will be lowest during the day, so it’s the best time to burn fat.

So, if we control things such that we use very little or no protein as fuel, the energy cost of our exercise is supplied by a mixture of carbohydrate and fat. The relative contribution of carbohydrate and fat to the substrate mix being oxidized can be determined by measuring the respiratory quotient (RQ). This gets a little technical here, so I’ll be brief. Carbohydrate molecules such as glucose contain oxygen, so the carbon atoms in the carbohydrate molecule are already partially oxidized. However, the carbon atoms in a fatty acid molecule are not partially oxidized. Therefore, when fat and carbohydrate are burned (oxidized) separately different amounts of oxygen are consumed per amount of carbon dioxide produced. So if we measure the amount of oxygen consumed and carbon dioxide produced by an athlete while he’s exercising, we can “back calculate” if he’s burning fat or carbs as fuel. (I hope that wasn’t too painful.) An RQ of 1.0 indicates that essentially pure carbs are being used as fuel, and an RQ of 0.7 indicates that fat is the fuel source. Intermediate values of RQ demonstrate that a mixture of carbohydrate and fat is serving as the fuel supply.

What experiments like this have proven is that during very low intensity exercise (like walking) fat is the predominant fuel source (4,5,6). During sleep or rest almost exclusively fat is used. So if you believe these guys who advocate low intensity aerobics because it uses a higher percentage of calories from fat, then just sitting around and watching TV should get you ripped. As the intensity of exercise increases, we see that more carbohydrate is used as fuel (4,5,6). This progression continues until exercise intensity reaches V02max, at which time carbohydrate becomes the sole energy substrate (4). You will recall that V02max (vee-oh-two-max) represents the maximal rate of oxygen consumption by an athlete. This means that the aerobic energy system is completely maximized, and any further increase in energy needs must be met by the anaerobic (lactic acid) system. Since fat cannot be used by the lactic acid system, the energy at this point can only be supplied by carbs. This all makes good sense. We know that we can maintain low intensity exercise for prolonged periods of time (you could walk all day if you wanted to). That’s because this activity is powered by the aerobic energy pathway, which can use fat as a fuel source. Your body has many more calories stored as fat than it can store as glycogen, because fat is a much more compact way to store energy and because you have limited space to store glycogen. You can carry on this low level of activity indefinitely because you won’t run out of fat. But we can only sustain maximal exercise for a relatively short time, because this relies on the lactic acid system which can only use
glucose as fuel (other factors contributing to muscle fatigue are also at play here). After the glucose (stored as glycogen) is used up the fat can’t burn fast enough to meet the demands of the exercise. At very high exercise intensity oxygen cannot be delivered to the muscle fast enough to allow the aerobic energy system to operate, so the muscle must rely on the anaerobic (lactic acid) system, which can only use carbohydrate. The bottom line: fat cannot serve as the fuel source for very high exercise intensity, because it cannot undergo anaerobic metabolism. Carbs are the only fuel that can support maximal exercise intensity.

As you would expect, moderate intensity exercise uses a mixture of carbs and fat. As the duration of exercise proceeds, muscle glycogen gradually becomes depleted so oxidation of fat begins to make a greater contribution. We also see greater uptake of glucose from the bloodstream. This is attributable to greater muscle blood flow during exercise as well as more efficient extraction of glucose from the blood by the muscle. After 20 minutes of exercise muscle glycogen stores become partially depleted and the use of muscle glycogen slows (4). This is accompanied by increased use of blood glucose. The liver acts to help maintain blood glucose levels by breaking down its glycogen stores and releasing glucose units into the bloodstream. After both muscle and liver glycogen stores are depleted, which takes about two or three hours of moderate intensity exercise (marathon running or long distance cycling for example), is when we really get in trouble. At this point one of three things must happen: the exercise must be stopped or significantly reduced in intensity, blood glucose must be maintained by carbohydrate ingestion during exercise, or muscle tissue will be destroyed to supply amino acids as fuel.

It is well known that aerobic training allows one to perform “more aerobically” at the same absolute level of exercise intensity (4,7). This means that as your level of cardiovascular conditioning improves you can derive more and more of the required energy from fat and rely less and less on carbohydrates. This happens because cardiovascular training increases the number of mitochondria in muscle cells and the level of fat-metabolizing enzymes (4,7). In other words, the cellular fat-burning machinery is built up and your muscle learns to use less carbs and more fat. This is a great benefit of regular aerobic exercise. However, it won’t happen if all you do is walk. In our experience here at Parrillo we have seen that there is an intensity threshold required to elicit this metabolic adaptation. You can’t get your muscles to grow unless you lift intensely, and you can’t train your muscles to rely more heavily on fat unless you do your aerobics intensely. Intense aerobics will have a much more marked effect in helping you get lean than mall walking. Trust me on this one.

An added benefit here is that as you train your muscles to use a higher proportion of fat in the substrate mix, this spares muscle glycogen. If you can burn more fat you don’t need to burn as much glycogen. So you’ll have more endurance plus greater strength as your workout proceeds. Depletion of muscle glycogen is associated with exercise fatigue (4). The glycogen-sparing effect resulting from increased lipid oxidation appears to be an important mechanism explaining why aerobic exercise causes an increase in endurance capacity (4). Furthermore, aerobically trained individuals seem to store more fat inside their muscle cells, as well as increasing their ability for intramuscular glycogen accumulation (4). You want to get lean? You want to get pumped? You want to maximize your strength and endurance? Do your aerobics and eat a high carb - low fat diet. You’ll be amazed at the results. Next month we’ll continue our discussion of carbohydrates and exercise and talk about dietary manipulation of fuel stores and energy substrates. What kind of carbs are best? When? How much? Stay tuned.

References

Carbohydrates—The Optimal Fuel For Success, Part II

by John Parrillo

In the last article we began our discussion of carbohydrates as the preferred fuel for athletic performance. It is well known that the ability to sustain moderate to heavy exercise for prolonged periods of time is related to initial muscle glycogen concentration (1). The more glycogen you have stored in your muscles, the longer you can exercise at a given work load. One experiment showed that when muscle glycogen levels were 0.63 grams of glycogen per 100 grams of muscle, a standard exercise load could be maintained for 57 minutes before fatigue. When glycogen levels were increased to 1.75 grams per 100 grams of muscle, the same exercise could be performed for 114 minutes. And if the initial glycogen level was 3.31 grams per 100 grams of muscle the exercise could be continued for 167 minutes (1,2). The close correlation between muscle glycogen levels and time to exhaustion is a good reason to follow a high carbohydrate diet. It has been suggested that glucose and fatty acids cannot cross the cell membrane (that is, enter the cell) fast enough to provide adequate fuel for intense exercise (1). This is why muscle glycogen (glycogen already stored inside muscle cells) is the most important fuel for exercise.

Now let’s talk about some specific dietary strategies to maximize endurance performance. It is very important to fill glycogen stores completely before participating in an exhaustive endurance event. Endurance athletes who train on successive days are likely to require 65-75% of their calories from carbohydrates to optimize performance (1). It may be that feelings of tiredness which are attributed to overtraining are in fact due to low glycogen stores (1). Some cases of “overtraining” may really just be under-nutrition. Foods rich in complex carbohydrates are preferable to refined sugars because they are more nutrient dense and result in lower blood glucose and insulin levels. This makes it more likely that the carbohydrate will be stored as glycogen rather than being converted to fat. It is recommended that the last meal consumed before an endurance event be relatively light and contain a mixture of easily digested complex carbohydrate and protein (1). This meal should be eaten about two to three hours prior to exercise to allow time for the stomach to empty. Improvements in exercise performance from pre-exercise carbohydrate ingestion is probably due to a delay in the normal decline of blood glucose during exercise (1). Most likely, this works by supplementing hepatic (liver) glycogen reserves. A recent study has shown that ingestion of one to two grams of carbohydrate per kilogram of body weight one hour before exercise can improve performance (1). In this experiment the carbohydrate was given in liquid form, which is what we would generally recommend if you’re going to eat something within an hour of exercise. This allows for more rapid digestion and absorption than is possible with solid food. Pro-Carb Powder™ (original Vanilla or the new Chocolate flavor) is ideal for this, supplying 22 grams of medium-chain carbohydrate (maltodextrin) along with four grams of protein per scoop. That means a 180 pound athlete would need about four scoops taken 30-60 minutes before competing.

Consuming carbohydrates during exercise can also improve performance. This works by helping to maintain blood glucose levels and preventing hypoglycemia, rather than by sparing muscle glycogen (1). Keep in mind I’m talking about maximizing exercise performance here, not fat burning. If you’re doing aerobics simply to burn fat then you don’t want to eat anything during exercise because this will decrease the utilization of body fat as fuel. Competitive endurance athletes may however improve performance by consuming a carbohydrate drink during exercise. This will help replace fluids as well as maintain blood glucose. The rate of gastric (stomach) emptying is key here, as this ultimately controls the availability of the ingested carbohydrate. The stomach empties faster the fuller it is, so it is advised to keep the stomach volume relatively high by taking frequent small drinks. Maltodextrin theoretically should exit the stomach faster than glucose solutions due to its lower osmolality (the concentration of particles in a solution). A rate of about 45 grams of supplemental carbohydrate per hour seems adequate to maintain blood glucose levels during moderate exercise (1). This would be one scoop of Pro-Carb Powder™ every 30 minutes.

Whatever you do, stay away from fructose as an exercise fuel. Fructose is the sugar found naturally in fruit and, ironically, in most sports bars (the Parrillo Bar uses rice dextrin, not fructose). Some people recommend fructose for athletes because it has a low glycemic index and results in a low insulin response. This line of reasoning however fails to consider the big picture of fructose metabolism. Fructose is a bad choice for athletes for two
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reasons. First, a significant proportion of it is converted to fat by the liver. This is probably the reason it has a low glycemic index and a low insulin response. Second, it does not work well for restoring muscle glycogen. Fructose is metabolized by the liver, not by muscle. Trials with fructose supplementation during exercise have failed to demonstrate an improvement in performance (1) and using fructose as a carbohydrate source to replenish muscle glycogen stores following exercise does not work as well as glucose or glucose polymers (1,2).

Restoration of muscle and liver glycogen reserves after exercise is critical for recovery and subsequent exercise performance (1). I feel it is also very important in order to derive the maximal training effect from exercise, so that you can go out and have improved performance next time. Now we will discuss the type, timing, and amount of carbohydrate needed to maximize recovery of glycogen stores after exercise.

Research shows that glycogen levels can be restored within 24 hours following exhaustive exercise if 600 grams of carbohydrate are consumed (1). This makes good theoretical sense, because most people can store around 400 grams of carbohydrate as glycogen (and maybe twice that much using carb loading techniques). So 600 grams provides enough to replenish glycogen stores plus a little left over to use as fuel during your recovery day. (It is assumed that you will not be exercising during this 24 hour period.) The rate of glycogen synthesis is most rapid immediately following exercise. This is due to several factors, including increased activity of the enzyme that manufactures glycogen, increased permeability of the muscle cell membrane to glucose, and increased sensitivity of muscle to insulin following exercise (1). You should try to consume one to one-and-a-half grams of carbohydrate per kilogram of body weight every two hours for the first six hours after exhaustive exercise and a total of 600 grams during the first 24 hours.

The type of carbohydrate used also affects the degree of glycogen repletion. This effect is most likely due to the glycemic and insulimic responses of various carbohydrates. Fructose causes a much lower blood sugar level and insulin level than glucose-based carbohydrates. It is well known that fructose is not nearly as effective as glucose at restoring muscle glycogen (1,2). This is probably because fructose metabolism is essentially confined to the liver. Several studies have compared simple sugars versus complex carbohydrates, with various results. Some studies have found no difference, and some have suggested that simple sugars result in better glycogen recovery during the first 24 hours. One study found that complex carbohydrates resulted in higher rates of glycogen synthesis after 48 hours (1,2). Apparently complex carbs work better over the long term and higher levels of glycogen can ultimately be achieved using complex carbs. My recommendation is to avoid sugar but to use a relatively short chain glucose polymer such as found in Pro-Carb Powder™ or the Parrillo Bar for the first six hours after exercise and then rely on complex carbs for the remainder of glycogen repletion. This should result in optimal glycogen recovery. Simple sugars are more easily converted to fat than complex carbohydrates, and this may be the reason that higher glycogen levels are seen after 48 hours with complex carbs. The complex carbs are more prone to be stored as glycogen while simple sugars more readily spill over into fat stores. The best carb choices for glycogen repletion are complex starches such as rice, potatoes, sweet potatoes, beans, oatmeal, and so on. Contrary to what some proponents of the high fat diet say, current research proves that complex carbohydrates have very little tendency to be converted to body fat (3,4,5).

Several studies have directly compared the effects of carbs versus fat on endurance. One compared a high carb - low fat diet (83% carbs, 3% fat) to a high fat - low carb diet (94% fat - 4% carbs). They found that the group consuming high carbs burned more carbohydrates during exercise and had an endurance time of 210 minutes compared to 88 minutes for the high fat group (2). A high carbohydrate diet results in greater muscle and liver glycogen stores plus helps maintain blood glucose levels longer, resulting in greater endurance. Hard training athletes need extra carbohydrate to support their exercise activity. When a group of athletes was fed a diet containing 40% carbohydrate, their muscle glycogen levels steadily declined over a few days of training. When they were switched to another diet containing the same number of calories but 70% carbs, their glycogen stores were maintained (2). This is very important. It means that not only do athletes need extra calories to fuel their exercise activity, but it also matters where the calories come from. A high fat diet cannot maintain glycogen stores even if it is adequate in calories. This is because fat cannot be converted to glycogen. Also keep in mind that athletes need more protein than sedentary people. This has been proven in many studies using nitrogen balance techniques.

We recommend a diet providing one to one-and-a-half grams of protein per pound of body weight each day with the rest of the calories provided by complex carbohydrates. Try to limit fat to
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5-10% of calories. Use high quality, low fat proteins such as chicken breast, turkey breast, egg whites, and fish. Good starchy carbs are things like potatoes, rice, beans, and oatmeal. At each meal you should also include a fibrous carb, such as broccoli, asparagus, salad greens, or other vegetable. Each meal should be balanced, containing one complete protein source, a starch, and a fibrous vegetable. Try to divide your daily grams of protein and your total calories evenly among six small meals. The Parrillo Performance Nutrition Manual contains exact instructions on which foods to eat, which foods to avoid, and how to structure your diet. It also contains a detailed food composition guide and comes with a food scale, so you can determine how many calories and how many grams of protein, carbs, and fat you’re consuming. It contains precise directions on how to modify your diet to optimize gaining lean mass or losing body fat.

Regarding supplementation, Parrillo Performance Hi-Protein Powder™ is a high efficiency protein mixture providing a high level of glutamine, branched chain aminos, and essential aminos. This is an excellent way to get your protein intake up where it needs to be. It’s now available in chocolate, which is delicious. Endurance athletes and bodybuilders trying to gain weight will do well with Pro-Carb Powder™, a maltodextrin-based carbohydrate supplement. This is an ideal supplement for glycogen repletion and carbohydrate loading. We have had great success using it alone or in combination with CapTri® before and during endurance events.

Another product that we’ve just introduced called 50/50 Plus™ fits this need for additional carbs and protein nicely. With 20 grams of protein and 17 grams of complex carbohydrate in each two scoop serving, 50/50 Plus™ provides your body with the protein necessary to stave off muscle catabolism for energy as well the extra carbs to supply energy when you need it and help replenish glycogen stores when you’re finished with your activity. 50/50 Plus™ comes in four delicious flavors — Vanilla, Chocolate, Orange Cream, and Milk — and can be mixed with water or stirred into your food to boost your nutrient levels.

Endurance athletes should also consider Liver-Amino Formula™. This supplement is the ultimate source of heme iron, which is a superior iron source for building blood cells. Creatine is another supplement that can help extend your energy base. And all serious athletes should be using Essential Vitamin Formula™ and Mineral-Electrolyte Formula™.

Even if you’re a bodybuilder and not an endurance athlete, vigorous aerobic exercise will help you get bigger and leaner. Aerobics helps build capillary density in muscle tissue, allowing for better nutrient delivery and more growth. Aerobic conditioning also trains your muscles to rely more on fat as a fuel source but increasing mitochondria and the level of fat burning enzymes (6,7). This helps you get leaner plus spares muscle glycogen for a better pump. Until next time, good training.

References


The Ultimate Growth Combo

by John Parrillo

Carbohydrate and Protein — We already know how important these nutrients are individually. Now check out what happens when we put them together!

There are several criteria we must consider when evaluating a nutritional supplement for bodybuilders. First, is there some plausible mechanism by which the supplement might work? This just means is there some logical reason why the supplement should be expected to produce results. For example, we might expect protein supplements to be helpful because they provide the building blocks the body needs to build more muscle tissue. Second, is the supplement actually absorbed by the body and delivered to the site where it’s supposed to act? If your supplement is not absorbed into the bloodstream and carried to muscle cells, it probably won’t do much. Third, does it produce its effects at the recommended usage level, or is the amount used too small to really be effective. And fourth, the most important criteria is, does the supplement actually produce the desired effect better than a placebo or control. The first few criteria are really asking, “CAN the supplement work?” And the last question is asking, “Does the supplement REALLY work and do what it’s supposed to do?”

Unfortunately, few scientifically controlled studies have been performed to specifically evaluate how well nutritional supplements work to help bodybuilders. Many of the supplements out on the market have never been tested to see if they really work. Some of them have been, however. A recent article in the Journal of Applied Physiology (1) tested the effects of either a carbohydrate supplement alone (CHO), a protein supplement (PRO), or else a mixture of carbohydrate and protein (CHO-PRO) to see how the various supplements affected the levels of anabolic hormones in healthy drug-free weight lifters. In addition to merely providing the raw materials for building muscle tissue and storing glycogen, foods and supplements can affect the hormonal environment of the body. In this magazine I have written extensively about how to use food to control various hormone and enzyme levels to create an anabolic environment in the body where nutrients are shuttled to the lean compartment (muscle) while drawing on stored body fat as an energy source. This concept of “nutrient partitioning” amounts to eating in such a way that the food you eat is used to build muscle tissue while your body fat is burned as a fuel source. To me, this is the essence of bodybuilding nutrition. This works because many of the body’s anabolic and catabolic hormones are significantly influenced by diet, and it is the levels of these hormones that determines to a great degree whether the calories you eat will be stored as fat or turned into muscle.

At Parrillo Performance, we do a lot of “end point” testing of our supplements before a formulation is released on the market. By this I mean we try various formulations of supplements on elite, competitive bodybuilders to find out what actually works. The competitive bodybuilder is the ultimate research lab for studying bodybuilding supplements, because any little change in his or her physique is readily apparent. We follow the athlete’s weight, lean body mass, percent body fat, strength on the core lifts, overall “look” and hardness, plus subjective information such as energy level, training intensity, and how he or she feels. By making small changes in formulations we can see how these affect size, strength, conditioning, endurance, and energy level. This is really results-driven testing, because the reason people come to Parrillo Performance is for results. Sometimes (often times, actually) we figure out what works “out in the field” with real bodybuilders before the scientists back in the labs have figured out why or how it works. It’s always gratifying when the biochemical research explains some of the results we’ve seen in the gym, and that’s the case with this paper.

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It has been well established that weight lifting causes an increase in growth hormone and, to a lesser extent, testosterone. This is no doubt part of the way in which resistance exercise brings about muscle growth. The question
is, can we use any nutritional “tricks” to help this process along, above and beyond simply providing the raw materials needed to make more muscle protein? In fact, we can use supplements to improve the anabolic milieu to further enhance muscle growth. The most obvious way to improve the situation is to increase insulin levels, which acts as a potent stimulus to increase muscle amino acid uptake and activate the protein synthetic machinery. Exercise tends to lower insulin levels, which is great because this promotes fat burning during exercise, but then after exercise during the recovery period we want to activate insulin to take advantage of its anabolic properties. This is one time when we don’t have to worry so much about insulin causing fat accumulation, for two reasons. First, right after training the muscle cells are hungry for nutrients and they will gobble up all the calories before the fat cells can get them. Second, after exercise glycogen stores are depleted so any carbohydrates you eat at that time will be stored as glycogen rather than being converted to fat.

Carbohydrate alone or in combination with protein (but not protein alone) serves as a potent stimulus for insulin release. Furthermore, we know that protein feeding stimulates growth hormone and IGF-1. The tension placed on muscle during weight training somehow activates protein synthesis and induces muscular hypertrophy.

Studies which use novice trainers and low intensity programs. The subjects were given four different supplements to test: carbohydrate (CHO) which was a mixture of dextrose and maltodextrin, protein (PRO) which was a mixture of milk protein isolate and whey protein, carbohydrate plus protein (PRO-CHO) which was 70% carbohydrate and 30% protein, or else plain water, which was used as the control. This is also good news because the protein and carbohydrate supplements used are virtually identical to the most popular protein and carb supplements used by bodybuilders. The CHO supplement was given at a dose of 1.5 grams CHO per kg of body weight, which works out to be about 120 grams of carbs, or 480 calories on average per supplement dose. Again, this is good news because this is a realistic amount of supplement and we should expect to see an effect, if there is one. The other supplements (PRO and CHO-PRO) were given at equal caloric loads to the CHO supplement, so we can directly compare the effects of the different formulas.

The subjects performed high intensity training sessions going to failure between 8-10 reps on 8 core exercises. Then immediately after exercise and again 2 hours after the exercise session the athletes were given one of the supplement formulas. Before exercise and for the next eight hours after exercise the athletes’ blood was monitored for glucose, testosterone, growth hormone, IGF-1, and insulin levels. Thirty minutes after the exercise and the supplement ingestion, plasma glucose levels in the CHO and CHO-PRO groups were significantly elevated compared to the PRO and control groups. Another supplement dose was given two hours after exercise, but this did not seem to further affect blood glucose levels. Going along with this, plasma insulin was significantly increased in the CHO and CHO-PRO groups, and to a lesser extent in the PRO supplement. The combination CHO-PRO supplement actually increased insulin levels to a greater degree than CHO alone. We might not have expected this, since the CHO supplement alone increased blood glucose levels greater than the combination supplement, but keep in mind that protein also serves as an insulin stimulus. So even though carbohydrate alone increases blood sugars levels more, adding some protein to it results in a higher insulin level. So far we can already draw some very important conclusions.

First, when you take a supplement after training you definitely want to include some carbohydrate in it, rather than just using a pure protein powder. This results in a much higher insulin level than protein alone, and this will help drive the amino acids into the muscle. Second, mixing protein along with the carbohydrate further boosts insulin levels beyond carbs alone, which is exactly the effect we want here. We’re not too worried about carbs spilling over into fat stores because right after a workout glycogen levels are depleted, so the carbs will be used to replenish glycogen and will not be converted into fat. Third, taking a second
supplement dose 2 hours after training has minimal effect on hormone levels. The big benefit seems to come from taking a respectable dose (120 grams in this study) of the supplement as soon as possible after training, and certainly within 30 minutes after you finish your workout. I suggest taking a shaker bottle to the gym with you and drinking your supplement at the gym as soon as you finish training.

Growth hormone levels rose sharply immediately after the exercise bout but declined back to baseline within 2 hours after exercise. The supplements were chosen to have no immediate effect on GH levels, but at 6 hours after exercise the GH levels were higher in the CHO and CHO-PRO groups. It seems that the exercise itself has a bigger short-term impact on GH release than the supplements, but by six hours after exercise the effect of the supplements becomes apparent. It is also worth mentioning that the GH increase brought about by the exercise itself was greater than the GH increase seen at six hours post-exercise, which was attributed to the supplements. This really comes as no surprise, since we know that weight training is really the prime stimulus for muscle growth, not supplements. Plasma testosterone levels were seen to rise sharply immediately after exercise, but then within one hour declined to below pre-exercise levels. All of the supplements resulted in testosterone levels declining below the value seen with water alone. Within 6 hours after exercise the CHO and CHO-PRO groups had returned essentially to pre-exercise levels, but the PRO alone was still depressed. More on this later.

What does this all mean? We know that the early rapid gains seen by beginning weight trainers are primarily due to increased motor learning (1). This means training the nervous system to recruit more muscle fibers to fire simultaneously. The more efficiently the nervous system can activate the muscle, the stronger the contraction. So early on we are mainly training the nervous system. It's not unusual for a novice trainer to basically double his strength in the first six months of training. After a few months of initial training, you likely remember hitting a plateau, where further increases in strength came more slowly. At this point further increases in strength are more closely related to increased muscle mass and muscle cross-sectional area (1). Several factors influence the rate of increase of new muscle mass. These include the volume and intensity of training, the availability of adequate nutritional substrates and calories to support growth, and the hormonal environment of the muscle. If the only purpose of nutrition was to supply the building blocks for growth, then it wouldn't matter that much what you ate. If, however, you want to control the hormones directing the anabolic drive, this takes a more sophisticated approach.

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The hormones most directly related to muscular growth are insulin, growth hormone, testosterone, and IGF-1. Insulin may potentiate muscular hypertrophy by stimulating amino acid uptake and protein synthesis by muscle. Furthermore, insulin seems to increase growth hormone levels by inducing hypoglycemia (7). This is probably what was happening when we saw GH levels increased by the CHO and CHO-PRO supplements six hours after exercise. The supplements caused an initial increase in insulin levels, which after a few hours resulted in hypoglycemia (low blood sugar) which in turn stimulated GH release.

Probably the biggest surprise was observed with testosterone — all the supplements seemed to decrease testosterone levels compared to plain water. What's up with this? Either testosterone secretion by the testes was decreased, or else possibly the supplements caused more testosterone to be cleared from the blood (maybe by moving it inside cells) thereby resulting in a lower blood level. To investigate this the authors looked at LH (lutinizing hormone) levels. LH is the stimulus for testosterone to be released from the testes, so if the supplements caused decreased testosterone secretion then LH levels should be depressed as well. They found that LH levels were unaffected by the CHO supplement (the only one they tested for this) suggesting that the testosterone level was decreased as the result of increased removal of testosterone from the blood rather than decreased secretion. While it remains to be proven, the authors suggest that plasma testosterone may have been decreased by the supplements as a consequence of increased movement of testosterone into muscle cells, where it acts to promote protein synthesis.

A number of important conclusions can be drawn from this study. You should supplement with a combination of protein and carbohydrate after training because this results in a more favorable anabolic hormonal environment than either protein or carbohydrate alone. You should take the supplement soon after training, within 15-30 minutes. A second dose of supplement two hours after exercise seems to confer little additional benefit in terms of altering hormone levels compared to a single dose. The dose...
used here was about 120 grams of protein and/or carbohydrate. We agree that this is an appropriate dose size for stimulating growth and optimizing recovery after training. Also, the anabolic hormone most responsive to dietary control is insulin, and to a lesser degree growth hormone (whose secretion is stimulated mainly by protein). This comes as no surprise. Growth hormone and testosterone are best stimulated by intense training. This is why we need a combination of hard training plus a carefully crafted diet to generate optimal hormone levels to maximize muscle growth and fat loss.

Since this study came out a couple of years ago we have used this as a starting point and done some of our own trials here at Parrillo Performance. We have tried various formulations on some top level competitive bodybuilders and fitness athletes and have taken the idea described in this paper a few steps further. First, we found that with our athletes, who train harder and longer than the ones in this study, a ratio closer to 50% protein - 50% carbs works better. Top level bodybuilders just seem to need a little more protein to get that degree of muscle hardness we’re going for. Also, we get better results if we use maltodextrin without the dextrose as the carbohydrate source. Dextrose is another name for glucose, a simple sugar. We find that our athletes can pack on more muscle without gaining fat if we leave the sugar out of the formula. Third, we have added glycine (an amino acid) to the formula to further improve its anabolic effect. 50/50 Plus™ contains no sugar and no fat. We have settled on a combination of whey protein and other milk protein isolates to generate what we feel is an optimal amino acid profile.

This new product line is called “50/50 Plus™” to reflect its composition of about 50% protein and 50% carbs. It also provides a good source of calcium and includes vitamins important for muscle repair and growth. We’re very proud of this new supplement development. It’s designed specifically to promote nitrogen retention and muscle growth. The ideal times to use it are immediately after training, as your first meal of the day to set up an anabolic hormonal environment, or any time as needed with or between meals. The beauty of this product is that it is “programmed” to generate a hormonal environment which results in muscle growth. Not only does it provide the raw materials your muscles need to grow, but it also programs your hormone levels to channel the nutrients into muscle and not fat. It comes in four delicious flavors: chocolate, vanilla, milk (which is great in oatmeal), and orange-cream. I suggest a serving size of 4 scoops if you are using it as a post-workout recovery and growth supplement, 4 scoops in place of a meal, or 2 scoops if used as a calorie boost with or between meals. I think this product is very solid and deserves to be considered a “first line” supplement for bodybuilders. An excellent entry level supplement program would be 50/50 Plus™, Creatine Monohydrate, and the Essential Vitamin and Mineral- Electrolyte Formulas. I think you’ll find this supplement might easily push your growth to the next level. The work of hormonal control and nutrient partitioning has been done for you - all you have to do is train hard and take the supplement and you’re guaranteed to provide your muscles with the ultimate hormonal milieu for growth.

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The Energetics of Nutrient Metabolism, Part I
by John Parrillo

One of the fundamental problems in bodybuilding is how to gain muscle without getting fat. In order to pack on more muscle we have to be eating enough to supply all of the nutrients and energy we need to grow, but if you’re not very careful about how you do this you’ll end up gaining as much fat as muscle. This month I want to talk about the correct way to structure your diet to gain muscle and not fat. To do this we first need to review some basic science about nutrient and energy metabolism.

Over the last ten years or so quite a bit has been learned about how diet affects body composition. The old way of thinking was that all that really mattered was calories — if you eat more calories you’ll gain weight and if you eat fewer calories you’ll lose weight. This concept is referred to as “energy balance.” The number of calories contained in a food is a measure of the energy content of the food — calories are a unit of energy. Energy balance is the number of calories you eat minus the number of calories you expend (burn) as energy. If you consume more calories than you burn this results in a “positive energy balance” and the excess calories you consume are retained as body weight (either muscle, fat, or glycogen). If you consume fewer calories than you burn this is a “negative energy balance” and you lose weight. If you consume the same number of calories that you burn this is called “zero energy balance” (or more often simply “energy balance”) and your weight will remain constant.

No one doubts the importance of energy balance in determining body weight. It’s just that we understand now that there’s a lot more to it. Let’s say we’re trying to gain weight, so we’re intentionally eating excess calories. It turns out that what kind of food we choose to supply those excess calories can have a big effect on whether the weight we gain will be muscle or fat. Furthermore, scientific data demonstrates that it is possible to lose fat without cutting calories. The issue we want to explore is if diet composition can affect body composition. Body composition is simply your percent body fat, determined by your pounds of fat and pounds of lean mass. You should monitor your body composition about once a month with the BodyStat Kit to make sure you’re gaining muscle and not fat. By “diet composition” we mean the percentage of calories coming from protein, carbs, and fat. While overall body weight seems to be determined mostly by energy balance (and thus the total number of calories you eat) my theory is that body composition is determined more by diet composition. So what I’m really going to talk about here is how to use nutrition to help you gain muscle and lower your percent body fat. Interested now? First I will review some basics about energy metabolism, then discuss some nutrient balance studies done in humans, and finally wrap up with some recommendations on how to use this information to lower your percent body fat.

Like I mentioned earlier, the old way of thinking was that calories were all that mattered, and what kind of food you ate wasn’t considered that important. To understand how diet composition has the potential to affect body composition we need to review the thermodynamics of nutrient metabolism. All food we eat can be used as fuel. If you throw food into a fire it will burn and release heat. Chemically, this process is called “oxidation” because when something burns in a fire its molecules are combined with oxygen from the atmosphere. (This is why fires can’t burn without oxygen.) Inside our bodies food molecules are oxidized in a similar process except it occurs more slowly. As the food molecules are oxidized energy is released, just like heat energy is released by a fire. This energy is used to build a special molecule called adenosine triphosphate, better known as ATP. ATP is called a “high energy” molecule because it contains a lot of energy (duh). It contains three phosphate groups which all have strong negative charges! As you remember from high school, like charges repel — negative repels negative and positive repels positive. So the phosphate groups are repelling each other and this makes the molecule want to break apart. When the phosphate groups do break apart this releases the energy which was contained in the ATP molecule. This energy released by ATP breakdown is the immediate source of energy used to power muscular contractions and all of the other work done by the body. After the ATP splits apart some more energy released by food oxidation is used to put it back together again.

So the energy used to fuel our bodies comes from food, but before we can use this energy it has to be converted into ATP. The thing is that protein, carbs,
and fat all follow different metabolic pathways and the energy released from their oxidation is captured as ATP with different efficiencies. Some of the energy generated by oxidation of food molecules is lost as body heat and is not captured by ATP formation. This is referred to as the “thermic effect of feeding” (or TEF) and describes the percentage of energy lost as heat when a particular food substrate is metabolized. The TEF for dietary fat is about 5%, which means that 5% of the energy supplied by the fat is lost as body heat instead of being converted into ATP. The TEF for carbohydrate is around 8-10% and for protein is about 20-30% (1).

After we account for all of the energy costs of the various metabolic pathways we find that 90% of the energy supplied by fat is available for ATP production, 75% of the energy from carbs is used to make ATP, and 45% of the energy from protein oxidation is retained as ATP (1).

Therefore it seems obvious that the relative proportions of protein, carbs, and fat in the diet can have a big impact on the amount of dietary energy which is available to perform work or to be retained as body weight. For example let’s consider a diet that provides 2000 calories and is made of 20% protein, 30% carbs, and 50% fat. If you do the calculations you’ll see that the thermic effect (TEF) of this meal is around 200 calories (or 10% of energy content overall) which means that of that of the 2000 calories you ate, 200 of them are lost as heat. Now let’s compare that with a 2000 calorie diet composed of 30% protein, 60% carbs, and 10% fat. The overall thermic effect of this diet works out to be 270 calories (or 14% of energy content). Notice that although both diets contain 2000 calories, the low fat diet provides 70 fewer calories which are available to be stored, because they were lost as body heat during metabolism.

So what does this mean for you as a bodybuilder? Look at it this way: the diet higher in fat provided 70 more calories which can be used as energy or retained as body weight. These 70 “extra” calories are in the form of fat. Fat cannot be converted to carbohydrate or protein, therefore these 70 calories could not be stored as glycogen or muscle. They could only be stored as fat. Therefore the high fat diet has the potential to result in 70 calories worth of body fat storage more than the low fat diet. This is far from the whole story however. These considerations are just meant to demonstrate that two different diets which provide the same number of calories can result in a different effective energy balance. This concept is known as “food efficiency” and has been around in the livestock industry for years. It has long been recognized that feeding different diets to growing animals (say young pigs or cattle being raised for meat production) will result in different growth rates. A diet with a higher food efficiency will result in more retention of energy as body weight (i.e., more growth) for a given number of calories. In practice, however, diets with a high food efficiency result in more body weight gain because the animal retains more fat.

If all the food energy we eat is converted into ATP then how do we gain body weight? Well, in the situation of positive energy balance we are eating more calories than we burn. In that case not all of the food is burned and instead the portion that is not used as fuel is retained as body weight — either muscle or fat or glycogen. If the “excess” calories are supplied as carbohydrate they will be stored as glycogen until the glycogen stores are completely full. After that any more carbs can be converted to fat, but as we will see later this almost never actually happens. If the excess calories are supplied as fat they will be stored as fat, plain and simple. Unfortunately, the body cannot convert dietary fat into carbohydrate or protein, so if you consume excess calories in the form of fat they will be retained as adipose. I’d like to say excess calories supplied as protein will be retained as protein in muscle, but it doesn’t work that way. Gaining muscle is not as simple as consuming excess protein energy. Extra calories you eat as protein can be retained as protein or else converted into glycogen (via gluconeogenesis) or fat. When we get to the discussion of the nutrient balance studies later in this article, I’ll explain some factors that determine whether excess calories are retained as glycogen, fat, or muscle.

Let’s talk about how we can use these concepts. Let’s say we want to lose fat and lower our percent body fat. We all know that the fastest way to lose weight is to cut calories. There are several problems with this approach however. First, somewhere between 25-50% of the weight lost during energy restricted diets is muscle, depending on the severity of the energy deficit. This is unacceptable for bodybuilders. Second, energy deprivation will eventually slow down your metabolic rate so you will be burning fewer calories. Weight loss will eventually plateau, until you cut calories even further. Third, energy restricted diets cause an increase in the enzymes that make and store fat, so that when you remove the energy restriction (start eating normally again) the first thing that happens is you gain back the fat you lost. These adaptations are known as the “starvation response” and represent your body’s attempt to defend it’s fat stores in the face of energy deprivation. Your body perceives the energy deficit created by the low calorie diet as a famine and tries to hang onto it’s fat stores as long as possible so it can survive. These are the reasons low calorie diets ultimately result in failure about 90% of the time. But what if instead of cutting calories we shift to a lower efficiency diet. We still consume the same number of calories as usual, but now a higher percentage of the calories are lost as body heat during metabolism. This will result in weight loss (an effective negative energy balance) without

Unfortunately, the body cannot convert dietary fat into carbohydrate or protein, so if you consume excess calories in the form of fat they will be retained as adipose.
Reducing calorie intake and setting into play the starvation response. Metabolic rate will remain high and we won’t lose muscle. So these considerations about the energetic efficiency of nutrient metabolism allow us to design a diet which will result in fat loss without cutting calories, slowing metabolic rate, or losing muscle. Pretty slick, huh?

Next, I want to discuss some experiments done with humans to monitor what happens to the nutrients we eat under different dietary conditions (2-5). In the last few years it has become clear that overall energy balance really has three separate components. The nutrient energy supplied to the body comes in the form of protein, carbohydrate, and fat. These are called “macronutrients” because we consume them in large amounts, in contrast to the “micronutrients” like vitamins and minerals which we consume in small amounts. Protein, carbs, and fat follow different metabolic pathways. It turns out that the protein compartment of the body, the carbohydrate compartment, and the fat compartment are all regulated separately, although what happens in one compartment will obviously affect the others. So we have a protein balance (usually called “nitrogen balance” since most of the body’s nitrogen is contained in amino acids) which describes the balance between protein intake and protein utilization. A positive nitrogen balance means we’re gaining protein mass, which effectively means we’re gaining muscle mass. Similarly there is a fat balance which describes the amount of fat intake versus the amount of fat burned for energy. A negative fat balance means we’re losing body fat. And last is the carbohydrate balance, which is the amount of carbs consumed versus the amount used as fuel. A positive carbohydrate balance means we’re storing glycogen and a negative carb balance means we’re losing glycogen. Got it?

Since the forms of energy consumed and stored by the body are carbohydrate, protein, and fat then it makes sense that overall energy balance is determined by the sum of protein balance, carbohydrate balance, and fat balance. And although the protein, carb, and fat balances can affect each other, they are regulated separately. As simple as it sounds this has only been understood for about the last 10 years, and is still somewhat controversial. This has dramatic implications for bodybuilders and, for that matter, anybody wanting to lower their percent body fat. As you can see, if our goal is to lose fat we must achieve a negative fat balance, and this is not necessarily the same thing as a negative energy balance. To lose fat what we have to do is to burn more fat than we eat — in this situation we will be in negative fat balance and the fat which is burned in excess over what we consume must be derived from adipose depots. And the interesting thing is, if our goal is to lose fat we must achieve a negative fat balance, and this is not necessarily the same thing as a negative energy balance. To lose fat, what we have to do is to burn more fat than we eat — in this situation we will be in negative fat balance and the fat which is burned in excess over what we consume must be derived from adipose depots. To lose fat it doesn’t really matter what your overall energy balance is, just so you have a negative fat balance. If you think about it, it’s really the protein balance that determines how much muscle mass we have and the fat balance that determines how much body fat we’re carrying. So these nutrient balances (and not energy balance per se) are what determine our body composition. And nutrient balance is largely determined by diet, since the diet establishes the input side of the balance equation. The studies I want to discuss have looked at how the fat, carbohydrate, and protein balances are regulated, how this relates to overall energy balance, and how all of this is affected by changes in diet. Afterwards it will become clear how you can make changes in diet composition to influence changes in your body composition.

The first paper I want to review examined what happens if we feed people an excess of calories supplied as carbohydrates (2). For this experiment six healthy young men were fed a test meal containing 480 grams of carbohydrate, which is about twice as much carbohydrate as an average person would eat in a whole day. Overall the meal consisted of 93% of energy (calories) as carbs, 5% protein, and 2% fat. To monitor nutrient metabolism the respiratory quotient (RQ) was monitored by indirect calorimetry over the next 10 hours. What does that mean? Each of the different macronutrients (protein, carbs, and fat) require different amounts of oxygen to burn. When a food molecule is completely burned it is converted into carbon dioxide (CO2) and water (H2O). A fat molecule contains very few oxygen atoms, so when you burn a fat molecule it can combine with a lot of oxygen molecules. So if you are burning fat for fuel you will consume a lot of oxygen. A sugar molecule (a carbohydrate) contains some oxygen atoms already built into the molecule, so when it is burned it consumes less oxygen. In other words, from a chemical point of view the carbon atoms in a carbohydrate molecule are already partially oxidized, so you can only add so much more oxygen when you burn it. The carbon atoms in a fat molecule are fully reduced (which is the opposite of oxidized) so when you burn fat more oxygen is consumed than when you burn carbohydrate. Protein works out to be in between.

So what you do is place the person in a room or a special chamber where you can monitor how much oxygen he consumes and how much carbon dioxide he produces, and from this you can
calculate if he’s burning carbs or fat for energy, and how much of each. To monitor protein metabolism urine samples are collected and the amount of protein utilized can be determined from the amount of urea nitrogen excreted in the urine. Indirect calorimetry is a special technique where we monitor oxygen consumption and carbon dioxide production and from that determine how much protein, carbs, and fat are being burned as fuel. The respiratory quotient (RQ) is the ratio of carbon dioxide produced divided by the amount of oxygen consumed, and this (along with urinary nitrogen excretion) is what tells us what mixture of protein, carbs, and fat is being used as the fuel source (the substrate mix, or fuel mix).

Some amazing things were discovered with this experiment. Most people would think that if you overfeed that many carbohydrate calories at one sitting you would store the excess energy as fat. But that’s not what happened. During the ten hours following administration of the test meal, 133 g of carbohydrate, 17 g of fat, and 29 g of protein were oxidized (burned). Disposal of the 480 gram carbohydrate load was accounted for by oxidation of 133 grams, storage of 346 grams as glycogen, and conversion of less than 3 grams into fat. Probably most exciting was that during this same time 17 grams of fat were burned. The diet only provided 8 grams of fat, so the subjects actually lost fat as a result of the test meal, even though it contained excess calories.

This study demonstrates that feeding excess calories in the form of carbohydrate results in glycogen storage, but not fat storage. Feeding excess energy as carbohydrate increases the rate of carbohydrate oxidation, so if you eat more carbs you burn more carbs. This effect minimizes any conversion of carbs into fat. If you consume excess calories in the form of carbohydrate they will mostly be burned as energy or else stored as glycogen. Subjects in this study actually had a negative fat balance (i.e., lost fat) even after carbohydrate overfeeding. But don’t get too carried away with this. This experiment was just overfeeding carbohydrates for one meal. If this was continued over a few days eventually glycogen stores would become saturated and then I expect we would see net fat storage begin to occur. The conclusions from this paper are that acute (short-term) carbohydrate overfeeding increases carbohydrate oxidation, so that if you eat excess calories in the form of carbs some of the excess will simply be burned and lost as heat. The remainder will be stored as glycogen, but will not be converted to fat. Next month I’ll pick up the discussion with an experiment to test what happens if we consume excess calories in the form of fat. And it ain’t pretty.

References


The Energetics of Nutrient Metabolism, Part II

by John Parrillo

In the previous bulletin we started our discussion about nutrient balance and what this means in terms of controlling body composition. The simplistic way of thinking about body weight is that it is merely the consequence of energy balance. A positive energy balance means that we’re consuming more calories than we burn, so we gain weight. A negative energy balance implies that calories expended exceed caloric intake, so we lose weight. This much is true, but is far from the whole story.

Athletes, and especially body-builders, are not just concerned about body weight but even more with body composition. Calories are a measure of the energy supplied by the food you eat. This energy can be supplied in the form of protein, carbohydrate, or fat. Once inside your body, this energy can be used as fuel or else retained as body weight. The portion which is retained can be stored as either protein, carbohydrate, or fat. Therefore overall energy balance (or caloric balance) is really the sum of protein balance plus carbohydrate balance plus fat balance (1-4). Sounds simple enough right? Believe it or not, this way of looking at energy balance has only been considered for the last ten years or so. Before that, is was just calories in versus calories out, and what kind of food was used to supply those calories wasn’t felt to be very important.

During the last decade sophisticated metabolic techniques have been used to look at the individual components of energy balance. By analyzing the ratio of carbon dioxide produced to oxygen consumed (the respiratory quotient, or RQ) and by analyzing the urine for nitrogen excretion, scientists can figure out just how much protein, carbs, and fat a person is burning for fuel. The intake of these nutrients can be determined by weighing food portions and looking up the nutrient composition in tables. The difference between how much of a nutrient (fat for example) is consumed versus metabolized gives us the nutrient balance. If we consume more fat in our diet than we burn, then the difference is stored as body fat.

Unfortunately, dietary fat cannot be converted into protein or carbohydrate, so a positive fat balance will result in expansion of the adipose depot. Last month we reviewed a study which demonstrated that excess dietary carbohydrate is stored as glycogen with very little (essentially none) being converted into fat (5).

Now keep in mind that this study involved acute (short term) carbohydrate overfeeding. Your body has a limit to how much glycogen it can store, so prolonged carbohydrate overfeeding will eventually result in fat accumulation. The point is nonetheless very important that carbohydrate feeding increases carbohydrate oxidation and that excess calories in the form of carbohydrate are stored as glycogen, at least until glycogen stores are saturated. Also, protein and carbohydrate have a much higher thermogenic effect (TEF) than fat does (6). This means that protein and carbs increase your metabolism and help you burn more calories. The result is that over-consumption of protein or carbohydrate is less likely to result in fat accumulation (as compared to over-consumption of fat) because a significant amount of the energy is lost as body heat, and therefore is unavailable for retention as fat. Furthermore, for protein or carbohydrate to be stored as fat they first have to be converted into fat, and this conversion process uses up some of the calories. So while it is possible to gain body fat by eating too much protein and carbohydrate, these nutrients are much less prone to be stored as fat than is dietary fat.

In summary, there are four major factors why carbohydrate contributes less to body fat stores than does dietary fat. First, increased carbohydrate intake results in increased carbohydrate oxidation (1-5). This means if you eat more carbs, you burn more carbs, so they don’t get converted to fat. Second, the excess carbs that don’t get burned are stored as glycogen instead of being converted to fat (5). Third, carbs increase your metabolic rate more than fat, so you burn more calories leaving fewer to be stored as fat (6).

Fourth, some of the energy supplied by the carbohydrate is consumed in the metabolic process of converting it into fat, so it is relatively less efficient at fat production (6). Now I want to describe a study which examined what happens when excess calories are supplied as fat (7). Seven healthy young men were studied in a special metabolic lab. For the first day they were fed their usual diets at a level of energy intake equal to energy expenditure. This diet on average was comprised of 15% protein (105 grams), 50% carbs (335 grams), and 35% fat (109 grams). After obtaining baseline readings, the subjects were fed the same amount of protein and carbs but twice as much fat
on the second day. This represented about 110 grams of excess fat, providing around 1000 excess calories, as compared to the baseline diet.

During the first 24 hour period the measurements confirmed that the subjects were in energy balance, indicating a good match between energy intake and expenditure. During the second day the excess fat load did not alter energy expenditure or RQ. This means that the fat supplement did not alter either the amount of substrate oxidized or the profile of the fuel mix. In other words, the excess fat did not increase metabolic rate or energy expenditure, nor did fat overfeeding increase fat oxidation (use of fat as fuel). This is in marked contrast to the result observed with carbohydrate overfeeding (refer to last month’s article), which did increase metabolic rate and which did stimulate use of carbohydrate as fuel (6). The authors also reported that protein and carbohydrate balances were not affected by the excess fat load, but the fat balance was +108 grams, almost exactly the amount of excess fat load.

The addition of extra fat did not decrease the amounts of protein or carbohydrate that were burned as fuel, nor did it increase the amount of fat which was burned. Apparently the addition of extra fat to a typical diet does nothing to spare protein or carbohydrate from oxidation. Nitrogen balance (and thus protein balance) was not improved by the addition of fat. Furthermore, the excess fat did nothing to increase energy expenditure or fat oxidation. And since fat cannot be converted into protein or carbohydrate, an excess fat load must be stored as body fat. It is somewhat amazing that of the 110 grams of extra fat supplied, 108 could be accounted for by storage as body fat.

What does this mean for body-builders? The clear message is that if you’re in a positive energy balance, gaining weight, you should limit fat intake as much as possible. If you are operating in a caloric excess in an attempt to gain weight, then any calories you supply as fat will be stored as fat. Now we all know people who have gotten in good shape while following a relatively high fat, low carb diet. This confuses a lot of people. How can this be explained? Because to do this they were in negative energy balance (losing weight), not a positive energy balance. In a positive energy balance, the excess calories will be retained as body weight: either protein (muscle), glycogen, or fat. If the excess calories are supplied as fat, they will be stored as fat. Period. However, during weight loss energy balance is negative. There are no excess calories. In this situation all of the calories we eat will be burned as fuel, so none will be retained as body weight. If you’re operating in a negative energy balance you can get away with eating fat, because all of the calories you eat will be burned even if they come from fat. So the state of energy balance is critical in determining the metabolic fate of dietary fat.

This leaves two unanswered questions: First, does this mean that what I eat is unimportant if I’m dieting to lose weight? In other words, during weight loss can I eat a high fat diet and get equally good results? Second, what happens during weight maintenance, when we’re in energy balance for prolonged periods of time?

With regard to the first question, diet composition (that is, a high fat versus a low fat diet) is relatively less important during energy restricted diets, but it’s still important. You can certainly get away with eating more fat while you’re losing weight and suffer less adverse results. If you eat fat while you’re gaining weight, you’re going to get fat. There’s no way around it. However, if you eat fat during weight loss it’s all going to be burned as fuel anyway. Nonetheless, we find that our athletes end up with better results (in terms of body composition) if they limit dietary fat even during weight loss. I think there are several reasons for this. First is that carbohydrates have a protein sparing effect. This means that you will lose less muscle during the diet if you supply the bulk of your non-protein calories as carbs instead of fat. Second, carbohydrates have a higher thermogenic effect than fat, so you will burn body fat faster, have a higher metabolic rate and higher energy expenditure. Third, if you go too low in carbs muscle glycogen stores will be depleted and training intensity will suffer. Fourth, diets too low in carbs suppress thyroid hormone levels, which will slow metabolic rate and the rate of fat loss.

So if you’re dieting to lose body fat you will be eating fewer calories and will lose fat faster and retain more muscle mass if you eat a low fat diet as outlined in the Parrillo Performance Nutrition Program.

Regarding the second question, several studies suggest that a diet lower in fat will result in lower body fat levels during periods of energy balance and weight stability (8,9,10). This is a complicated and controversial area. Basically, to maintain energy balance and constant body weight this (generally) requires balance of the protein, carbohydrate, and fat stores. Let’s consider the fat compartment for a moment. To achieve fat balance we need fat oxidation (burning fat as fuel) to match fat intake. The problem with fat is that increased fat intake does not cause increased fat oxidation. So how do we achieve fat balance while on a high fat diet? In other words, if fat intake is high what can we do to increase fat oxidation so eventually we can achieve fat balance? Some evidence suggests that fat oxidation increases as body fat mass increases (8,9,10). What seems to be happening is that fat oxidation is determined by free fatty acid concentration in the blood, which is in turn determined by body fat mass.

So when we switch to a high fat diet the first thing that happens is we store more body fat - because increased fat intake does not increase fat oxidation, so we have a state of positive fat balance. After a while body fat mass increases, which in turn increases free fatty acid levels in the blood. This finally results in increased fat oxidation, so that fat balance is achieved on the high fat diet, albeit at a high level of body fat mass. The same sort of arguments can be advanced for the adaptations which would be expected to result from switching to a diet lower in fat. As I said, this is still somewhat controversial, but some people believe that obesity is
really the body’s way of adapting to a high fat diet, so that fat and energy balance can be achieved (8,9,10). Based on our experience at Parrillo Performance, I would have to say that people generally maintain leaner body composition while following a low fat diet. Probably one of the reasons people get such good results with CapTri® is that CapTri® is oxidized immediately as fuel, in contrast to conventional fat, and has very little tendency to be stored as body fat. Recently some metabolic studies have been performed with special lipids like CapTri®. The results are very exciting and explain some of the things we’ve been observing here for years.

References


Ultimate Endurance Performance

by John Parrillo

It is well known that endurance exercise performance is highly dependent on carbohydrate fuel availability. Ingestion of a high carbohydrate (CHO) diet prior to exercise, and supplementation of carbohydrate during exercise, have both repeatedly proven to improve endurance performance. Furthermore, the onset of fatigue during prolonged exercise correlates highly with muscle glycogen depletion. However, the rate of oxidation of orally supplemented CHO seems to have a maximum limit around 1.0 to 1.1 grams per minute (1). Even when ingestion of oral carbohydrate during exercise is increased to a rate of 2 grams per minute, the rate of oxidation of this carbohydrate supplement did not exceed 1 gram per minute. Thus there seems to be an upper limit to how fast the body can digest, absorb, transport, and oxidize carbohydrate. In simple terms, your body cannot digest and absorb carbs fast enough to keep up with the rate of carbohydrate oxidation during prolonged exercise performed at moderately high intensity.

What this means is that you can’t keep up with the energy demand simply by supplying extra carbs while you exercise—your body can’t absorb them fast enough. If you try, you’ll just get a full stomach and a belly ache. So this means that muscle glycogen will be consumed and eventually when it is depleted you will “hit the wall.” So another strategy to improve endurance performance would be to supply another fuel source that could be used at the same time as carbohydrates, possibly sparing muscle glycogen and delaying the onset of fatigue. There are several theoretical reasons why medium chain triglycerides, such as CapTri®, might help in this regard. CapTri® is a special kind of engineered fat that is processed by the body differently from conventional fats (2). CapTri® is absorbed directly into the bloodstream from the gut and is transported to the liver where it is largely metabolized into ketone bodies. CapTri® is absorbed and metabolized as rapidly as glucose and serves as a source of immediate energy. The liver converts CapTri® into ketone bodies, which are fat breakdown products, which are then transported to the muscles and burned as fuel. Importantly, the availability of carbohydrate does not seem to suppress the use of CapTri® as a fuel source (2,3). This means that if we add CapTri® to the fuel mix it will be burned at the same time we’re burning carbohydrate, and this extra source of added energy should help relieve the demands on the carbohydrate depot. In theory, this should improve endurance performance.

CapTri® has a number of other interesting metabolic properties that makes it well suited as an energy substrate for exercise. It is very rapidly digested and absorbed, and does not require transport via the lymphatic system, as do conventional fats (2,4,5,6,7). Furthermore, medium chain fatty acids (MCFAs) do not require the carnitine transport system for entry into mitochondria, which further enhances their availability as an immediate energy source. Medium chain fatty acids are thus oxidized as rapidly as glucose itself (2) which is truly remarkable. What this all means is that we have an alternative fuel source which can be burned just as fast as glucose and which can be burned at the same time as glucose. Since there is a limit to how fast we can digest and absorb energy from carbohydrate (about one gram per minute) this represents an excellent way to further enhance supplemental energy intake during exercise. CapTri® has a very high thermogenic effect, which means it is preferentially burned as a fuel source, and also has very little tendency to be stored as body fat (4,5,6,7). MCFAs (includes MCTs) have been shown to produce as much energy as glucose when isocaloric quantities of MCFA or glucose was ingested prior to exercise (8).

A recent study was undertaken to examine the effects of MCFA supplementation on endurance exercise performance (8). Six male cyclists all with three years or more of serious training experience at 300-500 km/week were studied. Each subject completed three successive trials consisting of two hours riding at 60% of peak VO2 (60% of maximal intensity) followed immediately by a 40 km time trial. Each of these trials were separated by ten days during which time the subjects ate and trained as usual. Before the experimental trials the cyclists consumed either a 10% solution of short chain glucose polymer, an isocaloric 4.3% MCT solution, or else a solution providing a mixture of 10% glucose polymer plus 4.3% MCT. These test formulas were called CHO, MCT, or CHO+MCT, respectively. During the exercise sessions the subjects’ blood and respiratory gases were measured to monitor fuel metabolism.

When comparing the three formulas in terms of average speed to complete the 40 km time trial, it was found that the fastest average speed was for the CHO+MCT formula, in the middle
was the CHO alone, and the cyclists performed the slowest when supplementing with MCT alone (8). This makes perfect sense if you think about it. We know that the preferred fuel for intense exercise performance is carbohydrate, and that endurance performance correlates with carbohydrate availability. So we would expect that cyclists supplementing with carbohydrate alone would perform better than those supplementing with MCT alone, and this is exactly what was observed. Furthermore, we would expect that taking both CHO and MCT together at the same time would result in better endurance performance than either one separately, and this also is what was found. This is because MCFAs can be used as fuel at the same time as glucose, thus increasing the overall pool of available energy substrate beyond what can be obtained from carbohydrate alone. Conventional fats just don’t seem to be very effective at this, apparently because they are metabolized too slowly.

When some of the specific metabolites were looked at, it was found that both of the supplemental formulas which provided carbohydrate suppressed the rise in endogenous free fatty acids normally seen during prolonged exercise. What am I talking about? This is simply saying that if you use a carbohydrate-containing supplement before or during exercise this will decrease your use of body fat as a fuel source during the exercise session. Logical, right? If you eat a bunch of carbs right before you train, you’ll burn less body fat than if you train on an empty stomach. This is why it’s so important to define your training goals and know what you’re trying to accomplish. If you what to maximize endurance performance you should supplement with carbohydrate (and even better, with carbohydrate plus CapTri®) before and during training, but if you want to maximize body fat loss during the training session you should do it on an empty stomach. Or if you’re worried about maximizing lean body mass, refer back to the “Next Level” articles in the September and October issues of The Press, where we explain how branched chain amino acid supplementation (Muscle Amino Formula™, Hi-Protein Powder™, 50/50 Plus™ or Optimized Whey Protein™) can help prevent muscle loss during training.

In contrast, the addition of CHO to the MCT-containing formula did not reduce the rise in plasma-free medium chain fatty acids. So while carbohydrate availability seems to reduce the oxidation of long chain fatty acids (which includes both body fat and conventional dietary fats) it does not suppress the use of MCFAs (includes MCTs) (2,8,9). This is another reason why conventional fats just don’t work well as energy supplements during endurance exercise. If you want the biochemical explanation: carbohydrate metabolism generates an intermediate called malonyl-CoA which inhibits the activity of the carnitine shuttle. This is the transport system which is required to carry long chain fatty acids inside the mitochondria where they are burned. This means that as long as carbohydrate fuel is available for exercise you won’t burn much fat. It’s only as the carbohydrate stores become depleted that fat burning picks up. On the other hand, MCFAs such as CapTri® do not need the carnitine shuttle to enter mitochondria, so for this reason they can be burned at the same time as glucose. This is one of their special properties that make them so well suited as an energy source for athletes.

Of note, the rate of carbohydrate oxidation was lower in the MCT and CHO+MCT trials than in the CHO trial after 90 minutes of exercise. Overall the rate of carbohydrate oxidation was highest for the CHO formula, moderate for the CHO+MCT, and lowest for the MCT alone. This also is exactly what we might have expected. The addition of MCT to the CHO formula represents an alternative fuel source which can be used at the same time as glucose. So you would expect this to help the glucose last longer, which it did. And the rate of glucose oxidation is lowest for the pure MCT supplement because no supplement glucose is provided in this formula. Equally as important, the decrease in carbohydrate oxidation which occurred as a result of MCT supplementation seems to have been due to decreased oxidation of muscle glycogen, rather than just a decrease in oxidation of plasma glucose.

There are two very important findings from this study which will help endurance athletes. First is that the addition of MCT to a CHO beverage supplement ingested during exercise significantly increased cycling speeds during a 40 km time trial done after a two hour “pre-exhaustion” ride at 60% intensity. This means that the MCFAs significantly improved performance at the end of a long (approximately three hours total) endurance event. Second, the MCTs also seemed to spare muscle glycogen at the end of this simulated race. This may in fact be the mechanism by which performance was improved. At Parrillo Performance we have noticed for some time that our athletes seem to be stronger and perform better for a longer period when supplementing with CapTri®. We always believed the reason for this to be two-fold. One part of the explanation is that CapTri® provides an additional energy source which can be burned at the same time as glucose, thereby providing greater overall energy delivery to muscles. Also, this additional energy substrate seems to spare muscle glycogen, thereby delaying the onset of fatigue. So you not only can
perform faster, you can perform faster longer. This is the first formal laboratory experiment which has been performed to scientifically prove that these theories of ours actually do work in experienced athletes.

I should mention that other experiments have been done in the past which failed to demonstrate any decrease in carbohydrate oxidation as a result of MCT supplementation. These trials used doses of MCT around the 30 gram level (about 2 tablespoons), which doesn’t seem to be enough to demonstrate a statistically significant decrement in CHO oxidation. The protocol reviewed here (8) employed an MCT dose around 86 grams, which is equal to 6 tablespoons, administered in a beverage consumed gradually during exercise over 3 hours. So to get this effect you would need to consume about 2 tablespoons of CapTri® per hour. This should be mixed with Pro-Carb™, a slow-release complex carbohydrate, to generate a fairly dilute solution. We suggest two scoops of Pro-Carb™ mixed with two tablespoons of CapTri® in one-half to one liter of water to be consumed gradually during each hour of intense endurance exercise. During a three hour endurance event this would amount to a total of six scoops of Pro-Carb™ and six tablespoons of CapTri® in a total of 1.5 to 3 liters of fluid. Adjust the amount of fluid to suit your particular needs. This will vary somewhat depending on ambient temperature and humidity. Remember that water replacement is just as important, if not more so, than carbohydrate supplementation. This formula will provide a total of 1,320 calories split roughly equally between carbohydrate and MCFA. Also, be sure to experiment extensively with this formula before an actual competitive event. Some people experience mild nausea or stomach cramps the first time they use MCT, particularly in fluid form. So break yourself into it before a real competitive event.

In summary, this study confirms some of our theories and observations that we’ve been talking about for the last eight years or so. That is, MCFAs like CapTri® improve endurance performance. This seems to be the result of both the availability of a secondary energy source which can be rapidly oxidized along with glucose, thus increasing energy delivery to cells, and also by sparing muscle glycogen oxidation and delaying fatigue. Don’t forget — you heard it here first. For a refresher course on MCFA biochemistry and metabolism, get a copy of our Sports Nutrition Guide which is filled with great information on CapTri® and energy utilization during exercise.

References


Losing Body Fat With CapTri®

by John Parrillo

It is well understood that medium chain triglycerides (MCT) have a higher thermogenic effect than long chain triglycerides (LCT) and this fact has stimulated considerable interest in the possible use of MCT for body fat control. Medium chain triglycerides are prepared by the esterification (addition) of medium chain fatty acids (MCFAs) to a glycerol backbone. Medium chain fatty acids are themselves naturally occurring in certain tropical oils and are commercially obtained from fractionation of coconut oil. Medium chain fatty acids, by definition, contain from six to 10-12 carbon atoms in their hydrocarbon chain, whereas long chain fatty acids are 14 or more carbon atoms in length. Animal fats and most vegetable oils ("typical dietary fats") are comprised of long chain triglycerides. CapTri® is comprised of mostly pure C8 fatty acids with with some C10s and absolutely no C12s since these can uplink to long chain fats.

The difference in physical structure of MCT as compared to LCT (that is, the shorter fatty acid chains) confer different chemical properties to these fat molecules, which results in MCT following a different metabolic pathway in the body. Conventional fats (LCT) are released from the intestines in complex with carrier proteins in special particles called chylomicrons. Rather than being released directly into the bloodstream, the chylomicrons are released into the lymphatic system and then enter the blood via the thoracic duct. This circulatory route results in the LCT bypassing the liver and instead being circulated throughout the body. Capilarys can bind the chylomicrons where they are acted on by an enzyme called lipoprotein lipase, which releases the long chain fatty acids from the chylomicron particle. The long chain fats are then stored in fat cells where they remain (generally) until they are needed as a fuel source. The basic concept is that conventional dietary fat is not utilized immediately as a fuel source but instead is preferentially stored in fat cells. Fat is the biochemical form in which the body stores excess energy. Fat is, in essence, a storage molecule. So it makes sense that dietary fat would be preferentially stored.

In contrast, MCT is not incorporated into chylomicrons and instead is absorbed directly into the bloodstream. It is carried to the liver by the portal vein where it is rapidly metabolized. Several things can happen to MCT in the liver, but the primary metabolic fate is the conversion of MCFAs into ketone bodies. Ketone bodies are partially metabolized fatty acids which are then released from the liver into the general circulation. The ketones are then used as an immediate fuel source by peripheral tissues such as muscle. Another important difference between MCFAs and conventional fats is that long chain fats require a transport system called the carnitine shuttle to enter mitochondria. Mitochondria are special structures inside cells where fats and other substrate molecules are converted into ATP, the form of energy which directly powers cellular work. The carnitine shuttle transports long chain fats from the cytoplasm to the interior of the mitochondria, where they are burned as fuel. The activity of the carnitine shuttle is inhibited by a metabolic intermediate called malonyl-CoA, which is generated as a byproduct of carbohydrate metabolism. This means that metabolism of long chain fats occurs only slowly as long as carbohydrate is available as a fuel source. Once carbohydrate levels are depleted, there is less malonyl-CoA around and the activity of the carnitine shuttle increases and long chain fats are more readily used as fuel. MCFAs, on the other hand, do not require the carnitine shuttle for transport, so they are rapidly metabolized as fuel even in the presence of carbohydrate.

These properties result in MCT behaving very differently from conventional fats in the body. Instead of being preferentially stored as body fat (as are LCT), MCT is preferentially used as fuel with very little MCT being stored as body fat (1-3). Since MCT can be oxidized at the same time as glucose, this alternative fuel source has the potential to spare carbohydrate oxidation. This could delay depletion of muscle glycogen and the onset of fatigue during prolonged endurance exercise. We talked about a study demonstrating this last month.

Your total energy expenditure (TEE) is the total number of calories you burn in a day. (See reference 4 for a nice discussion of the components of energy expenditure, especially as relates to food intake and exercise activity.) The biggest component of TEE is the basal metabolic rate, or BMR. This is the number of calories you burn at rest just to maintain life. Things like maintenance of body temperature, blood pressure, heart rate, breathing, nerve transmission, ionic gradients across cell membranes and other non-exercise related activities are considered to be part of the basal metabolic rate.

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membranes, and things like that account for about 70 percent of the total number of calories the average person burns in a day. Another significant factor of TEE is the thermic effect of activity (TEA) which basically is energy spent in activity, including exercise. The next component of your daily energy expenditure is the thermic effect of feeding, or TEF. This is essentially energy lost as body heat during fuel (food) metabolism. When your car engine burns gasoline some of the energy is converted into useful work—making the car move. Some of the energy from burning the gasoline is simply lost as heat to the environment. You know how hot a car engine gets? A lot of the energy from burning the gasoline is simply lost as heat. All of that energy which heats up the engine and the radiator and the exhaust system is not being used to make the car go—it’s just lost to the environment.

What happens inside the human body during fuel metabolism is significantly more complicated, but a general analogy exists. When your body burns food as fuel some of the energy which is produced is captured as ATP and can be used to power the body, but some of it is simply lost as body heat and dissipated into the environment. The proportion of the food energy which is lost as heat during metabolism is the TEF, and it’s different for different foods. (See “The Biochemistry of Energy Expenditure” by J.P. Flatt in reference 5 for a detailed discussion.) Conventional fats have a TEF around five percent, which means five percent of the calories supplied by the fat are lost as heat. Carbohydrate has a TEF of eight to 10 percent and protein around 20-25 percent. Different fuel substrates (protein, fat, and carbohydrate) follow different metabolic pathways and are converted into ATP with different efficiencies. So it seems logical that some foods might generate more body heat during metabolism than others.

Some people think that when it comes to dieting and body weight control that a calorie is a calorie and it doesn’t matter much what you eat. However, since different foods have differing energetic efficiencies it would seem that all calories are not created equal.

Several studies in laboratory animals have shown that diets high in MCT result in increased thermogenesis and less deposition of body fat than diets high in LCT (1,2,3,6). Studies in humans have similarly demonstrated an increase in thermogenesis after feeding MCT as compared to an equivalent amount of LCT (7-10). This month we want to discuss a recent paper comparing the effects of MCT and LCT on energy expenditure in humans (11). Eight healthy young men were each fed four different diets on separate occasions and their metabolic responses were measured in a respiratory chamber. A respiratory chamber is a special room where the atmosphere of the room can be monitored for the amounts of oxygen consumed and carbon dioxide produced by the person inside. From this information we can calculate total energy expenditure as well as the metabolism of carbohydrate and fat as fuel. Urinary nitrogen excretion is used to monitor protein metabolism. The men were fed four different diets all providing the same number of calories. Each diet contained a total of 30 grams (about two tablespoons) of a fat supplement. The diets differed in the ratio of MCT to LCT in the fat supplement. The ratios of MCT to LCT (grams to grams) in the four diets were as follows: zero to 30 (no MCT), five to 25, 15 to 15 (half MCT, half LCT), and 30 to zero (all MCT). During the study period the men were fed their baseline diets, which consisted of approximately 15 percent protein, 40 percent fat, and 45 percent carbohydrate. Each subject spent 24 hours in the respiratory chamber on four separate occasions, once for each of the fat supplements. During the stay in the chamber each man was fed his baseline diet plus 30 grams of one of the fat supplements at a total calorie intake designed to match maintenance energy requirements. In other words the subjects were fed at a calorie level intended to result in weight maintenance and were not intentionally overfed or underfed. The 30 gram fat supplement was fed in three 10 gram doses with each of three meals of the baseline diet. This amounts to about two teaspoons or 2/3 tablespoon of added oil per meal.

It was found that 24 hour total energy expenditure differed substantially in diets containing 15 and 30 grams of MCT, with average increases of 38 and 113 calories per day respectively as compared to the diet providing only LCT. The diet providing five grams of MCT supplement during the 24 hour period (about a teaspoon) did not show an effect. Thus there seems to be a dose-dependent increase in energy expenditure—diets providing more MCT result in higher metabolic rate. No difference was seen in respiratory quotient or in nitrogen excretion, indicating that the overall balance between carbohydrate, fat, and protein metabolism was not affected—just the total energy expenditure.

When fed the 30 gram MCT supplement, the subjects’ metabolic rates increased from between 64 to 180 calories per day, with an average increase of 113 calories per day. This was statistically significant (p < 0.001). This amounts to roughly a five percent increase in metabolic rate by switching from the LCT diet to the MCT-containing diet. We find this remarkable especially considering the small amount of MCT used in this study. They used a total of 30 grams divided among three meals, which is about 2/3 of a tablespoon per meal. It should be noted that within the range studied, an increase in the amount of MCT resulted in an increase in metabolic rate. It seems reasonable that an even larger effect might be seen if larger amounts of MCT are employed.
(Actually, this has been observed in other studies. One of the main purposes of this paper was to examine if diets containing small amounts of MCT would be effective in increasing metabolic rate.) We usually recommend people use between one and three tablespoons of MCT per meal to see a real effect, and most of our athletes eat more than three meals per day. This paper is important in demonstrating that a significant increase in metabolic rate can be achieved by incorporating as little as two tablespoons of MCT per day into the diet.

So how does a diet containing MCT increase energy expenditure and metabolic rate? There are probably a couple of mechanisms at work. As we discussed earlier, conventional fats are preferentially routed for storage in adipose depots, a process which does not consume much energy. MCTs on the other hand are rapidly metabolized and some of their energy is lost as heat during nutrient processing. Another factor which may be responsible for the increase in metabolic rate seen with MCT feeding could be activation of the sympathetic nervous system (SNS). In the present study they observed an increase in 24 hour urinary norepinephrine excretion with increasing MCT to LCT ratio in the diet, suggesting possible activation of the sympathetic nervous system by MCT (11). Interestingly, in rats fed MCT the increase in metabolic rate could by blocked by propanolol, a drug which blocks the SNS. The SNS is definitely involved in controlling metabolic rate and fat metabolism, and may in part be responsible for the increase in metabolic rate seen with MCT. Exactly how this effect is mediated is not clear, but it is known that SNS activity is stimulated by 3-hydroxybutyrate, one of the ketone bodies produced by MCT metabolism.

At this point it is important to discuss the right way and the wrong way to use MCT. (Our concern here is with potential uses of MCT to affect changes in body composition. Last month we talked about how to use MCT to enhance endurance performance, which is a totally different topic.) If your goal is to gain weight, then it is as simple as adding CapTri® to your baseline diet. This will add extra calories to your diet and promote weight gain. The beauty of CapTri® is that it has very little tendency to be stored as body fat, so you can increase calories and gain weight while minimizing fat accumulation. Keep in mind if you are in a calorie surplus and gaining weight that any conventional fat (LCT) you consume will be very prone to be stored as body fat. Any time you are gaining weight this means you are in a net positive energy balance—a calorie surplus. If any of those calories are supplied as long chain fats, then they will simply be stored as body fat. So to properly use CapTri® to promote weight gain, simply add it to your food to supply extra calories, but be sure to minimize your intake of regular fat first and do your aerobics to burn off any excess fat.

To use CapTri® to promote loss of body fat, it’s not as simple as just pouring some CapTri® onto your food. Some people have this misconception. There’s nothing magical about CapTri® that makes you burn more calories than you eat or anything like that. It’s that a higher proportion of the calories from CapTri® are lost as body heat as compared to other foods and therefore fewer calories are available to be retained as body weight. This results in greater reliance on stored body fat as a fuel source. So the idea is to replace a given number of calories from conventional fat with an equivalent number of calories from CapTri®. For example, to achieve the results seen in this paper you would remove 30 grams of conventional fat from your diet and replace these with 30 grams of CapTri®. CapTri® has a much higher thermogenic effect than regular fat and is much less prone to be stored as body fat, so by substituting CapTri® for regular fat this should increase energy expenditure and possibly over time reduce body fat levels. If you have already minimized your intake of conventional fat as much as possible, you could next try substituting CapTri® for an equivalent amount of carbohydrate calories. This, theoretically, should further increase energy expenditure. This strategy would allow you to try the low carb approach without relying on conventional fat as the alternative fuel source. Many of our bodybuilders have used this approach with great results. CapTri® is very concentrated in calories, so you really need to weigh your food, count calories, and watch what you’re doing. But if you use it properly, you should achieve very good results.

You might ask if you’re going to remove 30 grams of conventional fat from your diet, why bother to replace it with 30 grams of CapTri®? Why not just cut out the calories? Won’t that work even better? Such an approach would result in faster overall weight loss, at least initially. However we have found that if people cut calories too much they end up losing muscle mass. This ultimately results in decreased metabolic rate and energy expenditure. On low calorie diets your metabolism slows down and eventually weight loss grinds to a halt. By keeping energy intake up, this helps keep the metabolic rate from declining. The key is to provide the calories in a form which minimizes body fat accumulation. Of course, a small decrease in calorie intake is reasonable and can be very effective in promoting use of stored body fat as energy. The point is that you have to rely on something as your energy source, and we have found that many people can get a good result by minimizing conventional fats, consuming one to one-and-a-half grams of protein.
per pound of body weight per day, and then by meeting the remainder of their energy requirement by some combination of complex carbohydrates and CapTri®. The Parrillo Nutrition Manual goes into great detail in exactly how to do this and provides detailed information on how to adjust your diet to maximize muscle mass while minimizing body fat. You should also consult the BodyStat kit for important advice on how to change your diet to achieve your body composition goals.

References


Unlocking the Mystery of Fat Loss and Muscle Gain, Part I

by John Parrillo

Whether you’re a competitive bodybuilder or just someone trying to get in shape, Parrillo Performance is here to show you how to achieve your best condition ever. We’re the only ones whose program is based on a foundation of solid nutrition from healthy foods and a commitment to consistent training, rather than on some miracle supplement or powder. We show you how to keep producing results month after month, year after year.

The truth is, the biggest key to your success is you. Only you can do what it takes to achieve your dream physique. We can tell you what to do, but we can’t do it for you. The first step is to pick specific goals and to get motivated to do whatever it takes to achieve them. The keys to bodybuilding success and physique transformation are motivation, dedication, consistency, and hard work. Notice that these are all personal qualities that only you can provide—and also notice that supplements and training routines were not mentioned. There are no magic tricks. There are no shortcuts. There is no easy way. If this was easy, everyone would look great.

I’ve found that people who pick specific goals are more likely to get results than people who just have a general idea of what they want to achieve. It’s not enough to say that you want to get in shape this year, or you want to gain some muscle, or that you want to get stronger. You need to be more specific. A good place to start is to take a “personal inventory” using the BodyStat Kit™. Record your weight, percent fat, pounds lean mass, and pounds of fat. Pick a goal body weight and body composition and a target date for when you plan to achieve this result. If you put on some fat over the holidays and want to get in shape, exactly how many pounds of fat do you need to lose, and when do you want to arrive at your goal? For example let’s say right now you weigh 205 pounds at 14 percent bodyfat. That means you’re carrying about 29 pounds of fat (205 X 0.14). And your goal is to be in shape for your vacation in June. Last summer you got down to nine percent bodyfat, and this year you want to show up at the beach ripped at seven percent fat. This will be the best shape you’ve ever been in. To calculate your goal weight first determine your present lean body mass, which here would be 205 - 29 = 176 (lean mass equals total body weight minus pounds of fat). Next divide your lean body mass by the quantity (1 - percent fat), so if your goal is 7% body fat (7% = 0.07) your target weight would be 176/(1 - 0.07) = 176/0.93 = 189. This means that if your present lean mass stays the same, at a goal body weight of 189 you would be seven percent fat. Next calculate how many pounds you need to lose. Here that would be 205 - 189 = 16 pounds.

I recommend that you lose fat at the rate of one pound per week for optimal results, and never greater than two pounds per week. If you lose weight faster than this you will lose a lot of muscle along with the fat. This means you would need to allow 16 weeks to lose 16 pounds, in this example. Furthermore I suggest after about ten weeks of dieting you take a two week break and gain a couple pounds. If you remain in an energy deficit for too long this will decrease your metabolic rate and your rate of fat loss. I have found that people start to lose muscle after awhile if they diet for too long. So for every 10 weeks of dieting I think you should take two weeks off and gain two pounds. During this two week period continue to eat clean, and increase calories mainly by eating more complex carbohydrates. Most of the weight you gain should be muscle, and this should also give a boost to your thyroid hormone levels. Prolonged low calorie dieting, particularly low carbohydrate diets, will decrease thyroid hormone levels and metabolic rate. Finally, give yourself two weeks at the end to fine tune things. After losing the fat you’ll actually look better if you increase calories for a week or two and fill out your glycogen stores. So to lose 16 pounds of fat you should plan on a total of 20 weeks. If you lose two pounds a week the whole thing could be done in 10 weeks, but be careful not to lose lean mass. If you want to lose two pounds a week I would suggest using Muscle Amino Formula™ (our branched chain amino acid formula)
Unlocking the Mystery of Fat Loss and Muscle Gain, Part I

to help minimize catabolism of muscle protein.

After deciding that you want to lose a pound a week for 10 weeks, you can then take the next step in planning what to do. Since a pound of fat contains 3,500 calories, to lose a pound a week you need to achieve a net energy (calorie) deficit of 500 calories per day. Probably the most effective way to do this is by combining a modest decrease in calorie intake with an increase in aerobic exercise activity. For example you may want to decrease energy intake by 250 calories a day while performing 250 calories of additional exercise activity. The combined result is an overall energy deficit of 500 calories per day, which will bring about loss of one pound of fat per week. It is best to do your aerobics first thing in the morning before breakfast on an empty stomach. This is the time of day when your glycogen levels are lowest, causing your body to rely more heavily on fat stores as fuel.

You can create a similar plan for whatever your goal is – losing fat, gaining muscle, achieving a desired body weight or body fat percentage – the point is just to be specific. Know how many pounds of fat you want to lose, or how many pounds of muscle you have to gain, and what time with which frame you have to work. I picked fat loss as an example here because that’s a popular goal this time of year. Calculate how many pounds of fat you need to lose, and this will tell you how many weeks to plan on to achieve your goal. If you have to be ready for an event on a certain date, such as a contest or a photo shoot or a trip to the beech, this will allow you to determine when you need to start your program. Of course you need to know your body composition to do this. Probably the most convenient way to do this is with the BodyStat Kit™. This device consists of a set of precision skinfold calipers and an instruction manual telling you how to determine bodyfat percentage. The manual also includes instructions on how to modify your training and nutrition program to keep making progress in the right direction. Knowing your body composition is one of the most fundamental facts in bodybuilding, and following how this changes in response to different training

and nutrition programs is key to making longterm progress. If you keep track of your body composition, pounds of lean mass and pounds of fat, this will help you figure out which training and diet changes work best for you.

Another approach that works very well for many people is what we call controlled weight cycling. It works like this: The first month you gain a pound a week. If you’re training hard and eating right you should be able to gain three pounds of muscle and around one pound of fat. The next month you lose a pound a week and try to lose three pounds of fat and only one pound of muscle. (Of course, when we gain weight we would prefer for it all to be muscle, and when we lose weight we want it all to be fat. However, in reality the two usually go together). The net result after two months is that you’ve gained two pounds of muscle and lost two pounds of fat. Over a year’s time this adds up to 12 pounds of muscle and 12 pounds of fat, which is quite a physique transformation. The beauty of this approach is that you can do it over and over and keep piling up the gains. We’ve all heard the inspiring stories of people who have lost 30 pounds of fat and gained 12 pounds of muscle in three months, and although these may be true, the problem is that sort of miraculous progress is usually only attainable by people who start off really out of shape, and generally you can only pull off something like that once. After that it gets harder to continue to make progress. Controlled weight cycling offers a way for experienced athletes to continue to grow regardless of their level of development.

Obviously there are countless variations on this idea. As outlined above, your overall body weight would remain constant, and you would gain the same amount of muscle as the amount of fat you lose. If you want to increase overall bodyweight or if you don’t have much fat to lose, you could gain a pound a week for six weeks and then lose a pound a week for three weeks. You get the idea. The point is that whenever you gain weight even if you do everything right most people gain some fat along with the muscle. (Actually, if you gain weight simply by overeating and you don’t exercise about 75 percent of the excess weight will be fat and 25 percent will be muscle, but you can reverse this ratio by a strict diet and intense exercise). Then, by going on a weight loss cycle you can take off any fat you gained. Furthermore, any time you lose weight you will lose some muscle along with the fat (generally). This, along with a decrease in thyroid hormone levels, will decrease metabolic rate. So by following every weight loss cycle with a weight gain cycle we can maintain muscle mass and metabolic rate. So this two-pronged approach really does make a lot of metabolic sense.

The length of each cycle depends on your specific goals. If your goal is fat loss you could lose a pound a week for 10 weeks and then gain a pound a week for two weeks, then repeat (if you have a lot of fat to lose). If your goal is weight gain you could gain a pound a week for 10 weeks, then lose a pound a week for two weeks, and so on.

Well, all of this sounds good, but as with most things it’s easier said than done. Let’s talk a bit about the specifics of how to do this. We will discuss both the fat loss phase and the muscle building phase. For each phase we need to talk about nutrition, training, and supplementation. Of course, in an article this size I can only hit on the basics. For more details you should consult the Par-
rillo Performance Nutrition Manual and the BodyStat Manual. Proper diet is key to both losing fat and gaining muscle. Remember that food is the foundation of nutrition and the role of supplements is to increase the cellular levels of specific nutrients beyond what can be achieved from whole foods alone. If someone tries to tell you that their supplement is the key to your bodybuilding success, they’re trying to sell you something. The fundamentals for bodybuilding success are proper training and proper nutrition from food.

So where do we start? There are a few key pieces of information you should have right from the start. First is your present bodyweight and body composition, and then your goal bodyweight and body composition. Set realistic goals and a realistic time frame. It’s perfectly OK to set some long range goals of where you want to be two years from now, but really that’s too far away to be useful for the short term. You will get better results if you break up your long-term goals into a series of smaller steps that are more immediately achievable and easier to obtain and verify. I don’t want to get ahead of myself, but usually people get stale on a particular workout routine and the gains start to diminish after four to six weeks. Therefore it works best for most people to make some change in their workout routines every three to six weeks. This could be a change in exercise selection, the amount of weight used, rep ranges, training frequency, workout structure, tempo, etc. The point is, plan on changing something every month or so to keep presenting your body with a new challenge and a new stimulus. So if you plan on switching around your workout every month, then it seems logical to have some goals for that month. A month is a long enough period of time that you can actually see some changes, but not so long that you get stale. So break up your longterm goals into monthlong blocks, and maybe even weeklong blocks. As an example let’s pick a simple goal: to lose 10 pounds of fat. At a pound a week, this will take 10 weeks. This gives us some kind of benchmark we can go by to monitor our progress. Every week we need to check bodyweight and body composition to confirm things are going as planned. By evaluating things frequently we can make adjustments to keep things moving in the right direction.

The second key piece of information is your current caloric intake, because all of our dietary calculations are based upon that. To determine this, simply start weighing your food and calculate how many calories you consume in an average day. The Parrillo Nutrition Manual comes complete with a food scale, a nutrient hard time losing weight. Their bodies seem to have adapted to low calorie diets and continue to hoard fat in the face of relatively low energy intake. Sometimes these people get better results by paradoxically increasing calories while simultaneously increasing exercise activity. This seems to help them gain muscle tissue, which in turn raises metabolic rate and helps them burn more fat. Presumably this also reverses the hormonal and enzymatic adaptations to prolonged caloric restriction.

During the times when the goal is to gain muscle tissue we need to increase calories above the MER. The exact number of calories it takes to build a pound of muscle is not precisely known, but is probably around 2,500. (Note that this is much more than the mere energy content of the muscle tissue.) Although the exact numbers are not known, it seems to work well to strive for an energy surplus of about 300 calories a day when you’re trying to gain a pound of muscle per week. You may find that you need to go higher than this, but this is a good starting place. Some people gain too much fat if they have an energy excess of 500 calories a day, and other people can tolerate it. We suggest you continue to perform aerobic exercise while you gain weight, although not as much as during weight loss. By continuing to do your aerobics you will minimize fat accumulation during weight gain as well as maintain your cardiovascular fitness. A good starting place would be to plan for doing 60 minutes of aerobics a day when you’re losing weight and 30 minutes a day while you’re gaining weight. Then simply adjust caloric intake so that you gain a pound a week, without gaining an unacceptable amount of fat. For most people this works out to be between 300-500 calories a day above MER. During weight gain or weight loss we generally accept the 75:25 ratio as being good results. In other words if 75 percent of the weight you gain is muscle and 25 percent is fat, that’s good. Conversely, if 75 percent of the weight you lose if fat and only 25 percent is muscle, that’s also acceptable. Sometimes people can achieve better results than this, but these
are usually beginners who start off pretty far out of shape. It is possible, in fact, to gain muscle and lose fat at the same time, especially for people just starting to lift weights. However, you can see that with more experience your bodyfat percentage will eventually get very low and advanced athletes inevitably resort to some form of weight cycling. The traditional way of doing this was to gain 50 pounds during the “off season” and then lose 40 pounds during the pre-contest diet, and hope to come in ten pounds heavier than last year and still in good shape. Generally, I think it works better to use shorter cycles.

The kinds of food to eat are really not much different for weight gain and weight loss. What changes are the overall number of calories and the ratio of protein to carbohydrate. Good protein sources include skinless chicken breast, skinless turkey breast, egg whites, and fish. Carbohydrates are best divided into two general categories: starchy carbs and fibrous vegetables. Good starches are potatoes, sweet potatoes, rice, beans, peas, corn and oatmeal. Good fibrous vegetables are salad greens, broccoli, green beans, asparagus, spinach, squash, and so on. The Parrillo Performance Nutrition Manual contains an extensive list of foods that are appropriate for bodybuilders as well as their nutrient breakdown.

To design your diet the first step is to determine the number of calories you need. This depends on if your goal is to gain muscle or lose fat. Next, limit fat to 10 percent of total calories, and fewer if possible. (Refer to recent issues of this magazine for a detailed discussion about nutrient balance and why dietary fat is more prone to be stored as bodyfat than is protein or carbohydrate.) For weight gain you should consume about one gram of protein per pound of bodyweight each day. This should come from complete protein sources such as those listed above or from a high efficiency protein formula such as Parrillo Optimized Whey Protein™. During weight loss I would increase protein to one-and-a-half grams per pound of body weight a day. This extra protein helps prevent loss of muscle tissue while dieting. Then the remainder of your calories are derived from complex carbohydrates (and CapTri®, if you’re using that). Be sure to have both a source of fiber and starch at each meal. For breakfast oatmeal is a good carbohydrate choice since it is high in fiber, although considered a starchy carbohydrate. Divide your total daily calories and protein grams roughly into five or six small meals and try to eat every three hours. With this as a background, next bulletin I’ll talk more about how to modify your program to optimize muscle gain and fat loss and also discuss changes in exercise routine and supplementation strategies.
Unlocking the Mystery of Fat Loss and Muscle Gain, Part II

by John Parrillo

Last bulletin we began our review of the fundamental principles behind successful bodybuilding and fitness. The basic ingredients for success are motivation, dedication, consistency, and hard work. After that, you just need a little know-how, which is where we fit in. The foundation for building a fantastic physique is intense and intelligent training combined with proper nutrition. At Parrillo we believe your nutrition program should be based on a healthy diet from whole foods. Supplements can be effective in increasing specific nutrient levels, but cannot take the place of a proper diet of wholesome foods.

We discussed that you need a few pieces of information at the onset to help design the most effective bodybuilding or fitness program for you. First you need some specific goals. This means pounds of fat to lose, pounds of muscle to gain, and the time frame to accomplish these changes. Second you need to know your body weight and body composition. This allows you to establish specific goals and design a realistic plan. Third you need some idea of your daily calorie consumption, since many important dietary calculations depend on this. If you don’t know this now, don’t worry. You’ll figure it out quickly as we go along. You will need a food scale and a nutrition composition guide, which are supplied in the Parrillo Nutrition Manual. And it really helps to have a way to monitor body composition, such as the BodyStat Kit.

While it is possible to lose fat and gain muscle at the same time, this becomes more difficult as you become more advanced. If you have a fair amount of fat on your body (say greater than 15% for men or 25% for women) your initial priority should be to lose fat. If you train hard, you may be able to gain some muscle at the same time. On the other hand, if you’re already pretty lean your goal will be to gain muscle while minimizing fat accumulation. Advanced bodybuilders and fitness athletes usually find it becomes necessary to cycle weight gain and weight loss to make any significant changes in lean body mass. This is because even under ideal circumstances around 75-80% of the weight you gain will be muscle, and the rest is fat. So after awhile you will need to take off the fat. We have found a very effective approach which works well for many people is to alternately gain a pound a week for several weeks then lose a pound a week for several weeks. You can alter the proportion of time spent gaining versus losing depending on what your short term goal is. This strategy was discussed in some detail last month. If you’re around 10-15% body fat a very good plan would be to gain a pound a week for four weeks then lose a pound a week for four weeks. If you follow our nutrition and training program faithfully probably about 75% of the weight you gain will be muscle and 75% of the weight you lose will be fat. This yields a net result of two pounds of muscle gained and two pounds of fat lost in two months. This may not sound like much at first, but if you’ve been at this game for long you will soon come to appreciate that most bodybuilders would be very happy with that rate of progress. Look around the gym where you train. Most likely many of the people have made no discernible progress in the last year. We find that on our program even “average” people can easily attain results like this, and genetically gifted athletes do much better. Furthermore, this approach keeps your metabolism from getting stuck in a rut and your progress stalling.

So now let’s talk about some specifics of how to do this. We’ll deal the weight gain phase first. To gain a pound a week you will need to increase calories from 300-500 per day above your maintenance energy requirement (MER), the amount you would normally eat to maintain constant body weight. First, limit fat to 5-10% of total daily calories. A few months ago I explained some studies on energy metabolism which demonstrated that dietary fat is more prone to be stored as body fat than are protein and carbohydrate (1-7). This is especially true during overfeeding (calorie surplus). Next, consume about 1 to 1 1/2 grams or more of complete, lean, high quality protein per pound of body weight each day. This should come from sources such as skinless chicken or turkey breast, egg whites, or fish. You can also use a high quality protein powder such as our Hi-Protein Powder or new Optimized Whey Protein as needed. Then supply the rest of your calories from complex carbohydrates. You should include at least one starchy carbohydrate (such as rice, potatoes, corn, beans, etc.) and one or more fibrous vegetables (salad, broccoli, green beans,
Unlocking the Mystery of Fat Loss and Muscle Gain, Part II

and so on) at each meal.

It is important to structure each meal properly. Your daily requirement for protein and carbohydrate should be roughly evenly divided among five or six meals, and more if necessary. You should eat every two to three hours. This seems to improve insulin profiles and nutrient absorption and assimilation of amino acids into protein tissue. This way of eating also helps to reduce fat accumulation during weight gain. Be sure to have a protein source, a starchy carb, and a fibrous carb at each meal. Don’t eat all protein at one meal and all carbs at the next. That is not the most effective way to channel ingested nutrients for storage in muscle.

Regarding supplementation, this varies somewhat from person to person. Everybody should be using the Essential Vitamin Formula and the Mineral-Electrolyte Formula. Our nutrition program does not include dairy products or fruit. Although these are perfectly healthy, good, nutritious foods for an average person, they interfere with getting the best results in for those interested in getting as lean as possible because they supply a relatively high proportion of their calories as simple sugar, which we need to stay away from to minimize fat accumulation (8). Since we don’t recommend fruit or dairy for bodybuilders, this means you will need some supplementation to ensure you get enough vitamins and minerals. Also, most people will likely benefit from our Evening Primrose Oil Formula, which supplies essential fatty acids. These are the basics, to ensure your metabolic machinery has all of the raw materials it need to function at peak efficiency. For muscle building another core supplement which essentially everyone would benefit from is creatine. This not only makes your muscles bigger and harder, it also increases strength and endurance allowing for more intense workouts. Beyond that, the most effective supplement choices vary among individuals.

If you find it difficult to eat all of the protein called for, the best supplement for you will be one of our protein powders. Both the Hi-Protein Powder and the Optimized Whey Protein provide absolutely fantastic quality protein sources. If you’re a person who tends to gain a lot of fat easily, especially when trying to pack on muscle, then you probably would do best using CapTri. The correct way to use CapTri is to substitute it for an equivalent amount of calories from complex carbohydrate. Although total caloric intake will not change, CapTri is more thermogenic than carbohydrate leaving less energy for retention as body fat (9-13). (Refer to some of our recent articles in the Performance Press or in the Sports Nutrition Guide which can both be accessed through the internet at www.parrillo.com.) If on the other hand you find it very difficult to gain weight and have trouble eating enough food to achieve weight gain then Pro-Carb may work very well for you. CapTri is also a great supplement for adding “good calories” to your diet. “Hard gainer” typically seem to have a metabolic setup that does well on higher carbohydrate levels and higher insulin levels. A person who gains easily and tends to put on fat generally does better with relatively less carbs and more protein whereas a naturally skinny person usually gains easier with relatively more carbs. If you’re involved in a lot of endurance exercise you may want to try Liver-Amino Formula which supplies a high concentration of heme iron as well as Muscle Amino, CapTri and either of the protein powders. So the optimal supplement program for you depends on your body type and genetic background as well as your nutritional needs. If you have further questions about this consult the Parrillo Nutrition Manual or the Parrillo Sports Nutrition Guide or give us a call.

Training is obviously key to gaining muscle mass. If you’re not pushing yourself to the limit in the gym your gains will not be maximized. When it comes to bodybuilding, the results versus effort curve drops off really fast. By this I mean if you give 100% effort, you’ll get 100% results. If you give 80% effort, you’ll get about 50% of the results. And if you give 50% effort you’ll probably get very little results. It requires a pretty severe stimulus to drive the body to produce more muscle tissue than it already has. During the muscle gaining phase you need to be lifting the heaviest weights possible for low to medium reps. Most of your work should be around 6-8 reps, with some in the 3 rep range or even less. You should strive to increase strength, the amount of weight you can lift for a given number of reps, rather than the number of reps you can perform with a certain load. In other words increase the weight, not the number of reps. After four weeks on your gaining cycle you should be lifting heavier weights in all the basic lifts. During this time you should emphasize the basic compound movements, such as squats, deadlift, bench press, and shoulder press. Use the principle of periodization to try to get a new personal best in each of these lifts by the end of the cycle. Usually people do best here training five days a week or so. Experiment with different splits and routines to add variety, but always include the core mass building exercises. Generally you will be training with heavier weights, for fewer reps, and more rest time between sets. I would still advise doing aerobics 30 minutes a day. This will minimize fat accumulation as you gain muscle. If you’re naturally lean and find it difficult to gain, you may cut this down to three days a week.

Turning our attention to fat loss, basically we eat the same foods but in somewhat different proportions. Our first consideration is caloric intake. As mentioned last month, a pound of fat contains 3,500 calories, so to lose a pound a week means a daily energy deficit of 500 calories. Usually most people do best by a combination of reduced caloric intake and increased aerobic exercise. You might try reducing energy intake to 250 calories below your MER and then...
The image contains a text segment from a document discussing fat loss and muscle gain, specifically focusing on dietary strategies and the role of exercise. The text touches on the importance of calorie intake, protein consumption, and the relationship between food choices and exercise. It also mentions the use of supplements like creatine and Evening Primrose Oil to enhance results. The document highlights the need for a well-rounded approach, combining diet, exercise, and supplementation for effective fat loss and muscle gain. The text is part of a larger discussion on nutrition and fitness, likely aimed at readers interested in bodybuilding or athletic performance. The segment includes a picture of a nutrition product, indicating the practical application of the discussed strategies.
the letter, every day.

Regarding exercise, here you still need to train intensely, but we will increase the rep range to 8-12 and emphasize strict form and maximal contraction of the target muscles. For fat loss we will increase the rep range and the total volume of exercise, while somewhat reducing the rest period. You still want to train to failure, but now emphasize control and feeling the muscle more than sheer weight. This is not a license to ease up on your training - if that’s your impression you’re thinking about it the wrong way. The intensity is still high. Your effort is still 100% of what you can do. It’s just the style is a bit different. In fact, most bodybuilders will say this style of training is more difficult and more painful. Emphasize slow eccentric contractions (resist the weight as you lower it). You will be lifting somewhat lighter weights, but overall will be lifting more total weight per workout because you’ll be doing more volume. Plus you have less rest. This type of training is by no means easy, and most people are glad when it’s time to go back to the heavier weights with less reps. For cardiovascular training, increase this to 40-60 minutes per day, or more if needed. One good way to approach this is to reduce your caloric intake by a maximum of 250 calories per day below your MER, and no more. (A maximal reduction of 10% of calories is another reasonable guideline.) Then do however much aerobic exercise you need to lose weight at your goal rate. If 40 minutes a day is enough, fine. If it takes two hours a day, then do two hours. The amount of aerobics needed to get in shape varies among individuals, depending largely on genetics and how much fat they need to lose. We feel however that everyone will ultimately get better long-term results if they include aerobic exercise as part of their fitness program. Not only does this help control body fat, but intense aerobic exercise also helps build capillary density in muscle tissue, allowing for greater nutrient delivery and muscular development.

References


Optimizing Anabolic Drive

by John Parrillo

Over the last few years we’ve seen some real advances in the field of bodybuilding nutrition. In particular, there are now several new products which can dramatically improve the results you get from weight training. We’re constantly experimenting here with ways to produce even better results and to extend those results to a wider range of athletes. The quality of the natural (drug-free) bodybuilder has exploded in the last few years, due at least in part to some very effective supplements. If you showed pictures of today’s top natural bodybuilders around a gym 10 years ago, no one would have believed that such results could be achieved without steroids. It is quite possible these days to attain an amazing physique with simple nutrition, hard training and a few core supplements. In this bulletin I want to talk about the science behind some of these supplements and how to use them for best results.

One of the most amazing and effective bodybuilding supplements ever has to be creatine monohydrate (1-5). Creatine is actually an energy supplement first and foremost, providing high energy phosphate groups to replenish the ATP which is consumed during muscular contractions. (See our Technical Nutrition Summary on creatine at our website, www.parrillo.com, for a review on creatine and energy metabolism.) Creatine is nontoxic even in large amounts, is well-absorbed orally, and is readily taken up by muscles. There it is converted into creatine phosphate, which then serves as a donor of phosphate groups to ADP to re-generate ATP. ATP, as you know, is the immediate energy source used by muscles. So if we increase creatine levels inside muscles this will increase energy production, which translates into longer and harder workouts (1-5). Athletes using creatine report a significant increase in strength. This has been confirmed by objective trials (1-5).

Creatine seems to work in two ways to increase muscle size. First, the creatine molecule is osmotically active, which means when it is stored inside cells it attracts water along with it. This fills out the muscle making it bigger and harder. This effect is rather dramatic and is noticeable within a week or two of creatine use. Our athletes usually report a 4 to 14 pound weight gain after their first month of creatine use (depending mainly on their initial skeletal muscle mass and level of creatine stores before supplementation), which is confirmed to be lean body mass by body composition analysis. Second, creatine is effective at increasing strength and endurance during weight training (1-5). It is not unusual for an experienced lifter to improve his or her maximum lift by 5-15% or to notice an increase of 2 or 3 more reps with a 10 rep-maximum load after creatine supplementation. This places a more severe stress on the muscle which ultimately stimulates greater hypertrophy.

The standard protocol for using creatine is to “load” the muscles for 5-7 days with 20 grams per day, taken as four servings of 5 grams each. This saturates the muscles with as much creatine as they can hold. This is followed by the “maintenance” phase, which usually consists of 5 grams per day, although some of our larger bodybuilders use 10 grams per day. Creatine uptake by muscles seems to be stimulated by insulin, so it makes sense to mix creatine with a carbohydrate. Probably your best bet is to mix it with some Pro-Carb or Optimized Whey Protein (which also is a good stimulus for insulin release) and take it after your workout. Some people advocate taking creatine before a workout, but this doesn’t make much sense physiologically since exercise suppresses insulin. There seems to be no advantage to cycling creatine. When you stop taking creatine you simply begin to deplete your existing stores, which takes 4-8 weeks. In summary, creatine is one of the few supplements which has been proven in placebo controlled clinical trials to improve strength and exercise performance (1-5). It also increases lean body mass. Creatine is not converted to fat or stored in fat depots, so any weight gain you experience from creatine will be lean mass.

We have found the combination of Optimized Whey Protein and creatine to be a very powerful supplement tool. This is probably a more effective supplement combination than anything that was available even just a few years ago. To understand why, it is important to know a few things about whey protein and amino acid metabolism. It turns out that the amino acid profile of whey protein is very well suited to the needs of growing muscles. Glutamine occupies a central position in amino acid metabolism, since it is able to donate an amino group to a variety of keto-acids to form other amino acids. As you know, proteins are long chain-like molecules and the links of the chains are the amino acids. There are 20 different amino acids found in human proteins. Twelve of these your body can make itself, and these are called “nonessential” amino acids. The other eight are not able to be made by the body and are called “essential” amino acids because it is essential they be obtained from the...
diet. As a protein molecule is being built the amino acids are linked end-to-end one at a time to form a growing chain. The subcellular organelles upon which proteins are assembled are called ribosomes. If the cellular supply of one of the amino acids is depleted, then the ribosome won’t be able to find the next “link” to add to the chain and protein synthesis will stop. If the missing amino acid is an essential amino acid, there’s nothing to be done. Protein synthesis will halt until the depleted amino acid is replenished by the diet. If however the next amino acid to be added to the chain is one which the body can manufacture itself, then protein synthesis can proceed. One of the important things about glutamine is that it serves as the donor of amino groups during the synthesis of many non-essential amino acids. Therefore it helps make sure that adequate levels of the non-essential amino acids are available for protein synthesis. This may explain one reason why glutamine is the most abundant free amino acid in the circulation (6).

Glutamine also plays a pivotal role in energy metabolism, believe it or not. Glutamine serves as the preferred fuel source for several cell types including immune cells and cells lining the intestines. During injury, burns, illness or other severe stresses (such as surgery), sometimes the body has to rob muscle tissue of its glutamine to serve as fuel for the intestine and the immune system. This depletes the body’s glutamine reserve which can ultimately compromise immune function. This is one of the reasons why these conditions are highly catabolic and are associated with rapid loss of lean body mass. The fascinating thing is that this parallels in many respects what we see in the over-training syndrome.

Since your body can make glutamine from other amino acids it has traditionally been classified as a non-essential amino acid. However, during the last few years glutamine has been reclassified as a “conditionally essential” amino acid. This is because during times of severe stress your ability to make glutamine is unable to keep up with the demand. In these situations you need to supply additional glutamine in the diet to prevent a catabolic state. Experiments in animal models have demonstrated that glutamine supplementation can result in better nitrogen balance and conservation of skeletal muscle (6). During times of severe stress, including intense exercise, glutamine reserves, particularly in skeletal muscle, are depleted (7). It is thought that intense exercise may be considered a form of stress similar to other catabolic stressors such as illness, infection, and surgery. During both acute (short term) high intensity exercise and prolonged exercise plasma glutamine levels transiently increase (as glutamine is released from skeletal muscle) then decrease during the post-workout recovery period. If recovery between exercise bouts is inadequate then the effects may be cumulative, and over-training has been associated with prolonged low glutamine levels which recover slowly (7). In athletes suffering from the over-training syndrome plasma glutamine levels are depressed for months or even years (7). In fact, exercise physiology scientists have been looking for a blood test to help them define some objective measure of the over-trained state. So far the only reliable measure which has been found is the plasma glutamine level, which is depressed during over-training (8). In addition to glutamine’s central role in protein synthesis is the interesting prospect that it may also help promote glycogen storage in muscle (9). It would seem that glutamine helps preserve muscle mass during times of stress by several mechanisms.

If this isn’t enough to stimulate your interest in glutamine, it has also been proven that glutamine administered orally can increase growth hormone release (10). Most interesting was that the effective dose was only two grams (10). Actually, if you think about it, we don’t care about growth hormone release per se. And it’s at this level of skepticism and questioning that you get to be a real thinker about bodybuilding nutrition. What we care about is muscle mass. The real bottom line is that glutamine increases skeletal muscle protein synthesis. Glutamine increases skeletal muscle protein synthesis, and it’s effects are greater in the presence of insulin (11).

Why all this talk about glutamine? Because glutamine is probably the single most important amino acid in supporting muscular growth. It not only helps block catabolism of muscle tissue during stress but also provides an important anabolic stimulus for muscle growth. But there’s more to the story. We’re not home yet.

The scientific understanding of muscle metabolism and exercise performance is probably the richest when it comes to the BCAAs - the branched chain amino acids. These are the essential amino acids leucine, isoleucine, and valine. While glutamine is the most abundant amino acid in the bloodstream and free inside muscle cells, the BCAAs are the most abundant amino acids incorporated into muscle proteins. Just when you thought it was all becoming simple, it gets more complicated. The branched chains have been a favorite supplement of hard core bodybuilders for years. And finally science is ready to agree. For decades, and still even today, many people think of muscle as a structural - functional type of tissue with really no role in energy production. Well, I have news for you. During times of stress, including severe exercise, muscle tissue can be broken down to serve as a fuel substrate, just like any other tissue of the body. Hopefully you will burn mostly fat as fuel, but you must also rely on glycogen, the storage form of carbohydrate. Eventually your body will also turn to protein, particularly the BCAAs, as a fuel source (the good, the bad, and the ugly). The muscle proteins are a rich source of branched chain amino acids. The problem is that muscles can actually use the BCAAs directly as fuel, so in a pinch they will cannibalize themselves and oxidize their own proteins as a fuel source.

Supplemental BCAAs are not only incorporated into muscle proteins but can also reduce catabolism of pre-existent muscle tissue. Supplemental BCAAs are highly incorporated into muscle. The liver does not have significant amounts of the enzyme “branched chain amino transferase,” so is unable to significantly degrade the BCAAs. Muscle cells do however possess branched chain aminotransferase and are
able to utilize these amino acids as fuel. (Please refer to our Technical Supplement Bulletins on our website for details and references.) I have extensively reviewed branched chain amino acid metabolism in the past, and encourage you to review our past articles for previous information. Now I just want to add some new findings. High altitude climbing is a well known catabolic paradigm, and recent evidence demonstrates that BCAA supplementation can improve protein balance under this catabolic stress (12). Although both groups of climbers, those supplemented with BCAAs and those without, showed loss of overall body weight, the BCAA group showed a surprising increase in lean body mass while simultaneously losing fat. The group without BCAAs lost both muscle and fat. Also of note, the BCAA group showed an increase in arm girth during the climb while the group without experienced a decrease in arm size. It was concluded that BCAA supplementation helped prevent muscle catabolism (12).

Another new trial demonstrated a benefit from BCAA supplementation. In this study men were studied with and without BCAA supplementation during leg extension exercises (13). It was found that supplemental BCAA helped reduce breakdown of endogenous proteins, at least in part by being used as fuel themselves. So the branched chains reduce catabolism of muscle protein during exercise (12). Another recent study demonstrated that BCAA supplementation increased growth hormone and testosterone levels in long distance runners (14).

It is well known that the branched chains stimulate insulin secretion. Some of the newer studies also indicate an increase in growth hormone and testosterone following BCAA administration. Also, they suppress the use of muscle proteins as fuel. In part this seems to be because they “sacrifice” themselves for use as fuel, thereby sparing the breakdown of endogenous protein. The insulin effect probably also has something to do with this. Importantly, the BCAAs which are not oxidized as fuel are very prone to be retained by muscle and incorporated into muscle proteins. Thus they are both a powerful anabolic as well as an anti-catabolic stimulus. (Keep in mind this in not meant to be a comprehensive review of BCAA metabolism. This is just an update from our previous reports. Please refer to the website for more detailed information.)

Well, why all this talk about glutamine and branched chain amino acids? Because whey protein is comprised of around 30% BCAAs and is also high in glutamine. But, as usual, we’ve taken it a step further at Parrillo. In our formulation of Optimized Whey Protein we’ve added additional branched chain aminos plus more glutamine. Plus more glycine - another anabolic amino acid which can sometimes be limiting during growth. So with Optimized Whey Protein you get an excellent base providing an exquisite amino acid profile, already rich in the branched chains and glutamine. Plus fortified with extra BCAAs and glutamine, plus glycine. It’s probably the most anabolic amino acid mixture available on the planet - that was our intention when we designed it. Add creatine and you’ve got a simple recipe for amazing results.

So how do you sort out exactly the right supplement profile for you? Recently we unveiled 50-50 Plus, arguably the most effective post-workout supplement ever. Now we have Optimized Whey Protein. Which is right for you? Here are some simple guidelines.

If you have a hard time gaining weight you probably need more carbohydrates. Carbs stimulate insulin release and nutrient storage. I have yet to meet a “hard gainer” I couldn’t cure with more calories. Carbs are the most effective nutrient for gaining lean mass, when combined with adequate protein of course. If it is difficult for you to consume enough calories to support weight gain, you should first add 50-50 Plus and creatine. If you’re still having trouble add CapTri. CapTri is a very concentrated source of calories which has virtually no tendency to be stored as fat. Work up to two tablespoons with each meal. If you don’t like CapTri, or if you find your body type gets better results from carbs, then use Pro-Carb. Endurance athletes who are having a hard time gaining muscle or improving performance usually do best with Pro-Carb. They need the extra carbs because they burn so much during training.

If you gain easily, and find you’re struggling to keep fat off, then you should try Optimized Whey Protein and creatine. We find that the whey protein has very little tendency to contribute to fat stores, even when consumed in large amounts. As I have discussed at length in the past, certain food types are more easily converted to body fat than others. The whey protein seems to be preferentially retained as muscle with little spillage into fat stores. So during weight gain, rely on whey protein and creatine. During a fat loss cycle stick to the whey and creatine, but substitute CapTri for starchy carbs. Sounds simple, but it works.

Two simple supplement programs that will put muscle on anybody who trains hard. In closing I have to emphasize the importance of intense training. It just doesn’t work without that. We’ll supply the nutrition, you supply the work.
Optimizing Anabolic Drive

References


Rock Solid Evidence Supports Taking Minerals

by John Parrillo

Minerals may not be the most glamorous sports nutrition supplement, but they are very important and frequently ignored. For example, the RDA for calcium is 1,200 mg per day—an amount that is almost impossible to obtain from whole foods unless you eat a lot of dairy products. What is the typical bodybuilding diet? Egg whites, oatmeal, chicken breast, rice, vegetables (sound familiar?) I knew one bodybuilder who ate nothing but tuna and brown rice (even for breakfast). I pleaded with him to take a mineral supplement, but he didn’t think it was important. Mineral supplements cost a few cents a day and can provide valuable insurance against some major problems you really don’t want, like osteoporosis and anemia.

This month I want to talk about the trace elements. These are the minerals which are required by the body in very small amounts. The body generally stores less than five grams of the trace minerals. If you eat a balanced diet, you probably don’t need a vitamin or mineral supplement. However, many people who do eat all of the food groups still have mineral deficiencies anyway. And to make matters worse, bodybuilders do not always eat a balanced diet. Most bodybuilders agree with our recommendation to avoid and dairy products because of the simple sugars found in these foods. So for most people following a strict bodybuilding diet, vitamin and mineral supplements are recommended.

The following trace elements are considered to be essential in human nutrition: iron, zinc, copper, iodine, magnesium, chromium, selenium, silicon, cobalt, fluoride, nickel, molybdenum, vanadium and arsenic (1). Iron is probably the most well studied of these, and also perhaps the one which is most commonly deficient. As you know, most of the body’s iron is found in the red blood cells, where it is bound by hemoglobin. Hemoglobin is the protein which transports oxygen from the lungs to working tissues. Without enough iron, you can’t make enough hemoglobin and then this reduces the blood’s oxygen carrying capacity. In this condition, known as iron deficiency anemia, exercise performance is severely limited. In addition to being found in red blood cells, iron is also found in muscle cells incorporated into a protein called myoglobin. This is an oxygen binding protein that helps shuttle oxygen from the blood to the respiratory center of the cell—the mitochondria. Iron is also present inside the mitochondria as part of the cytochrome enzyme system, which is the molecular machinery responsible for energy production. In essence, iron plays a vital role at every step of the energy producing pathway because of its ability to reversibly bind oxygen.

Iron which is not being “put to work” in red blood cells, muscle cells or other cells is stored in the bone marrow. The average man will have about 1,000 mg of stored iron, while women store only about 300 mg (1). Most men lose about one mg of iron a day, an menstruating women lose about 1.4 mg. This is variable, however, and can be as high as 2.2 mg a day (1). Unfortunately, your intestines are not very efficient at absorbing iron. On average only about 10 percent of the iron you ingest is actually absorbed. For this reason the RDA for iron is 10 mg a day for adult males and 15 mg a day for adult non-pregnant females. During pregnancy, an extra 30 to 60 mg each day is recommended.

Dietary iron comes in two general forms, called heme iron and nonheme iron. Heme iron is an iron atom which is bound into a heme complex, a chemical constituent of the hemoglobin molecule found in red blood cells. As you might imagine, the best sources of heme iron are red meat and liver. Heme iron is relatively well absorbed—about 23 percent. Only about three to eight percent of nonheme iron is absorbed. Thus, on average, iron absorption works out to be around 10 percent since most people get some mix of heme and nonheme iron in their diets. For some reason that is not clear, meat and vitamin C seem to improve the absorption of nonheme iron. It stands to reason that the people most likely to be iron deficient are vegetarians, since their diet is lower in total iron, plus lacks heme iron altogether. Female vegetarians would be especially at risk.

If you eat less iron than your body loses on a daily basis, over time this will deplete the iron reserves in your bone marrow and you will develop iron deficiency. Your body can cope fairly well with this until the iron stores are severely depleted, and then the bone marrow can’t make enough hemoglobin anymore. Iron deficiency anemia results. In the United States about 10 percent of women are iron deficient and about six percent are so low on iron that they develop iron deficiency anemia. Less than one percent of adult American men are iron deficient. The higher frequency of iron deficiency in women usually attributed
to menstrual blood loss, and no doubt that does explain their greater (average) daily iron loss. However, it is interesting to note that about 50 percent of women consume less than 10 mg of iron each day. So women seem to have more of a problem with iron deficiency for a combination of two reasons: greater iron loss and lower iron consumption.

It is clear that iron deficiency anemia reduces exercise performance (2-4). When hemoglobin concentrations are too low the oxygen carrying capacity of the blood is reduced. This will obviously compromise energy production. When iron deficiency anemia is corrected exercise performance improves. Some evidence suggests that milder iron deficiency, without anemia, may also compromise exercise performance. For example, when athletes who have borderline anemia (hemoglobin levels near the lower limit of the normal range) are given supplemental iron their heart rate during exercise decreases (5). What does that mean? Well, if your blood cannot carry as much oxygen as it normally should, you can compensate at least partially by pumping a larger volume of blood per minute. This is why anemic people have a faster heart rate. Their hearts are pumping faster to try to keep up with the oxygen demands of the tissues. Also, blood lactate levels are higher in iron deficient athletes following exercise, and the lactate is reduced following correction of the iron deficiency (1). This indicates that the body is forced to rely more on anaerobic energy producing systems to fuel exercise if it is iron deficient. It seems logical that this would be the case if oxygen delivery was compromised.

The Parrillo Performance Mineral Electrolyte Formula™ provides five mg of iron per tablet in a special chelate form to enhance absorption. For the ultimate iron supplement, try Liver Amino Formula™, an ultra-purified liver preparation that supplies heme iron. Endurance athletes, women and vegetarians are at greatest risk for iron deficiency and should consider this supplement. It has been specially prepared and fat and cholesterol removed, and it provides high quality protein in addition to heme iron.

Zinc is another important trace element. It is found in meat, seafood and poultry (1). Zinc is bound to many enzymes and is required for the optimum function of many diverse metabolic pathways. Zinc deficiency results in reduced growth rate, anorexia (appetite loss) and impaired wound healing (1). Several studies have shown that athletes are more prone to zinc deficiency than sedentary people (6-8). Among the various studies, about 23 percent of female runners were found to be zinc deficient. This seems to be a result of both increased zinc excretion in urine and sweat as well as decreased zinc intake. Although zinc is not normally thought to be a key mineral for exercise performance, it is required for the activity of lactate dehydrogenase. This is the enzyme that converts pyruvate to lactate and is required for anaerobic energy production, the energy pathways that power weight lifting. So while adding extra zinc probably won’t improve your lifting, a zinc deficiency could definitely hurt it.

Chromium is of special interest to athletes because it helps insulin act more effectively, and thus improves carbohydrate utilization. Some studies suggest it also has effects on lipid metabolism and perhaps lean body mass. The RDA for chromium has been set at 50 to 200 micrograms (mcg) a day. Most people consume between five and 150 mcg a day. Chromium deficiency is common, probably because it is depleted in refined foods (1). The best food sources for chromium are meats, whole grains, yeast, nuts, cheese and molasses (1). Urinary excretion of chromium is increased by exercise, so athletes probably have a higher chromium requirement (9). Several studies have examined the role of chromium in weight training athletes (10,11). One group of beginning weight trainers were given 200 mcg of chromium per day for 40 days. The group increased lean body mass significantly more than the group given a placebo. Similar results were observed with football players. In another study, women receiving chromium achieved greater increases in lean body mass during a 12-week weight lifting program, but no difference was seen in men. Some studies have also indicated that chromium might help fat metabolism as well.

Other trials have not been able to demonstrate any significant effect of chromium on muscle or fat metabolism. Why do different scientific reports sometimes contradict each other? The most likely explanation is that chromium probably does have some effect, and if you are chromium deficient energy metabolism may not proceed with optimal efficiency. However, if you already have adequate chromium stores, taking extra may not make any further difference. This seems to be the case with a lot of issues relating to vitamins and minerals. If you are deficient in a vitamin or mineral big problems will develop. But if you have normal levels then taking extra doesn’t confer any additional benefit. I suspect this is the case with chromium. We can see an effect of chromium supplementation if the subjects in the study started off with chromium deficiencies. But if the study participants began the trial with replete chromium stores, then chromium supplementation might not do anything. Since several studies have demonstrated a significant effect on lean body mass from chromium supplementation, it is not unreasonable to suggest that serious athletes consider trying chromium for a month or two to see if it works for
them. As is the case with many nutritional supplements, you could go to the doctor to get your chromium level checked but it’s cheaper just to try the supplement than to get the blood test. You may be one of the people for whom it works.

One exception to this idea that enough is good but more may not be better is the antioxidants. The body’s requirements for vitamins C and E to prevent deficiency status are quite low. However, for C and E to function effectively as antioxidants you have to take quite a bit more than the minimum amount required to prevent an overt vitamin deficiency. Similar effects seem to be seen with vanadyl in promoting glycogen storage, but I haven’t found this to be true for chromium.

The Parrillo Meneral-Electrolyte Formula™ provides 25 mcg of chromium as chromium picolinate per tablet. Our vitamin and mineral supplements are designed to be taken one tablet with each meal. That will work out to be five or six tablets a day for most bodybuilders. This will supply 25 to 30 mg of iron each day, in addition to all of the other minerals included. This is enough to ensure adequate iron and chromium stores even in intensely training athletes, who lose more minerals daily and thus have higher requirements.

In closing, I would like to say a few more words about calcium. Although it is not a trace mineral, one of the most worrisome nutritional practices I see in bodybuilding is the avoidance of dairy products without adequate regard to eating enough green leafy vegetables or calcium supplementation. Most women increase bone density until age 30 or so, and then by age 35 bone mineral density begins to decline. The rapid decline which occurs after menopause can result in osteoporosis. One of the most important things you can do to prevent osteoporosis when you’re old is to build strong bones while you’re young. If you come out of middle age with relatively poor calcium status, that makes it all the more likely you’ll have problems when you’re older. Women especially (but men as well) should make sure that they get enough calcium from some source while they’re still young and increasing bone mineral density. You should consume 1,200 mg of calcium per day. This is difficult to do even if you do use dairy products, and it is very hard if you don’t. We all know that most bodybuilders use relatively little dairy. So it becomes very important to supplement calcium to make sure you get enough. Sometimes it’s hard to talk athletes into doing this because calcium supplements don’t have any effect on exercise performance or on your physique.

But, if you don’t use dairy products please be conscientious about taking a calcium supplement. Our Mineral Electrolyte™ provides 250 mg of calcium in each tablet. Four tablets a day is probably enough when combined with the calcium from your diet. Five tablets each day would guarantee that you meet your requirement. Plus Parrillo Hi-Protein Powder™ contains 280 mg of calcium per serving; Parrillo Optimized Whey Protein™ contains 130 mg of calcium per serving; and the Parrillo 50/50 Plus™ contains 250 mg per serving for the vanilla, chocolate and orange cream flavors and 300 mg per serving for the milk flavor, which tastes just like whole milk minus the sugar and fat.

References


If you’re not quite ready for the pool yet, don’t worry. Many people find their level of physical conditioning perhaps somewhat less than they were hoping for, especially at this time of the year. We have a program that will get you there in a hurry. It is possible to achieve a significant, if not remarkable, change in body composition and appearance in a relatively short time. It will take a serious commitment and hard work, but if you have the motivation and the determination, we can show you how to do it.

This program is about how to gain muscle and lose bodyfat at the same time. It’s designed for people who need to lose about 10 to 20 pounds of fat, and want to get in shape as fast as possible. It is completely realistic to plan to lose 20 pounds of fat and gain five pounds of muscle in 10 weeks. You will be amazed at what a difference 20 fewer pounds of fat and five more pounds of muscle will make in your appearance and in the way you feel.

Fundamentally, this is a fat loss program. A by-product is often a gain of a few pounds of lean muscle, although this is not a mass building program. We have seen a lot of people get extremely good results in a short time from making a few changes in their diet and training routines. Overall, this program involves a diet moderate in calories, low in fat, high in protein and moderate in carbohydrates. The exercise component involves a serious commitment to both weight training and aerobics. You will work very hard, but you can expect rapid and dramatic results. I will walk you through the design of this program step-by-step. This will allow you to understand the rational behind it and also will help you learn how to design routines for yourself as your goals and level of development changes.

First, let’s talk about nutrition. If our primary goal is fat loss and getting in shape, then we will need to sustain a net energy deficit. This means that more calories are expended as fuel than are consumed from food and supplements. This is a thermodynamic requirement for net loss of body weight. Each pound of body fat contains roughly 3,500 calories. Therefore, to lose two pounds of fat each week, we need a weekly energy deficit of 7,000 calories, or 1,000 calories each day. Generally I would encourage you to limit fat loss to two pounds per week. More rapid weight loss than that usually, but not always, is accompanied by loss of some muscle tissue. We have had at least one individual on this program lose three pounds of fat per week and still gain muscle at the same time. In four weeks he lost 12 pounds of fat and gained three pounds of muscle. Not bad for one month!

In my opinion the best way to achieve an energy deficit of 1,000 calories per day is through a combination of reduced energy (calorie) intake and increased energy expenditure. I would suggest reducing calories by about 500 per day compared to how much you usually eat. Then, perform 500 calories of extra aerobic exercise per day over what you usually do. This will result in a combined energy deficit of 1,000 calories per day, which will promote loss of two pounds of fat per week. As you know, I am not an advocate of low calorie diets, especially over the long term. But this program is designed to last for only 10 to 12 weeks, and a modest energy reduction for this short time won’t hurt you. Also, the increase in exercise activity will offset the decrease in metabolic rate that usually accompanies energy restriction (1,2). Although weight training is an important part of this program, we don’t consider the calories you burn during weight training. Weight lifting doesn’t burn many calories for one thing, and secondly most of the calories which are burned during weight lifting are derived from carbohydrates. It is important that you perform 500 calories per day of additional aerobic exercise, which is about an hour’s worth of relatively intense cardiovascular work.

What sort of diet works best? While I normally recommend a diet high in carbohydrates to achieve rapid results, we are going to cut down on the carbs. Essentially this diet is high in protein, moderate in carbs, and low in fat (3). You want to take in one to two grams of protein per pound of body weight each day. Obtain the rest of your calories from carbohydrates (or CapTri®) while minimizing fat intake. This usually works out to around 40 to 50 percent protein, 40 to 50 percent carbs, and five to 10 percent fat. Reducing carbohydrates seems to help promote fat loss by reducing insulin levels and reducing caloric intake. I feel it prudent to limit fat intake even while on a reduced calorie diet. You probably recall the detailed discussion we had about fat metabolism and nutrient balance a few months ago (4-11). When you are operating in an energy deficit essentially all of the food you eat will be used as fuel — except for some amino acids used to maintain or build lean tissue. It would seem you could get away with eating more fat since it’s just going to be burned anyway.
And that’s correct — if you eat a high fat diet which is deficient in calories you will still lose weight. (By eating a high fat diet containing surplus calories those extra calories supplied by fat will be retained as adipose.) Carbohydrates have a “protein-sparing” effect: this means that if you have carbs in your diet you’ll lose less muscle while consuming an energy deficient diet. Carbohydrates also have a higher thermogenic effect, which means your body will be forced to reply more on body fat for energy since less energy from food will be available to use as fuel (1). So while two diets may supply the same number of calories and result in the same amount of overall weight loss, I believe that the diet lower in fat will result in a leaner body composition.

Surprisingly, this diet can be quite satisfying, fulfilling and enjoyable. Another advantage of relying on carbohydrate as your energy source instead of fat is that carbs are much more filling and enjoyable to eat. We will use mostly fibrous vegetables and salads, while limiting starches. Starches are higher in calories than fibrous carbohydrates and occupy less space in your stomach. While starches usually form a major portion of our diet, for this 10 week program we will limit them to one or two servings a day.

Divide your protein and calories evenly over five or six meals. Most people get better results if they keep food selections relatively simple for this program. We get good results using egg whites, skinless chicken breast and low-fat tuna for protein sources. Have generous portions of vegetables and salad at each meal. You can have essentially all the vegetables and salad you want. It’s very difficult to eat too many calories from vegetables. I’m talking about things like broccoli, cauliflower, asparagus, spinach, green beans, and so on. Refer to the Parrillo Performance Nutrition Manual for a more extensive list, as well as the nutrient breakdown. Starches are things like potatoes, oatmeal, corn, peas, beans and rice. Treat yourself to a cup of oatmeal in the morning and maybe one other starch during the day. By supplying most of your carbs as vegetables and salad instead of starch, you will find it easier to limit calories. The bulk will help fill you up, the volume of food will be more satisfying and the vegetables will produce a smaller insulin response.

Some typical meals might go like this: meal #1: ten egg whites and one cup oatmeal meal #2: chicken breast and vegetables meal #3: tuna and salad meal #4: chicken breast, small baked potato and salad meal #5: ten egg whites and vegetables

This diet is low in calories and fat, and high in protein (3). It may not be the most exciting thing in the world, but it will strip fat off you in a hurry. And hey, it’s not forever. The salads can be enjoyable. Use green leaf lettuce with fresh peppers and onions, tomatoes and some fresh cilantro. Balsamic vinegar or lemon juice make tangy dressings with practically no calories. Grill your chicken outside to keep things flavorful. Or have some fresh grilled salmon or swordfish instead of tuna. Add some fresh mushrooms and chopped peppers to the egg whites. It doesn’t take too much effort to make this diet enjoyable. You will enjoy it even more once you see how fast the results come. You should avoid fruit and dairy products, which contain simple sugars, and bread, pasta and other refined carbohydrates (12).

What about supplements? There are four supplements that really help on this program. First are the Essential Vitamin™ and Mineral-Electrolyte™ formulas. Since we are avoiding fruit and milk, you will need a vitamin and mineral supplement. It is especially difficult, if not impossible, to supply your body’s requirement for calcium without using a lot of dairy products, unless you use a supplement. Next is creatine, which is in a class by itself in terms of supplements. You cannot be your most muscular and lean without using creatine. No matter how good you look, you’ll be better if you add creatine. Last is Optimized Whey Protein™. We started with the finest quality whey protein and then fine tuned the amino acid profile by adding extra glycine, glutamine and branched chain amino acids. I would consider this a “must have” supplement while dieting strictly. The high levels

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of glutamine and BCAAs act to protect muscle tissue during energy restricted diets. You can also use CapTri® if you need to increase your calories because you are losing weight at more than two pounds per week and don’t want to increase your carbs.

Now, about exercise. This intense shape up program demands a serious commitment to exercise. To get optimal results you will need to lift weights 45 to 60 minutes a day four or five days a week. Plus, you will need to do 60 minutes or more of aerobics everyday. I didn’t say this was easy. I just said you could get very fast results. On this program I would recommend a three day split, which means you train all muscle groups in three workouts. After this, you take one day off from lifting, then start over. This way, each muscle group is trained every four days and you’re lifting five days a week usually.

Feel free to design whatever sort of routine you want. It doesn’t matter so much how you divide up the workouts as much as that you train very hard whenever you lift. After warming up, train to failure in the six to 12 rep range. Do some work with heavy weights at low reps (six, say) and some work with lighter weight (around 10 reps). It is important to work hard and train to failure. This means performing the exercise in proper form for the prescribed number of repetitions until you can’t perform any more repetitions. I would aim for about 25 total sets per 60 minute workout. That’s a fairly brisk pace. Spend most of your time on free weights, although a few machine exercises are OK. Stick to the basics like squats, bench press and shoulder press.

The aerobic component of this program is very important. Although there are a few people who can get in good shape without aerobics, most of us need it. You will need to do at least 500 calories per day of aerobics, and more is fine. Many of the exercise machines these days will tell you how many calories you’re burning, which makes it easy to keep track. You must exercise at an intensity level where you are breathing hard and sweating. Moderate to high intensity aerobics will promote fat loss much faster than low intensity activities. Running on the treadmill is probably the best; Stairclimbers are also good. If your equipment doesn’t display calories burned, plan on one hour of fairly intense aerobics per day. Our athlete who lost 12 pounds of fat and gained three pounds of muscle in one month used exactly the program described above, except he did even more aerobics, sometimes almost two hours a day.

This program works best if you are able to monitor your change in body composition. Following overall body weight just isn’t enough. If you don’t already have a way to measure body composition, you might consider the Parrillo BodyStat Kit. I think the pay-off will make it worthwhile after just the first month. If you find you are losing muscle, you should increase carbohydrates slightly or add CapTri® and slow down your overall rate of weight loss. If you’re not losing fat on this program at the rate of two pounds a week it means you underestimated your maintenance energy requirement at the beginning. Decrease calorie intake by reducing starches by another 300 calories per day. If things are going extremely well and you are gaining muscle while losing fat, keep doing what you’re doing. Generally speaking, if you want to speed up your progress you are usually better off by doing more exercise rather than further reducing calories. The lower you go in calories the more important it becomes that those calories are extremely nutrient dense, and that the protein source is very high quality.

References
The Impact of Dietary Energy of Body Composition, Part I

by John Parrillo

I recently read an article that downplayed the value of liver supplements for athletes, bodybuilders and exercisers. I could say some unsavory words regarding my reaction to the article’s misinformation, but I’ll spare you!

Liver supplements—specifically desiccated liver—are an absolute must in your nutrition program, whether you’re a competitive bodybuilder, endurance athlete or exerciser who desires supreme fitness. The reason is, liver provides heme iron, high quality protein and B vitamins, thereby meeting several of the increased nutritional needs of athletes. To understand the importance of desiccated liver supplementation, let’s review how iron works in the body—why it is so vital to your performance.

Heme iron is intimately involved in key energy-producing reactions in your body. Energy comes from the breakdown of food and its consequent transport to body cells. Inside the cells, the foods are burned in a chemical reaction called “oxidation,” which simply means reaction with oxygen. For foods to be converted to energy, the cells have to get plenty of oxygen. This constant need for energy is so critical that if tissues are deprived of oxygen for more than a few minutes, they will perish.

Oxygen is carried to cells by red blood cells. They perform this shuttle service by binding to hemoglobin, the red pigment in the blood. Hemoglobin is a protein that includes a special chemical structure known as heme—a complex of porphyrin and iron. It’s the iron that binds oxygen in the lungs and subsequently releases it in the muscles and other peripheral tissues.

Muscles contain myoglobin, an oxygen-carrying protein that works inside cells. Like hemoglobin, myoglobin also requires iron to bind oxygen. Without the iron, the whole oxygen transport system won’t work. Not only that, iron is also required by the enzymes in the electron transport chain—the series of reactions in which oxygen is consumed in the cells. Iron, then, is required not only for transporting oxygen to the tissues but also for its use inside cells. Because of its critical role in oxygen utilization, iron has earned its reputation for occupying a central position in energy metabolism.

Iron deficiencies sap strength, yet, iron deficiency remains a major health problem. In fact, it is widely recognized as the most common nutritional deficiency in the world (1,2,3). In the U.S. alone, 22 percent of American women are iron deficient (1,2). The daily iron requirement for women is 18 mg a day, while on average they obtain only 10 to 12 mg a day (1). Among athletes, about 10 percent of males are iron deficient, compared to 22 to 25 percent of females (1). Many times a feeling of fatigue or low energy is the result of an unrecognized iron deficiency (2,3). A condition called sports anemia often affects athletes, particularly endurance athletes (1,3,6). Sports anemia, however, is not always associated with a true iron deficiency. During hard training, you actually damage skeletal muscle fibers-damage that must be repaired during recovery. Interestingly, if you haven’t been eating enough protein, your body will draw on red blood cells, hemoglobin and plasma proteins as a source of protein to repair your muscles (3). This reparation process may soak up all of the incoming protein and not leave enough left to rebuild new red blood cells at the normal rate. Thus, increased protein intake may be effective in treating sports-induced anemia (1). If you have low hemoglobin levels, you won’t perform as well at endurance events. Interestingly, endurance athletes have the highest incidence of sports anemia and also have the highest protein requirements. There seems to be an iron cost associated with exercise (3). Female athletes and endurance athletes are especially at risk of iron deficiency (1,2,3,6). Iron deficiency anemia reduces maximal oxygen uptake, reduces work output and increases the time required to recover between workouts (1).

The good news is that iron supplements have been shown to be effective in several critical areas (1,2,3). Iron supplements: • Reverse the effects of iron deficiency; • Restore hemoglobin levels; • Improve athletic performance in those who are deficient; and • May prevent an iron deficiency caused by training.

Iron supplementation alone will not correct true sports anemia, which is reasonable considering it is a protein deficiency. However, since liver provides both high quality protein and heme iron it should be beneficial to athletes suffering sports anemia.

Iron is also available in foods, as the chart shows. However, heme iron can be damaged by cooking. Heat reduces the ability of iron to be absorbed in half (5). Additionally, many iron-rich foods are high in saturated fat and cholesterol. Thus, desiccated liver supplements represent a highly bioavailable iron source. Our Parrillo Liver-Amino(tm) Formula is made from defatted liver, which means you don’t get all the fat and cholesterol that comes
The Impact of Dietary Energy of Body Composition

along with liver and red meat. Plus, we add predigested casein to further increase the protein content to 1.5 grams per tablet. This is why our Liver Amino is one of the best supplements available for bodybuilders and endurance athletes: it provides heme iron, quality protein and B vitamins all in one.

Now, what does all this mean to you? Actually, our Liver-Amino Formula is one of our “universal” supplements; in other words, it is vitally useful for every active person. What follows are the specific categories of people who should take this supplement daily: • Endurance athletes (whose iron needs are often elevated); • All female athletes and exercisers (deficiencies are common in this group); • Beginning bodybuilders who desire mass (the Liver-Amino Formula is one of the supplements in our Growth Program for Beginners); • Bodybuilders dieting and training for definition or competition (the supplement provides additional protein needed during dieting to guard against dieting-induced muscle loss); and • Experienced bodybuilders and exercisers striving to gain additional lean mass.

Our suggested usage is five to eight tablets with each meal. If you have information on how to use our Liver-Amino Formula(tm) successfully, please call our Info-Line at 513-531-1311 or access our website at www.parrillo.com.

What is the effect of diet composition on the hormones that act to control body composition? This topic is quite involved and we will deal with some basic concepts. The major players in this drama are insulin, glucagon, cortisol, growth hormone, thyroid, and to some extent testosterone. The most important relationship is the insulin-glucagon axis. These two hormones are made by the pancreas and act to control nutrient storage and nutrient utilization. Insulin is essentially a storage hormone and is released in response to eating. The most potent stimulus for insulin release is carbohydrate ingestion, followed by protein ingestion. Insulin shuttles carbohydrate molecules (glucose) inside cells for storage. It promotes the use of carbohydrate as fuel and stores carbohydrate as glycogen. After a meal, insulin is released and acts to help store nutrients and use glucose as fuel. Insulin promotes fat storage and converts excess carbohydrate into fat. Although, under normal conditions, not much carbohydrate is converted into fat - insulin does promote this. Insulin also prevents the release of fatty acids from adipose tissue and decreases the use of fat as fuel. Insulin behaves like a switch that turns off fat burning and turns on carbohydrate burning.

Glucagon is a counter-regulatory hormone. It has the opposite actions of insulin. Several hours after a meal, when most of the ingested nutrients have been burned or stored, glucagon levels increase. This promotes fat utilization and decreases carbohydrate oxidation. Immediately after a meal, insulin acts to promote fat storage, but after several hours of fasting, glucagon acts to promote fat oxidation. After the calories from your last meal have been used you begin to switch over to a fat burning mode. Of course, by this time most people get hungry and eat again, so they spend relatively few hours a day burning any significant amount of fat. The complete picture is much more complicated. The primary site of glucagon action is in the liver, with relatively little impact on peripheral fat stores. The main stimulus for release of fat from adipose tissue is the sympathic nervous system. The nerve endings release norepinephrine at the adipose cell, which in turn stimulates breakdown of stored triglyceride and fatty acid release. The major reason for considering the use of fat in a bodybuilding diet is that fat causes very little insulin release. By eating a low carbohydrate diet higher in fat, insulin levels should remain lower. Also, if carbohydrates are not available the body shifts into a fat burning metabolism during the day. Other studies (in rats) have demonstrated that the protein-to-carbohydrate ratio in the diet determines to a large extent the ratio of insulin-to-glycogen in the blood (11-13). These hormones seem to be almost entirely controlled by diet. Furthermore, studies suggest that the insulin-glycogen ratio influences bodyfat levels (11-13). For the same number of calories, more will be stored as fat if insulin levels are higher, simply because insulin promotes fat storage and prevents fat utilization.

On a different diet, providing the same number of calories, we would expect bodyfat levels to be lower if insulin levels are lower. This is logical. For these reasons we have seen the emergence of diets higher in fat and lower in carbohydrate. The disadvantages are problems inherent to fat metabolism, discussed above. One desirable alternative would be to use another energy source besides carbohydrate - which had favorable effects on the insulin profile - but which avoided the other problems faced by conventional fats. Medium chain triglycerides, such as CapTri(r), offer such an alternative. Conventional fats are comprised of long chain fatty acids, usually 16 to 20 carbon atoms long. Medium chain triglycerides (MCT) are a specially engineered, semi-synthetic fat that is built from fatty acid molecules that are only eight to 12 carbon atoms long. This small difference in chemical structure results in very different biological effects. MCT has a much higher thermogenic effect than conventional fat - probably higher than carbohydrate (14-19). MCT does not require the carnitine shuttle for transport inside the mitochondria and its oxidation is essentially unregulated. MCTs are oxidized very rapidly, more rapidly than glucose (14-19).

The liver converts the excess energy to ketones, or beta-hydroxy buty
ate and acetoacetic acid. These ketones are used as an immediate fuel source by the muscles. While conventional fats are preferentially stored, MCT are immediately oxidized as fuel. This results in almost no storage of MCT as adipose (14-19). MCT thus represents a dietary energy source, which has the advantages of fat but does not elicit much insulin response. MCT does not contribute to adipose depots. Another problem with the convention In our experience the 30 percent protein, 40 percent carbohydrate, 30 percent conventional fat diet works adequately - but not optimally - as long as an energy deficient diet is consumed. If fewer calories are consumed than expended, weight loss will result no matter what the diet composition. This diet (or practically any diet) will promote weight loss as long as an energy deficit is maintained. The high-fat diet can actually promote fairly rapid weight loss because of its favorable effects on insulin. However, you will run into problems on this diet when you approach maintenance level, calorically. Disaster occurs during calorie-excess when using the high-fat diet. Fat intake does not promote fat oxidation. If you consume excess calories supplied in the form of fat, they will be stored as fat. Period. You cannot use this diet to gain weight, unless you want to gain fat. By using MCT as the fat source - instead of long chain triglyceride - you can avoid the inherent problems. This results in a favorable insulin profile and eliminates the metabolic complications of consuming conventional fat. And since MCT is not retained as adipose, this makes it an ideal energy substitute during a weight gain phase. MCT use seems to minimize fat deposition during weight gain. All 30:40:30 high-fat diet is the inclusion of sugars, particularly in the form of fruit. Fruit can blow a diet. Fruit provides most of its calories in the form of simple sugars: glucose and fructose. Fructose is an especially bad choice for bodybuilders because it bypasses the phosphofructokinase enzyme step during glycolysis (20). This enzyme acts as a switch and determines whether sugars are stored as glycogen or burned as fuel. Fructose enters the glycolytic pathway and bypasses this enzyme. The fructose molecules are automatically shunted toward oxidation. During carbohydrate oxidation the carbon skeleton is converted to acetyl-CoA in the process of ATP generation. Fructose is rapidly converted into acetyl-CoA, which overwhelms the pathway that converts it into ATP. The acetyl-CoA piles up in the liver. Acetyl-CoA, it turns out, is the building block for fatty acid synthesis. Most of the fructose-derived energy is converted into fat by the liver and is subsequently released into the blood to be stored in fat cells (20). This is bad news! The argument used by fruit lovers is that eating it has almost no effect on increasing insulin release. True, but this has not been totally thought through. The reason fruit doesn’t increase insulin levels is that it is released from the liver as fat instead of carbohydrate, and fat doesn’t stimulate insulin release.

If you want to try the high-fat diet approach we would suggest you use MCT in place of conventional fat and avoid simple sugars, particularly fructose. This is very similar to some of the competition diets we have been devising for bodybuilders over the years. In the Parrillo version, start by eating one gram of protein per pound of bodyweight per day. Limit conventional fat as much as possible and provide 30 percent of total calories from CapTri(r). Derive the remainder of your calories from complex carbohydrate. Avoid simple sugars, including those found in milk and fruit. Avoid refined carbohydrates such as bread and pasta as well. Divide your daily total number of calories into five or six small meals, with roughly equal amounts of protein and carbohydrate at each meal. If your goal is to gain muscle mass, increase overall calories by increasing carbohydrates. If your goal is to lose bodyfat, decrease calories by decreasing carbohydrates. For exact instructions on how to construct meals, consult the Parrillo Nutrition Manual.

References
The Impact of Dietary Energy of Body Composition, Part II

by John Parrillo

What is the effect of diet composition on the hormones that act to control body composition? This topic is quite involved and we will deal with some basic concepts. The major players in this drama are insulin, glucagon, cortisol, growth hormone, thyroid, and to some extent testosterone. The most important relationship is the insulin-glucagon axis. These two hormones are made by the pancreas and act to control nutrient storage and nutrient utilization. Insulin is essentially a storage hormone and is released in response to eating. The most potent stimulus for insulin release is carbohydrate ingestion, followed by protein ingestion. Insulin shuttles carbohydrate molecules (glucose) inside cells for storage. It promotes the use of carbohydrate as fuel and stores carbohydrate as glycogen. After a meal, insulin is released and acts to help store nutrients and use glucose as fuel. Insulin promotes fat storage and converts excess carbohydrate into fat. Although under normal conditions, not much carbohydrate is converted into fat — insulin does promote this. Insulin also prevents the release of fatty acids from adipose tissue and decreases the use of fat as fuel. Insulin behaves like a switch that turns off fat burning and turns on carbohydrate burning.

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Growth hormone is one of the hottest topics in bodybuilding (and the lay press). This month I want to explain exactly what growth hormone is, how it works and how to increase your growth hormone level through diet, exercise and supplementation.

Growth hormone (GH) is a protein hormone made by the pituitary gland, a small secretory gland at the base of the brain. Hormones, chemical messengers secreted by endocrine glands into the bloodstream, are delivered to target tissues, where they exert their effects. Unlike other pituitary hormones, GH has no specific target gland. It exerts its effects on nearly all body tissues (1). GH release is controlled by two other hormones produced by the hypothalamus, a higher brain structure. Growth hormone releasing hormone (GHRH) stimulates GH release, while growth hormone inhibitory hormone (GHIH) inhibits GH secretion. GHIH is also called somatostatin. The balance between these stimulatory and inhibiting influences determines GH release. What, then, determines the balance between GHRH and GHIH? Age and body composition are the most important factors. Aging and adiposity negatively influence GH release (2); however, GH release can be enhanced through diet, exercise and supplementation.

Although growth hormone is important to bodybuilders, its primary function is to promote growth during childhood. People born with a growth hormone deficiency will become dwarfs unless it is replaced. Actively growing children have the highest levels of growth hormone. Gradually, GH release decreases with age. The decline in GH levels may in fact be the cause of some of the processes of aging.

Growth hormone promotes growth of nearly all the tissues of the body (1), including bones and internal organs. It stimulates cell division, causing tissues to grow. Bodybuilders who inject synthetic GH should understand that its effect is not limited to muscles; it effects other organs as well. Acromegaly is a disease caused by overproduction of growth hormone by a functional pituitary tumor. Individuals with acromegaly have characteristic deformities of the face, hands, feet and other body structures. While we want to optimize GH levels, more is not better.

In addition to promoting growth, GH has a variety of metabolic effects (1,3), including increased protein synthesis and nitrogen retention, increased utilization of fat as energy and decreased carbohydrate usage. In elderly individuals deficient in GH, restoration of more youthful GH levels promotes increased muscle mass and decreased bodyfat. The natural decline in GH levels accompanying aging may be partially responsible for the changes in body composition that occur as we grow older.

GH seems to enhance protein synthesis in several ways (1,3). First, it promotes transport of amino acids across cell membranes into the cells in which protein synthesis occurs (1). The increased concentration of amino acids inside cells means that more are available to be incorporated into proteins. Second, it seems to stimulate the ribosomes to make more protein by a mechanism independent of amino acid concentration. Ribosomes are the machines inside cells that link amino acids together to form proteins. Third, GH promotes gene expression, increasing the amount of RNA inside cells. RNA is a nucleic acid molecule that contains the information specifying the sequence of amino acids strung together to form a protein. In other words, the RNA contains the protein blueprint and tells the ribosome what to do. This chain of events will result in increased protein synthesis if the cell contains adequate amino acids, energy, vitamins and other nutrients necessary for growth. This is an important point to consider: In order for GH to be effective the cell must contain adequate nutrients and energy, otherwise growth cannot occur. Nutrition is absolutely critical. Finally, GH also seems to promote positive protein balance by decreasing protein breakdown (catabolism). One way it might do this is by increasing the use of fat as an energy source, thereby sparing body protein.

Growth hormone increases the release of fatty acids from adipose tissue and increases serum-free fatty acid concentration (1). Furthermore, it seems to increase the oxidation of fatty acids as fuel inside cells. It causes cells to preferentially use fat as fuel over carbohydrate and protein (1). Not only does this reduce protein catabolism, but it also spares glycogen. Some people have suggested that the increased availability of fat as fuel and the accompanying decrease in amino acid oxidation is the primary mechanism by which GH enhances nitrogen balance. This is controversial and poses quite an interesting hypothesis. We know, for example, that the medium chain triglycerides in CapTri® are preferentially used as an energy source and spare amino acid oxidation. Perhaps this is why CapTri® seems to enhance lean body mass. It may work by a similar mechanism.

Growth hormone also affects carbohydrate metabolism. It decreases the use of glucose as energy, thereby sparing glyco-
of the actions of GH are brought about by IGF-1 and other somatomedins, one might say that the function of GH is to stimulate somatomedin production. The half-life of IGF-1 is about 20 hours. So the IGF-1 “smooths out” the effectiveness of a single burst of GH release. The emerging picture? Most of the anabolic actions of GH are mediated by IGF-1 and GH has a direct catabolic effect on lipid metabolism (3).

The primary factor in determining overall GH secretion is undoubtedly age. Growth hormone levels are highest during childhood. Gradually GH levels decrease to about 25 percent of the initial level in the elderly. The second major GH factor is body composition (2). Excessive body fat seems to decrease GH levels. GH is normally released in a pulsatile (pulsation) fashion: the biggest spike occurs about two hours after deep sleep. So this means sleep is a stimulus for GH release. Other factors which increase GH release include exercise, excitement, stress, malnutrition and some specific nutrients. Malnutrition is an interesting one to consider. Protein malnutrition turns out to be a powerful stimulus for GH release. Does this mean we want to deprive ourselves of protein in order to increase GH levels? Certainly not. During protein malnutrition the body loses muscle mass, so more GH is released in an attempt to counteract this; the body fights to preserve muscle and does so by promoting the utilization of fat as energy instead of amino acids. Although starvation will increase GH levels, it won’t help you gain muscle.

Exercise is a relatively potent stimulus for GH release. Many studies seem to be in agreement that intense exercise, particularly anaerobic exercise resulting in glycolysis and lactic acid formation, are the most effective forms of exercise for increasing GH (2,4,5,6). This is probably why intense exercise, such as weight lifting, results in greater changes in body composition than low intensity exercise, such as walking. If you look at people who only perform low intensity exercise, you can see that they’re able to lose weight and get smaller, but not lean and muscular. Compare marathon runners to sprinters. Both utilize the same exercise (running), but sprinting has much higher intensity. The marathon runners are thin and sleek while the sprinters are much more muscular. Is there a connection? Most likely.

This also explains why you should always include some sets with higher reps. It is certainly possible to pick a heavy weight and train to failure after five reps, but this does not result in lactic acid accumulation. This style of training is an excellent way to increase strength but by itself does not result in optimal size increases. Train to failure with higher reps, as many as 20-25 reps, to really feel an intense burn. And just because you’re using a lighter weight for more reps doesn’t mean it’s a wimpy set. You can and should push the set to absolute failure. Training with moderate (and even light) weights can be very intense if you do it right. We do 100 rep sets with the belt squat, and believe me, it’s brutal. For optimal muscular development you need to do some training with very heavy weights in the 3-5 rep range, some training in the 8-10 rep range, and some training in the 20 rep range, until you really feel a burn. It is these higher rep sets, carried to failure, that stimulate GH release most
**Growth Hormone Physiology**

effectively.

You’ve heard you should do low reps for mass and high reps for definition. An oversimplification to be sure, but with an element of truth. Most people explain it this way: The high rep work burns more calories so helps you get more cut. This isn’t what’s really happening. In reality, you don’t burn many calories (relatively) lifting weights — even with high rep sets. The main factor is that the high rep sets trigger GH release. If done consistently, over time, this use of high rep sets will change body composition.

How do you take advantage of this knowledge and spur GH release? It depends. A rough guideline might be 25 percent of your sets in the 3-5 rep range, 50 percent in the 8-10 rep range, and 25 percent in the 20-25 rep range. Try this for six weeks and see what happens. Many bodybuilders have this idea that if they do more than 12 reps they’re wasting their time, and should just increase the weight. Not so. Doing work with higher reps is very beneficial. Just remember you have to take it to failure even if you’re doing high reps. Plus, if you have never trained above 12 reps, the change will undoubtedly stimulate your progress.

Another exercise parameter which seems to enhance GH release is to use shorter rest intervals. To do this, of course, you have to use lighter weights (and more reps). A difficult protocol which works well to increase GH levels is to train to failure at 10 reps (use 10 rep maximum weight) combined with one minute rest intervals. If you’re used to resting 3-5 minutes between sets, shortening up the rest interval to one minute or less; it will work wonders. Sometimes bodybuilders get into a rut; they plateau and can’t figure out the problem. It might be that they’re training like powerlifters: very heavy weights, very low reps with long rest intervals. If you haven’t made good gains in awhile try to incorporate some of these GH-releasing ideas.

In 1993 a scientific study compared the GH-release of 20 sets of one rep each (done maximally) to 10 sets of 10 reps (also maximum) and found the 10 sets of 10 reps resulted in greater GH release (6). Why? Probably the larger volume of work, done with enough reps to result in some lactic acid production, combined with short rest intervals, is the best way to trigger GH release. It may prove beneficial to include some high intensity aerobics as part of your cardiovascular training. There seems to be theoretical justification to include sprinting for better results.

You can also optimize GH release through nutrition and supplementation. A diet higher in protein seems to promote GH release. Another piece of advice is to not eat for two hours before a workout. Exercise seems to result in more GH release if performed on an empty stomach. What you should do just depends on your goals. If your goal is to be as strong as possible in the gym, lifting the heaviest weight you can, some ProCarb™ and CapTri® an hour beforehand will give you more energy and help you be stronger. But if your goal is to train for maximal GH release, you should probably wait for two hours before you train.

Certain nutrients have also been shown to increase GH levels (2,7,8,9). Certain combinations of specific amino acids, such as found in Enhanced GH Formula™, are shown to enhance GH release (8). Probably the best way to use these is on an empty stomach, first thing in the morning, right before a workout, and before bed. We were impressed to learn that MCTs, like CapTri®, can be a potent stimulus for GH release (9). As far as we know, this has only been examined in one study, but this study demonstrated a 900 percent increase in plasma GH levels two hours after MCT ingestion that was maintained for three hours. If you eat every three hours, that would keep GH levels up all day. We wonder if this is part of the way CapTri® works, in addition to it’s unique metabolic properties. We know that a high protein diet, medium in carbohydrates and containing one to two tablespoons of CapTri® each meal, consumed every two an a half to three hours, helps most people get lean and muscular. I wonder how much of this effect is mediated by GH. Try these modifications in your diet and exercise program and let me know what kind of results you get. Transform your metabolism into a muscle-building, fat-burning mode by using these GH-stimulating techniques. You might see a remarkable transformation in a relatively short time. Using Parrillo Performance principles, real people get real results real fast!

**References**


While insulin is one of the most important hormones in determining body composition, it is also one of the most misunderstood by bodybuilders. A clear concept of what insulin does, and how to control it, is key to achieving your physique goals. You can think of insulin essentially as a storage hormone, which is released by the pancreas after eating and stimulates cells to absorb and store nutrients from the bloodstream. Insulin is both anabolic and anti-catabolic. The major dilemma is that insulin promotes fat storage as well as muscle growth. You need to have some insulin around in order to grow (and to live for that matter) but too much will lead to excess body fat. Control is the key.

Diabetes is a disease in which insulin is either not present or else ineffective. Type I diabetes, which usually affects children, is an autoimmune disease resulting in destruction of the cells in the pancreas that produce insulin. These patients lose weight even in the face of eating more, because their cells do not effectively absorb the nutrients. This underscores insulin’s important role as an anabolic hormone. Type II diabetes usually affects adults, and in this case insulin is present but is not effective because the insulin receptor is not effectively activated by insulin. These patients are said to be “insulin resistant.”

Let’s discuss insulin’s actions, especially as related to bodybuilding, and then discuss how insulin secretion is controlled. This will lead to an understanding of dietary strategies to optimize insulin control and body composition. We will see that insulin occupies a central position in the control of carbohydrate, fat and protein metabolism.

Insulin’s most profound effect is probably on carbohydrate metabolism. After a meal the food is broken down by stomach acid and by enzymes in the stomach and small intestine. After the nutrients are digested into molecular-sized fragments, they are absorbed across the lining of the small intestine into the bloodstream. Carbohydrates are broken down into monos or disaccharides, meaning one sugar molecule or two sugar molecules linked together. Proteins are broken down to the level of individual amino acids or short polypeptides, which are short chains of a few amino acids. These protein and carbohydrate breakdown products are absorbed into the bloodstream and transported directly to the liver by a special vein called the portal vein. So the liver gets “first dibs” at these nutrients and is the processing plant that controls their metabolism. Fats follow a different pathway, which we have discussed in other articles. Fats (except for medium chain fatty acids like CapTri®) are packaged into special transport particles called chylomicrons, which do not enter the portal vein but instead are carried by the lymphatic system. CapTri® acts more like a carbohydrate (and in fact has been referred to as a “carbolipid” in the literature) because it is absorbed by the portal vein and taken to the liver where it is immediately processed for energy production.

After the carbohydrates reach the liver, they are converted to glucose, the form of sugar which is released into the bloodstream. One exception is fructose, a form of sugar present in fruit (and many sports bars, ironically). Due to the molecular structure of fructose, a significant fraction of it is converted into fat by the liver and is released into the bloodstream as a fat instead of a carbohydrate. (We have discussed the biochemistry of this in detail previously in #1 in the Sports Nutrition Guide). This is why we encourage our athletes to avoid fruit and fruit juice, and to carefully read the label before deciding on a sports bar. Parrillo Bars provide carbohydrate in a form, that is slowly converted to glucose, not fructose.

So after a meal the amount of glucose in the bloodstream rises. This causes a rapid secretion of insulin. This insulin in turn acts as a signal for cells to absorb and store glucose. The tissues that are most affected are muscle, fat and liver. Muscle tissue relies on carbohydrate (in the form of glucose) and fatty acids as its most common energy sources. At rest and during low intensity exercise muscle tissue relies most heavily on fat. Muscle cells normally are not very permeable to glucose, meaning that glucose cannot
easily get inside the cell. During the fast-
ing state blood glucose concentrations are
low, and therefore insulin concentrations are
low too, so the muscle cell relies more
heavily on fat since the glucose can’t get
in. Shortly after a meal blood glucose
levels rise, causing an increase in insulin
levels. The insulin binds to receptors on
the cell membrane stimulating the uptake
of glucose by muscle cells. Therefore for
the first hour or so after a meal muscle
cells use more glucose as fuel. Exercise
also somehow causes muscle to rely more
heavily on glucose as its energy source.
This is regardless of the fact that insulin
levels are low during exercise. Somehow
the contractile process makes the muscle
cell more permeable to glucose. So mus-
cles use glucose as fuel during the fasting
state (several hours after a meal) and
during exercise. During the fasting state
insulin levels are too low to stimulate sig-
nificant glucose uptake by muscle.

If I may digress for a moment, a related
question that often confuses people is
what is the optimal aerobic exercise inten-
sity to burn fat? At first you might think
that low intensity exercise, like walking,
would be best. It is true that during low
intensity exercise, a higher percentage of
the calories burned are derived from fat.
However, it is also true that fewer total
calories are burned. So higher intensity
aerobics will burn more fat grams per
hour, even though it works out to be a
classier percentage of calories. And what
we care about during our aerobics is the
amount of fat we burn, not the percent-
age. Furthermore, high intensity aerobics
do an advantage to mitochondrial,
which make them more efficient at burn-
ing fat. If you don’t believe this reasoning
just look around and ask yourself who’s
leaner, the people walking in the mall or
the people running outside? Hands down,
the runners are leaner than the walkers.
Although during high intensity aerobics
muscles use relatively more glucose, they
also use more fat.

Insulin stimulates muscle cells to absorb
glucose and to convert it into glycogen.
Glycogen is a polymer (chain) of glu-
cose molecules linked together, and is
the storage form of carbohydrate in ani-
mals (starch is the analogous molecule in
plants). When the cell needs glucose for
fuel, the glycogen is broken down into
energy units, which are then converted
to energy. This is especially useful during
high intensity anaerobic exercise such as
weight lifting or sprinting. Glucose can be
converted to lactic acid (a process which
releases energy) even without oxygen.
Aerobic metabolism requires the pres-
ence of oxygen, so the rate of aerobic
energy production is limited by the rate
of oxygen delivery. Once this level of
exercise intensity is exceeded, anaerobic
metabolism can provide an additional
energy boost for a few minutes. Only
substrate (and not fat) can be converted
to energy anaerobically. So while fat is
an important fuel source for aerobic ex-
cise, carbohydrate is the primary fuel
used to power weight lifting.

Insulin exerts a profound effect on car-
bohydrate metabolism in the liver. One of
the most important jobs of the liver is to
maintain blood glucose concentrations.
Under normal conditions the brain relies
exclusively on glucose as its fuel source,
so it is critical that blood glucose levels
be maintained. If blood glucose levels
rise too high or low for example by the use
of too much injectable insulin, or in the very
rare case of insulin producing pancre-
atic tumors) confusion results which can
progress to coma and even death. So the
liver soaks up a lot of glucose after a meal
and stores it, and then slowly releases it
as blood sugar levels drop several hours
later. This acts to maintain a relatively
constant blood glucose level even hours
after a meal. This guarantees a constant
fuel source for the brain and other body
tissues. Muscle cells are unable to re-
lease the glucose they store back into the
bloodstream. Once glucose gets inside a
muscle cell, it’s trapped there. This makes
the liver’s job even more critical, and ex-
plains why it gets first dibs at the nutrients
as they leave the small intestine.

Insulin exerts its control on liver
about carbohydrate metabolism at several key
points. Primarily it acts to stimulate the
conversion of glucose into glycogen (by
increasing the activities of phosphofruc-
tokinase and glycogen synthetase) and by
blocking glycogen breakdown (by inhib-
itating phosphorylase). These actions work
together to promote storage of glucose as
glycogen. About 100 grams of glycogen
can be stored in the liver. A hour or two
after a meal, blood glucose levels start
to fall. This reduces insulin secretion
by the pancreas and reverses the steps
above. Also, glucagon is secreted by the
pancreas, which has the opposite actions
of insulin. This results in the activation of
the enzyme phosphorylase, which breaks
down glycogen into glucose phosphate.
The enzyme glucose phosphatase then
removes the phosphate group from the
substrate molecule, allowing it to leave
the liver cell and enter the bloodstream.
The phosphatase group has a strong electric
charge, which makes it thermodynamically
unfavorable for glucose phosphate
to cross the lipid membrane and leave the
cell. Muscle cells lack glucose phospha-
tase, and that’s why the glucose taken up
by muscles is trapped there. The presence
of this enzyme in liver cells allows them
to store their glucose into the blood-
stream. Usually about 60 percent of the
substrate in a meal is temporarily
stored by the liver, to be released later
between meals.

We reach a very important point here.
The liver can only store so much gly-
cogen, and then it gets full. If too much
substrate is consumed in a single
meal, and liver glycogen stores are satu-
rated, insulin will promote the liver to
convert the excess glucose into fat. This
fat then enters the bloodstream and is
stored in fat cells. Regular readers on this
column will know that it takes a huge
amount of carbohydrate in a single meal
to result in conversion of carbohydrate
to fat. However, if you overconsume
substances repeatedly, liver glycogen
stores will eventually become saturated and
the excess carbohydrate can be con-
verted to fat. The keys are not to eat too
many calories in any one meal or over
the day. If you are trying to gain weight,
we have found a daily calorie excess of
300-500 calories per day works well for
most people. If you try to gain weight too
quickly, by eating too large an excess of
calories, then you will gain more fat along

Controlling Insulin for Optimal Results, Part I
with the muscle. To stay lean while gaining weight, gain slowly. Usually a pound a week is a good goal. If you put on fat easily, try to limit your caloric surplus to 250-300 calories a day. And even naturally lean people will begin to put on fat if their energy surplus exceeds 500 calories a day. The second point is meal patterning. By this I mean small, frequent meals. By dividing your daily caloric allotment into many smaller meals, this will spread out and slow down the release of glucose into the bloodstream, thereby reducing insulin levels. If insulin levels become too high, this increases the proportion of calories which are stored as fat. Third, meal structure is important. By combining protein with fibrous vegetables and protein this slows the release of glucose into the blood, also acting to help moderate the insulin response. These techniques are incorporated into the Parrillo Performance Nutrition Program.

Probably a word about glycemic index (GI) is warranted here. Glycemic index is a way of monitoring how fast a particular food is digested and appears as glucose in the bloodstream. This then is a rough index of the insulin response elicited by the food. It is measured by feeding an individual food (ice cream or potatoes, for example) in a standardized amount (usually 100 grams) and then drawing blood samples at frequent intervals after the meal and measuring blood glucose. This sounds like a great idea at first, but the problem is it doesn’t work when applied to real life situations. People don’t eat meals consisting of just one single food (at least bodybuilders don’t). Bodybuilders know that they get the best results when they combine carbohydrates and protein together at each meal. By consuming protein at each meal, this continually supplies the muscle cells with the amino acids they need to build protein. And by consuming carbohydrate at each meal, this provides a stimulus for insulin release, which promotes amino acid uptake and protein synthesis. So protein and carbohydrate should always be consumed together. This completely changes the rate of entry of glucose into the bloodstream for the mixed meal, thus it doesn’t work that way. Ice cream is a terrible bodybuilding food, because it can make you very fat. Potatoes and carrots on the other hand have a high glycemic index, around 100. So you might think they would make you fat. It turns out that potatoes and carrots are great bodybuilding foods. When they are combined with protein and fibrous vegetables their rate of digestion is greatly slowed, so that the GI of the mixed meal is much lower.

Now we will consider the influence of insulin on protein metabolism. Insulin acts to promote the storage not only of carbohydrate, but also of protein (and fat, don’t forget). In the absence of insulin, protein synthesis drops to zero. There are several ways insulin promotes protein storage. For one, it stimulates the transport of some amino acids into muscle cells. Most notably the branched chain amino acids leucine, isoleucine, and valine. These also happen to be the most abundant amino acids incorporated into muscle proteins. So if you use a BCAA supplement, such as Parrillo Muscle Amino, you should take it with meals. This will promote maximum absorption into muscle cells. Last month I discussed that growth hormone also stimulates amino acid uptake by cells and protein synthesis. So both hormones have an anabolic effect on protein synthesis. Insulin stimulates the transcription of certain genes, to increase the amount of RNA inside cells. It also stimulates the activity of ribosomes, the machines that connect amino acids together to make proteins. These three actions have a synergistic effect to increase protein synthesis. Insulin is also anti-catabolic acting to inhibit protein breakdown. It probably does this by reducing the activity of lysosomes, digestive factories inside cells that degrade old proteins. Insulin also decreases the rate of gluconeogenesis. This is the production of glucose (think “glucose genesis”) from amino acids by the liver. When blood glucose levels get too low, and the liver runs out of glycogen, muscle cells break down their own proteins and release amino acids into the bloodstream. The liver has the ability to convert these into glucose. This process is kind of a last resort that the body is forced to rely on in order to maintain glucose availability for the brain. Unfortunately, fat cannot be converted into glucose, so you have to break down muscle protein in this situation. This is obviously a bodybuilder’s worst nightmare. This will happen in cases when either overall caloric intake or else carbohydrate intake is too low. Another instance is in prolonged intensive aerobic exercise, such as marathon running.
running. This is why marathon runners, while being quite lean, also have small legs. To avoid this from happening, don’t restrict calories too severely and don’t go too low on carbs. We find that fat loss of one to two pounds a week is optimal. Usually if you try to lose faster than that most of the additional weight lost will be muscle. Also, the very low carb diets set you up for this problem. Generally I would not recommend going lower than one gram of carbohydrate per pound of body weight per day, and certainly never less than 100 grams per day. When insulin levels get too low, protein synthesis virtually stops, muscle breakdown is accelerated and muscle cells release large amounts of amino acids in the blood. The liver picks these up and converts them into glucose. This is why people with (untreated) diabetes experience muscle wasting and weakness.

There seems to be a synergistic effect between insulin and growth hormone. Experiments have been performed in young rats in which their pancreas and pituitary glands were removed. This renders them deficient in both insulin and growth hormone. In this situation growth stops. When either hormone is injected into the animals alone, a little growth results but not much. When both hormones are injected together dramatic growth results. So while both hormones are anabolic and anti-catabolic, neither one can do the job by itself. The reasons for this are not entirely clear, but may have to do with the fact the each hormone stimulates the uptake of a different set of amino acids.

What about the use of injectable insulin as a drug by some bodybuilders? First I will say that this is dangerous. While all drugs have potential side effects, insulin has the ability to kill you right now, if you inject too much of it. The rationale for bodybuilders using insulin has two parts. First, we have discussed the synergistic effect of insulin and growth hormone above. So bodybuilders who use growth hormone think they will get better results from their GH if they combine it with insulin. Second, growth hormone and anabolic steroids cause some degree of insulin resistance, so it takes more insulin to get the job done. What about using insulin as a stand alone drug, without anabolic steroids and GH? This won’t work, it will just make you fat. Studies in rats have demonstrated that injecting supra-physiologic (excess) insulin promotes excess fat storage. The only reason to use injectable insulin is if you’re a diabetic who needs it, and even then using more than you need will just make you fat. One of the goals of the bodybuilding diet is to reduce insulin levels, so what sense does it make to inject it? If you want to experiment in a natural way with increased insulin levels, just eat a diet high in sugar. See what I mean?

Next month we will continue our discussion of insulin and look at how insulin affects fat metabolism. Also, we’ll go into more detail about dietary strategies to optimize insulin response.

References


2. For detailed information about how to construct your diet for optimal insulin control, refer to the Parrillo Performance Nutrition Manual.
Controlling Insulin for Optimal Results, Part II

by John Parrillo

Last month we began our discussion about insulin and discussed its role in carbohydrate and protein metabolism. Now I will discuss how insulin affects fat metabolism and fuel selection, and dietary strategies for optimal insulin control.

As mentioned last month, insulin causes cells to absorb glucose and use glucose as an energy source. This automatically decreases fatty acid oxidation, since more glucose is being used. Insulin thus switches your metabolism to a carbohydrate-burning mode. Insulin also promotes fatty acid synthesis by the liver. These fats are then transported through the blood for storage in fat cells. Not only does insulin stimulate the liver to synthesize fat, but it also promotes fat uptake and storage by fat cells.

Insulin stimulates glucose uptake by liver cells. After the glucose concentration builds up and glycogen stores become saturated, the remainder of the glucose is available for conversion to fat. This is one key reason why we recommend you divide your daily allotment of calories into several small meals instead of fewer large meals. This will present your liver with less carbohydrate load at a time, thus minimizing conversion to fat. Furthermore, some intermediates of glucose metabolism generated by the citric acid cycle (the metabolic pathway responsible for the conversion of glucose to energy) activate the enzyme acetyl-CoA carboxylase. This enzyme catalyzes the rate-limiting step in fatty acid biosynthesis. Simply put, if glucose concentrations build up too high in liver cells, this activates the enzymatic pathway that converts glucose into fat. The newly synthesized fatty acids are coupled to glycerol to form triglycerides, the usual form in which fat is transported and stored. The triglycerides are then carried through the blood to fat cells in adipose depots. However, before they can be taken up by fat cells the fatty acids are cleaved from the glycerol by an enzyme called lipoprotein lipase. This enzyme is activated by insulin. Then the free fatty acids enter the fat cell and are combined with glycerol to reform the triglycerides. So, we see that insulin stimulates the rate-limiting steps of both fat synthesis and fat storage.

Not only does insulin act to promote storage of fat, it also inhibits the release of fatty acids from fat cells. The most probable stimuli for release of fatty acids from adipocytes (fat cells) are epinephrine and norepinephrine. Epinephrine, also known as adrenaline, is a hormone released from the adrenal gland in response to exercise, stress or fear. Norepinephrine is closely related, but is more commonly considered a neurotransmitter than a hormone. It is released from nerve endings of the sympathetic nervous system, and is also activated by stress and exercise. Epinephrine and norepinephrine both work by activating an enzyme called hormone sensitive lipase. This enzyme splits the triglycerides into free fatty acids so they can be released from the fat cells. Insulin inhibits this enzyme, thereby preventing the breakdown of triglycerides and release of fatty acids from fat cells.

Finally, insulin also stimulates glucose uptake by fat cells. Once inside, the glucose is metabolized and forms alpha-glycerol phosphate. This is converted to glycerol, which is combined with fatty acids to form triglycerides. This is another way in which insulin promotes fat storage.

As you might expect, when insulin levels are low these effects are reversed. Low insulin levels, as occur between meals, during fasting and during exercise, take the brakes off fat metabolism. This allows hormone sensitive lipase to become active, which releases large quantities of fatty acids and glycerol into the blood. Then it is transported to muscles for use as fuel. Thus, in the absence of insulin, your body switches from burning mainly carbs to burning mostly fat. There are a couple of obvious implications here. One is that you don’t want to eat right before exercise if your goal is fat loss. This is especially relevant regarding your aerobic exercise. If you don’t eat for two hours before your aerobics, then insulin and blood glucose levels will be low so you’ll rely more heavily on fat as a fuel source. This is also why we recommend doing your aerobics first thing in the morning on an empty stomach. Also, it does make some sense to reduce carbohydrate intake when you’re trying to lose fat. This “low-carb” approach helps lower insulin levels, thereby promoting use of fat as fuel. You don’t want to cut calories too severely, however, or this will reduce metabolic rate and promote muscle catabolism. So...
Controlling Insulin for Optimal Results, Part II

it would be nice if we had some other energy source to use in place of carbs. That’s where CapTri® fits in. It supplies a source of energy, which you can use in place of carbohydrates, to lower insulin and encourage the use of body fat for energy. CapTri® has a high thermogenic (heat producing) effect, which increases metabolic rate. Also, it is preferentially metabolized for energy and is not stored as body fat, in stark contrast to conventional fats.

In summary, insulin promotes fat synthesis and storage and inhibits fat utilization. Therefore, we want to optimize insulin levels to maximize use of fat as fuel and minimize stored bodyfat. We’ll talk more about how to do that later. Insulin acts to promote utilization of carbohydrate as fuel and inhibits the use of fat. Low insulin levels switches the fuel source oxidized from carbohydrate to fat. And since the blood glucose level determines the insulin level, we can see that the composition of the fuel mix oxidized (carbs versus fat) is determined primarily by the blood glucose concentration. If blood glucose is high, you’ll burn mostly carbs and not much fat. If blood glucose is low, you’ll burn mostly fat. So you generally want to keep blood glucose low to minimize bodyfat. That doesn’t mean you have to eat a low-carb diet, but you need to select your carbs carefully and always combine them with protein. Eating small, frequent meals helps.

The most potent stimulus for insulin secretion is carbohydrate ingestion, especially simple sugars. The rapid increase in blood glucose concentration causes a rapid insulin response. Normal blood glucose levels are around 90 mg/dl and basal (background) insulin secretion is minimal. After a meal when the blood glucose level rises above 100 insulin secretion is stimulated within three to five minutes. If blood glucose reaches about twice its normal value, insulin may increase to 10 times its normal level. This is accomplished through a combination of dumping insulin from the pancreas plus synthesis and release of insulin by the beta cells, which are the cells of the pancreas that make insulin. The increased insulin level quickly reduces the glucose level by stimulating cells to absorb glucose. Then the insulin level decreases again just as rapidly as it increased. This constitutes an important feedback mechanism to maintain glucose control.

Protein also stimulates insulin release, but not as strongly as carbohydrate. Insulin acts to help transport some amino acids inside cells, especially the BCAAs (branched chain amino acids). It also stimulates the incorporation of amino acids into protein, as we discussed last month.

Although I generally recommend that you consume carbohydrate and protein together, there is one exception. If you’re dieting to lose fat sometimes it works very well to have a protein drink before bed. This takes the edge off your appetite and helps you resist cheating. Also, this protein helps prevent muscle breakdown overnight and helps you burn fat while you’re sleeping. Right after a workout I would combine protein and carbs in about a 50:50 ratio. This will help replete glycogen stores and supply amino acids for growth. So the best supplement after workouts is 50/50 Plus™ which will supply nutrients optimal to support growth and recovery. The best supplement before bed is two scoops of Optimized Whey Protein™ to suppress muscle breakdown without inhibiting fat metabolism overnight. If you wake up starving in the middle of the night and have bad cravings, have another scoop of Optimized Whey Protein™. The best supplement to support your metabolism during low carb diets is CapTri®. Even during low-carb diets, a good rule of thumb is not to go below one gram per pound of body weight carbohydrate. Going too low in carbs promotes muscle breakdown and reduces thyroid hormone level, decreasing metabolic rate and fat metabolism. The exception might be if you’re carb loading for a contest, you might go lower than this for one or two days during the depletion phase.

Some hormones released from the gastrointestinal tract also stimulate insulin secretion. These are gastric inhibitory peptide, gastrin, secretin, and cholecys-tokinin. The intestinal tract releases these hormones after you eat a meal. Furthermore, the autonomic nervous system can also stimulate the pancreas to release insulin.

So we see that while insulin is necessary for growth, since it is responsible for transporting glucose and amino acids inside cells, too much insulin is not a good thing. Too much will result in fat accumulation. We have found that what works best is a relatively uniform blood glucose and insulin level, and fairly frequent feedings, including protein. This results in the muscle cells being constantly bathed in the nutrients they need to grow and having enough insulin to stimulate amino acid uptake and protein synthesis, but not so much as to promote fat storage. To achieve this you should eat every two and a half to three hours or so, which will work out to five or six meals a day. For most people, it works quite well to have, for the last meal of the day, Optimized Whey Protein™ right before bed, two to four scoops depending on your size. Serious bodybuilders will want to use 50/50 Plus™ within 15 minutes after a workout, again two to four scoops. Whether or not you count this as a meal just depends on how many calories you need.

Other meals should contain a protein source, a starch and a fibrous vegetable. The protein and the fiber slow the release of glucose from the starch, which serves as your primary glucose source. Pick your starch carefully. The best ones for bodybuilders are beans, rice, potatoes, sweet potatoes, corn, peas, lentils, whole grains, oatmeal, and so on. Refer to the Parrillo Performance Nutrition Manual for a detailed list of choices, including their nutrient profile.

“Meal patterning” refers to eating small, frequent meals, every three hours or so. Most people do best to limit each meal to 500-600 calories. If you eat too many calories at a single meal this will elevate blood glucose, and thus more insulin than is desirable. It will overwhelm the liver’s storage capacity for glycogen and result in “spilling over,” which refers to the conversion of carbohydrate into fat by the liver. “Meal structuring” refers to the
design of each individual meal. As discussed above, each meal should contain a protein source, a starch and a fibrous vegetable. Exactly how to combine these optimally varies from person to person. A good starting place is to consume one gram of protein per pound of body weight each day, and divide this evenly over six meals. Limit conventional fat to five-10 percent of total calories. The remainder of your calories are derived from carbohydrate. Try to maintain this structure at each meal, except the last one right before bed, in which a protein drink works well. Some people find they do better on even more protein, as much as two grams per pound of body weight per day. These are people who are training very, very hard, people who are dieting severely and individuals who genetically store fat easily and find it hard to get lean. If you have a genetic predisposition toward carrying too much fat, you will find that you get leaner if you eat more protein and less carbohydrate. Conversely, if you’re naturally thin and find it hard to put on muscle, you’ll do better with more carbs.

The macronutrient ratio for each meal might vary from 30 percent protein, 60 percent carbohydrates and 10 percent fat to a 45 percent protein, 45 percent carbs and 10 percent fat. A 2:1 ratio of carbs to protein works better in naturally thin people because this results in a higher insulin level, promoting weight gain. The 1:1 carb to protein ratio works better for individuals who store fat easily, since it results in a lower insulin level.

So far we have discussed food selection (refer to the Parrillo Nutrition Manual for a lot more details about this), meal patterning and meal structuring. We have mentioned a useful technique to maximize fat burning: do your aerobics before breakfast and wait for two hours after a meal before working out. Another trick is to eliminate carbs from your last meal of the day (an Optimized Whey Protein™ shake before bed). Finally, another very effective way to reduce insulin levels is to substitute CapTri® for some of your starch. This will reduce the carbohydrate load and decrease insulin release, helping promote fat burning. The way to use Cap-Tri® to help you lose weight is to use it in place of starch. The way to use it to help you gain weight is simply to add it to your regular meals to increase calories. The advantage of using CapTri® in this way is that it has very little tendency to convert to bodyfat. If your goal is to lose fat and gain muscle at the same time, you will need to train very intensely, and fairly frequently, and do your aerobics. The most effective supplement combination for this would be 50/50 Plus™ after workouts, Optimized Whey Protein™ before bed, CapTri® in place of some of your starch (maybe one tablespoon with each food meal, in place of 115 calories of starch), and creatine once a day (best taken with the 50/50 Plus™ after your workout).

The Parrillo Performance Nutrition Manual has a lot more information about the details of meal patterning, meal structuring and food selection than I can fit in this article, but these are some of the key concepts in achieving your physique goals.

References


2. For detailed information about how to construct your diet for optimal insulin control, refer to the Parrillo Performance Nutrition Manual.
Controlling Bodyfat Metabolism, Part I

by John Parrallo

One topic virtually everyone (with the possible exception of Sumo wrestlers) is concerned about is fat metabolism. Depending on how we define ‘fat’, about one-half of all Americans are considered overweight. One-third can be categorized as obese. These numbers are shocking and underscore the fact that most Americans just don’t eat properly or exercise enough. A century ago the big problem in nutrition was nutritional deficiency. Now our problem is excess body weight. It has been said that America is the only country where even the poor people are fat. Over the eons people spent much of their day, and a lot of energy, gathering and preparing food. Now you can order a pizza over the phone and have it delivered to your door. Food is readily available here, and it’s cheap, convenient and fast. You get a hamburger and fries without getting out of your car and there are vending machines at work loaded with candy bars and chips. Is it any wonder that Americans are fat?

Many people want to eat right and try to lose weight, but they don’t know what to do. There are low-fat diets, high-fat diets, low-carb diets, rotation diets, fruit diets and every other type of diet imaginable. To make matters more confusing, they all work and they all don’t work. I’ll explain this seeming contradiction later. There is a lot of confusion about the best way to go and this is understandable given that even scientists and doctors cannot agree. Before I get into the biochemistry and physiology and show how that helps us decide on the optimal diet, let’s just talk about some very simple general principles with which I think most people will agree.

My first general concept is that to lose fat and keep it off requires a permanent lifestyle change. Many people use a caloric-restricted diet for a period of time, reach their goal weight, then go off their diet and resume their previous way of eating, change that produces temporary results. If you want permanent results you need to make a permanent change. You need to pick a diet program with which you can live. An all fruit diet or a zero carb diet might make you lose weight, but is clearly a bad choice because you can’t live that way forever.

My second general concept is simple: to achieve a lean, healthy, beautiful physique requires exercise as well as a proper diet. This is a big problem for many Americans who don’t have time, energy or motivation to exercise. Let’s face it, Americans are lazy. We work hard and long hours but for most of us it is not work of a hard, physical nature. After work we are tired and don’t feel like exercising. We work hard in the stressful sense, but as a society we are physically lazy. That’s a big reason why, as a nation, we are fat. Most of the hard physical work these days is done by machinery. If you exercise enough, that can make up for a lot of dietary indiscretions. Marathon runners, for example, can eat as much as they want and still be skinny. On the other hand, if you don’t exercise your metabolism is so slow that even a small amount of food can make you fat.

We deal with a lot of clients (mostly women) who try to starve themselves thin, yet they cannot lose weight no matter how little they eat. I will say, almost without exception, that these people are eating too little and not exercising enough. Exercise increases your muscle mass, which in turn increases your metabolic rate and helps you burn fat. Eating more and exercising helps people build muscle. Muscle is the engine that burns fat. When we encounter someone who has been on a low calorie diet for a long time and just can’t lose weight (and we see this situation practically everyday) we will have them increase calories and exercise. We actually ask them to gain a pound a week for the first four weeks following our diet parameters. Chronic caloric deprivation lowers the metabolic rate as your body adapts to the reduced energy intake by reducing energy expenditure. After just one month on this program, these individuals find the fat melts off.

Dieting alone won’t work optimally, even if it is a proper diet. If you lose weight by caloric restriction alone, without exercise, up to half of the weight you lose will be muscle. This approach will also slow your metabolic rate, preventing further fat loss even on a low calorie diet. Exercise builds muscle and protects against the loss of lean mass while you shed fat. This approach maintains a high rate of metabolism, allowing continued fat loss. What about the person who refuses to exercise? You can get leaner and healthier through diet alone, but you’ll go much further and get there much faster of you include exercise in your lifestyle.

My third general concept gets back to this idea that all diets work, and all diets don’t work. Allow me to explain: any energy (calorie) deficient diet will result in weight loss. All diets, no matter how crazy or unsound, will work to produce weight...

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loss if they don’t supply enough calories to meet the body’s needs. This physiological fact-of-life contributes to the state of mass confusion. (Bad pun, sorry!) Diets fail because they produce results only as long as you remain on the diet. Once you go off the diet and eat ‘normally’, you gain the weight back. One leading obesity researcher put it like this: all diets work, it is the maintenance programs that fail. In other words, most people can starve themselves temporarily and lose weight, but are unable to maintain their reduced weight. There are two reasons for this. The whole concept of going on a severely restricted diet to lose weight is physiologically unsound and simply activates the body’s defense mechanisms against weight loss. Secondly, most people have no idea what a maintenance program is, or what to do. How about this as a concept: what if we just go on a maintenance plan at the beginning and just skip the low calorie diet?

A maintenance diet is the long-term diet that we intend to use for the rest of our lives to maintain our reduced bodyfat state. If this diet works to maintain the reduced state, it will work to produce that state. The reasons for this have to do with the thermodynamics of steady state energy and nutrient balance: which I have discussed in detail before. I devoted two or three articles to this topic about a year ago and it’s too much to repeat it all here. Check out our web site at www.parrillo.com for past articles in the Sports Nutrition Guide. Suffice it to say temporary low calorie diets backfire because they slow down your metabolic rate. You’re better off picking a program from the outset that you can tolerate for the rest of your life. You need to get enough to eat and not feel deprived. That is what the Parrillo Nutrition Program is all about.

With that as an introduction, we can now proceed to discuss some details of how fat metabolism is controlled. Once we understand my three general concepts, how to design a proper diet will be made clear. As usual, we will start with the basics and work into the details as we go.

After a meal the body has abundant carbohydrates (we’ll discuss low carb diets later) and this stimulates insulin release. Insulin in turn stimulates cells to absorb the glucose and use it for energy. Insulin exerts its greatest effects on muscle, fat, and the liver. Glucose is absorbed and used as fuel and the excess is stored as glycogen. (I’m glossing over this because we discussed it in detail in the last two months’ articles about insulin.) After the meal has been digested and absorbed and glucose has been taken-up by cells, eventually the blood sugar level starts to drop. This will result in decreased insulin levels and increased glucagon. This hormonal shift causes the liver to slowly break down the glycogen it stored from the last meal and release the glucose into the bloodstream. One of the main jobs of the liver is to maintain a relatively uniform blood-glucose level between meals. This provides a steady supply of blood sugar for the brain. Another important property of insulin is that it blocks fat breakdown and the release of fat from fat cells. Now with insulin levels decreased, the brakes are taken off of fat metabolism. An hour or two after a meal when blood glucose and insulin levels decrease, the body begins to use fat as well as glucose as a fuel source. In this state (called the post-absorptive state), after the nutrients from the last meal have been digested and absorbed, the body relies significantly on fat as a fuel source. This helps save the glucose for the brain, which cannot use fatty acids. Muscles love to use fat as fuel and will do so readily whenever insulin levels are low.

The absence of insulin allows fatty acids to be released from fat cells but this doesn’t happen automatically. Fat breakdown has to be stimulated by something. The most powerful stimulus for this is norepinephrine, a cousin to adrenaline. Norepinephrine (NE) is released from nerve endings of the sympathetic nervous system, which impinge upon the fat cells. This molecule acts as a neurotransmitter and provides the direct stimulus for fat cells to release fatty acids into the bloodstream. The fatty acids are delivered to the muscle cells where they are absorbed and used as fuel. What can we do to accelerate this process? A couple of things are obvious: One is to control insulin levels. At first you might think the best way to do that would be to eat a low carbohydrate diet. Although there are times when that is not a bad idea, usually it is not the best way to go. I’ll get back to that in a minute. The second major thing we can do is control overall caloric intake and this is much more important than insulin by itself. Things like diet composition and insulin levels are important and they seem to exert most of their effect at determining steady state body composition.

Overall body weight is determined primarily by energy balance. If you eat excess calories, you will not be able to lose fat regardless of how well you control insulin. So you have to eat the appropriate number of calories. We’ll talk more about that too. Third, we have to exercise. Exercise is the most powerful stimulus for NE release at the fat cells—at least the most potent stimulus over which we have voluntary control. We need to exercise to stimulate fat breakdown and the release of fat from adipose depots. Exercise increases our rate of energy expenditure and the utilization of fat as fuel by muscles. We are primarily talking about aerobic (cardiovascular) exercise here. The best thing you can do to increase fat loss is to eat the proper number of calories—distributed among the appropriate foods—and to exercise. Generally speaking, the more intense the exercise is the more effective it is. This applies to aerobics as well as weight training.

How many calories should we eat and how do we construct the proper diet? A pound of bodyfat contains 3,500 calories. This means you must achieve a net energy deficit of 3,500 calories to lose one pound of fat. A good goal, one that I generally recommend, is to lose one pound of fat per week. This would be an energy deficit of 3,500 calories per week, which equals 500 calories per day. Rather than reduce your caloric intake by 500 per day, a much more effective approach is to reduce your caloric intake by 250 per day (compared to what you normally eat) and
then do 250 calories worth of additional aerobic exercise, over and above what you would normally do. Together, these actions will generate a net energy deficit of 500 calories per day, promoting loss of one pound of fat per week.

Now you might say, well, I’m too lazy to go to the gym, so how about if I just decrease my caloric intake by 500 per day and don’t do any exercise? This will obviously produce the desired energy deficit, but the results will be terrible using this approach. (Although it is the most common approach to weight loss.) There are many complicated reasons for this, too much to go into the details here. Briefly, the first problem is that up to half the weight lost by simple energy restriction (without exercise) is muscle. So although you lose weight, body composition doesn’t change much, and neither does appearance. You just look like a smaller version of the same shape. We want to change our shape and appearance, not our weight per se. The second problem has to do with complex changes in hormones and enzymes and metabolism. Energy restriction will decrease your metabolic rate as your body adapts to decreased energy availability. To avoid this, do not restrict calories too severely (250 per day less than usual is enough) and exercise. Exercise offsets the decrease in metabolic rate that accompanies dieting.

I discussed diet composition last month. To review briefly, carbohydrates are a better choice than conventional dietary fat even though they are a more potent stimulus for insulin release. This has to do with the thermic effect of feeding (TEF) and the fact that carbohydrates tend to be stored in the body as glycogen, whereas dietary fat is stored as bodyfat. (Go back to the series on nutrient balance for a review.) We can still supply the bulk of our dietary energy as carbohydrate without overdoing the insulin response by using some common sense. The most obvious thing is to avoid simple sugars. Supply your carbs as complex carbohydrates. Second, combine starches with fibrous vegetables and protein. These decrease the rate of glucose entry into the bloodstream and greatly moderate the insulin response. Each meal should contain a protein source, a starch and a fibrous vegetable. If you want to reduce the carbohydrate content of the diet, reduce the starch, especially late in the day. If you need to keep the calories up, use CapTri® or increase the protein but stay away from conventional fat.

Next month we’ll get into some of the biochemical details of why this works.

References


2. For detailed information about how to construct your diet for optimal body composition, refer to the Parrillo Performance Nutrition Manual.
Controlling Bodyfat Metabolism, Part II

by John Parrillo

Last month we began our discussion about fat metabolism. We noted that the reason most people fail in their weight loss efforts is that they think dieting is a temporary change and eventually resume their old eating habits. They then gain back the lost bodyweight when they resume old diet patterns. In addition, many people will try to lose bodyweight by caloric restriction without exercising. This doesn’t work very well for a variety of reasons. In Part I of Control of Fat Metabolism, we discussed some simple concepts related to the construction and design of effective diets that maximize muscle mass while minimizing fat stores. Let’s summarize some of the key features:

The first step in designing an effective diet is to determine your current caloric intake. The easiest and best way to do this is to weigh all the food you consume for a week. Pick a week when your body weight is stable and calculate how many calories you consume in an average day by weighing everything you eat. This daily sum, derived from methodically weighing your food, is called the maintenance energy requirement and is the number of calories required to maintain current body weight and activity level. To gain quality bodyweight, increase this amount by around 250-300 calories per day. To lose weight without losing muscle, decrease your caloric intake by 250 calories (per day) below your maintenance requirement and then perform 250 calories worth of additional aerobics. Since a pound of fat contains 3500 calories, we generate a net energy (calorie) deficit of 500 calories a day, or 3500 per week. This will result in the loss of one pound of fat per week. We at Parrillo find this approach works very well.

Now that you have determined how many calories to eat, the next question is what is the best way to supply these calories to the body? This issue gets a bit complicated. In general, anyone who is working out and lifting weights (and wants to be lean and muscular) should consume at least one gram of protein per pound of body weight each day. Some people do better with two grams per pound per day, but one gram should be the minimum for a high intensity weight trainer. When you are gaining weight you will have a surplus of calories. These extra calories help “spare” protein, meaning excessive calories prevent protein from being burned as fuel. When you are losing weight you are calorie deficient and don’t have extra nutrients lying around. You are prone to lose muscle and utilize protein as a fuel source when you are losing weight. When this occurs, you lose muscle as well as fat. Therefore you need more protein when dieting than when gaining weight. It sounds paradoxical at first but there is great logic to it. A good rule of thumb would be to take in one to 1½ grams of protein per pound of body weight each day during weight gain or weight maintenance. For fat loss (not muscle loss) ingest one-and-a-half to two grams of protein per pound of bodyweight. After you have determined the caloric value of your protein requirement, allot another 5-10% of daily calories to fat. After you have determined the number of calories contributed by protein and fat, derive the rest from carbohydrates. We will explain later how to incorporate CapTri® into your diet. The Parrillo Nutrition Manual contains detailed instructions on how to do these calculations and comes with a food scale so you can control everything precisely.

Good protein sources include egg whites, fish, chicken breasts and turkey breasts with the skin removed. You will derive tremendous benefit from using our Optimized Whey™ protein powder. It has an ‘optimal’ amino acid profile, one that supports muscular growth and speeds recovery. We divide carbohydrates into two categories: starches and fibrous vegetables. Good starches include corn, peas, beans, potatoes, sweet potatoes, rice, oatmeal, and the like. Avoid refined or processed carbohydrates such as bread and pasta. And stay away from simple sugars. Good vegetables include salad greens, green beans, broccoli, spinach, carrots, and so on. Essentially, any vegetable is OK, except avocados and nuts, which are high in fat. The Parrillo Nutrition Manual contains a food composition guide that lists the best foods for our purposes: foods optimal for gaining muscle and losing fat. Respective nutrient values are included.

Our final issue concerns meal structure and pattern. We recommend each meal contain a balance of nutrients: a portion of protein, some starchy carbohydrates and a fibrous vegetable of some sort. The protein and fiber will slow down the release of glucose into the blood, thereby helping to control insulin levels. We ask that you divide your daily allotment of calories as evenly as possible into six (or more) meals, spaced evenly throughout the day. Try to eat a small, balanced meal every...
two to three hours. We find that six small meals will result in a leaner physique than the traditional three square meals. Three meals present twice as large a digestive task as six smaller meals despite equal nutritional makeup and caloric intake. Be sure and divide your protein requirements into near equal portions at each meal. You are free to choose different food items for each meal, but meals need to have approximately the same number of calories and protein. One exception to this rule of caloric balance is during pre-contest dieting when you may find it helpful to eliminate starch from your last meal of the day.

CapTri® is a very interesting compound. CapTri®, a special fat, has a different chemical structure than conventional fat. This unique structure causes CapTri® to follow a different metabolic pathway than fat and as a result, CapTri® is digested differently by the body. CapTri® is a concentrated source of calories: 8.3 calories per gram. But in contrast to regular fat, CapTri® has virtually no tendency to be stored as body fat. Instead, it is rapidly converted to ketones in the liver. These ketones are used immediately as fuel. This source of immediate energy thereby spares protein and carbohydrate and helps improve protein and glycogen retention. CapTri® can be used in two ways: to gain weight, simply add a tablespoon or two to your regular food. This will increase the caloric content of your diet, promoting weight gain. Since CapTri® has less of a tendency to be stored as body fat, these extra calories will not show up as fat. To promote fat loss we advise that you remove some starch from your diet and replace it with calorically equal amounts of CapTri®. CapTri® generates a higher thermogenic effect than carbohydrates. This means that some of the calories from CapTri® get converted to body heat, the more heat your body produces the higher the metabolic rate and energy expenditure. If more of the calories you eat are expended as energy, fewer are available to be retained as body fat, so you’ll lose more fat.

By decreasing the carbohydrate content of a diet we reduce insulin levels, further promoting fat loss. The 40-30-30 diet (protein/carb/fat) is very popular right now. This approach reduces insulin levels and promotes fat loss and is actually not a bad idea - although deriving 30% of your calories from conventional fat is in itself problematic. We at Parrillo Performance find that much better results are achieved if CapTri® is used as a fat source. This allows us to reduce carbohydrates (and therefore insulin levels) without restricting calories too severely. The Parrillo Nutrition Manual contains detailed instructions on this issue and is the single most useful muscle building and weight loss tool available. You will get far better results from your supplements if they are used in conjunction with a proper diet. Diet is the foundation to proper nutrition.

Last month I promised some discussion on the biochemistry of fat metabolism. Rather than making this a purely technical exercise, I decided to emphasize the practical aspects and how we can use this information to attain our physique goals. Let’s start with a discussion of how dietary fat is metabolized – then some explanation on how body fat is metabolized and finally some discussion on how fatty acids are used by muscle for fuel. Oil and water don’t mix. Your blood, and indeed your whole body, is mostly water. Fats and oils cannot simply float through your blood stream - because they don’t dissolve in water. Fats are carried by special protein particles made in the intestines and the liver. Most of the fat we eat is in the form of triglycerides. A triglyceride is a glycerol molecule (three-carbon alcohol) with three fatty acid molecules attached: one to each carbon atom of the glycerol backbone. In the small intestine the fatty acids are cleaved from the glycerol by an enzyme called lipase which is made in the pancreas. The fatty acids are then absorbed by the intestinal cells and re-combined with glycerol to re-form triglycerides.

It sounds crazy, but I think the problem is that native triglycerides are too big to make their way inside the cell. Next, triglycerides are combined with carrier proteins, which act like a detergent and help the fat become soluble – dissolve in the blood. These particles of triglyceride and protein are called chylomicrons and are then released into the lymphatic system. The lymphatic system is a network of vessels much like the blood vessels - except instead of carrying blood it transports fluids between tissues and ultimately dumps it into the blood stream via the thoracic duct. The thoracic duct is the body’s largest lymph channel and empties into the subclavian vein on the right side of the neck. Once chylomicrons enter the blood stream they are transported to adipose tissue and stored as body fat. After a meal, carbohydrates are the preferred energy source and fat is stored as body fat. When carbohydrate stores are depleted, the body will burn bodyfat. This is a major reason why we encourage a low fat diet. Once fat arrives at an adipose (fat) cell, an enzyme called lipoprotein lipase (LPL) cleaves off the fatty acids, which is then absorbed by the fat cell. Once inside, they are re-combined with glycerol and the triglyceride is stored for later use.

It is interesting to note that while fats are transported by the lymphatic system to the bloodstream and then to fat cells, protein and carbohydrate follow a different route. They are transported directly to the liver by a special vein that runs from the small intestine to the liver called the portal vein. The liver gets “first dibs” on protein and carbohydrate. Why? Because it has an important job to do: make proteins needed for the blood. The liver wants these amino acids first, to make sure it can do its work. The proteins that the liver makes have priorities: they are required for life and are more important (to survival) than muscle. This is why amino acids go straight to the liver instead of to muscle cells. Also, the liver wants the carbohydrate because it needs to store glycogen, which helps maintain blood glucose levels for the operation of the brain. Between meals, after blood sugar levels start to drop, the liver slowly releases glucose to keep the level relatively constant. Without this procedure, you would pass out, go into a coma and
eventually die if you went for more than a few hours without a meal. Not good. The fats bypass the liver and end up getting delivered to the fat cells for storage. It is as if the liver is saying: “I don’t need that fat, it’s just for storage.” So you can understand why we at Parrillo Performance are not fond of dietary fat. Less is better.

Another interesting thing about Cap-Tri® is that it is transported to the liver just like carbohydrate. Because of its unique molecular structure it does not require incorporation into chylomicrons for transport. Instead it is taken directly to the liver where it is broken down into small fragments called ketones which are then released into the bloodstream. These ketones are then used as fuel by muscle, helping to spare carbohydrates and amino acids. Once a fatty acid is stored by a fat cell, it just sits there. It doesn’t do anything. It waits until your carbs run low and you need some energy. Insulin blocks the release of fatty acids from fat cells. Once blood sugar levels fall and insulin declines, this inhibition is removed. You begin to use fat as energy to a significant degree. The most potent stimulus for release of fatty acids is norepinephrine (NE). This is a neurotransmitter released from the sympathetic nervous system that stimulates fat cells to release fatty acids. NE activates an enzyme called hormone sensitive lipase, which then breaks down the triglyceride and releases the fatty acids. The fatty acids are delivered by the blood to the muscles and then burned for fuel.

When a fatty acid arrives at a muscle cell, it is absorbed and has to wait inside the belly of the cell. Fatty acids are converted to energy in a sub-cellular organelle called the mitochondria. These mitochondria are like little furnaces inside the cells. In the mitochondria is where food molecules are burned to release energy. They contain enzymes that break down food molecules and combine them with oxygen to produce energy, which is then used to make ATP. (We have discussed ATP in detail before. Refer to your old issues of the press). Fatty acids are unable to enter the mitochondria by themselves. They have to be transported across the membrane by a special carrier system called the carnitine shuttle. The problem with the carnitine shuttle is it is inhibited by one of the by-products of carbohydrate metabolism. The shuttle is not very active if carbohydrates are available. This is another reason why fat metabolism proceeds at a low level until carbohydrates are extensively depleted.

You should think of body fat as energy insurance. Your body prefers to use carbohydrate as energy (Hey! – so why not feed it carbohydrates!) and will do so as long as carbs are available. Once the available carbohydrates are depleted, energy substrate utilization switches over to fat. Your stored body fat keeps things going when you run out of carbs. Lesson two: dietary fat is automatically stored as body fat - by and large. So feed your body small frequent meals, give it quality carbs and protein and limit dietary fat. It makes sense and it works. CapTri® is a different animal from regular fat and behaves completely differently. CapTri® acts like a carbohydrate and does not induce much insulin release. These properties, plus the thermogenic considerations, make CapTri® a very useful tool for anyone wanting to maximize muscle or minimize bodyfat.

References
3. For detailed information about how to construct your diet for optimal body composition, refer to the Parrillo Performance Nutrition Manual.
Most everyone knows that testosterone is one of the principle hormones responsible for muscle growth and most have also heard of cortisol. They might have some vague idea that cortisol is bad in so far as muscle growth; but few could tell you exactly what cortisol is - much less how to control it. This month I thought I would explain what cortisol is and what we can do to favorably manipulate it.

Cortisol is a steroid hormone manufactured by the adrenal glands. It is not anabolic like testosterone; to the contrary, cortisol is primarily catabolic. Before you rush off to the doctor to have your adrenal glands removed, realize that cortisol (despite the negativity attached to catabolism) is essential for human existence. One of the simplest ways to understand the diverse effects of cortisol is to look at a couple of diseases related to cortisol production. When someone is afflicted with Addison’s Disease, the body is unable to produce cortisol (1). This promptly results in hypotension (low blood pressure), shock, and eventual death. There are a variety of substances the body produces to control blood pressure and some of them work by binding to receptors on the blood vessel walls. Without cortisol these receptors become insensitive to the substances that normally bind and hypotension and death can develop. By injecting the sufferer with a shot of cortisol (or a synthetic version) this potentially deadly situation can be quickly brought under control. Without any cortisol in your system you would die within a day or two.

At the other extreme is Cushing’s Disease, a condition caused by excess cortisol (1). Cushing’s sufferers become obese and develop diabetes (cortisol causes insulin resistance) and osteoporosis. They also experience severe muscle wasting and may become so weak they are barely able to walk. Sufferers develop very tender skin and bruise easily and profusely. Edematous causes those with Cushing’s Disease to retain water and become puffy. These unfortunate people develop a characteristic body shape called the “Cushingoid habitus,” characterized by very thin arms and legs (from the muscle wasting), coupled with a large, obese abdomen and a round, puffy face. This disease can be mimicked by giving someone prednisone, a synthetic form of cortisol. This drug is used to treat rheumatoid arthritis, lupus, asthma and a variety of other inflammatory diseases. Patients who require large doses of prednisone for a prolonged time develop syndromes virtually identical to Cushing’s Disease. The bottom line on cortisol is simple: too much and you will risk muscle wasting and obesity. Not enough cortisol can also give you massive medical problems.

We need to strike a happy medium. Fortunately, as long as your adrenal glands are functioning properly, you’ll never have to worry about cortisol deprivation or excess. Your adrenal glands, in concert with other glands (and nature), automatically regulate cortisol and keep it in the appropriate range. So why am I bothering to write about this obscure subject? It turns out that exercise increases cortisol levels – and this has important implications that need to be taken into account by anyone who practices high intensity weight training. Exercise stimulates muscle growth and paradoxically also triggers the release of cortisol. When cortisol is suddenly dumped into the bloodstream it is a potentially catabolic situation. So we need to understand how cortisol works and how it is regulated so we can design a training and nutrition strategy which will allow for optimal growth - while minimizing cortisol’s catabolic effects.

So let’s begin with a brief summary of how cortisol secretion is regulated (1). The adrenal glands receive a signal to produce cortisol from an endocrine gland in the brain called the pituitary gland. This chemical signal is called ATCH and travels from the pituitary to the adrenals via the bloodstream. ATCH activates the adrenals to produce cortisol. The pituitary is in turn regulated by CRH originating in the hypothalamus. The hypothalamus and pituitary glands are part of the brain and serve to control the endocrine system. These glands coordinate the activity of the endocrine system with the nervous system. The hypothalamus releases CRH, which stimulates the pituitary to release ATCH. This stimulates the adrenal glands to release cortisol. As blood cortisol levels increase, some of it circulates back to the hypothalamus. The hypothalamus senses the cortisol concentration and determines when to shut down CRH release, which brings the cycle to a halt. When cortisol levels drop too low, or when the body faces a new stress, this again activates the hypothalamus to produce CRH and the cycle begins again. This is how cortisol is produced and regulated.

Various stimuli can cause this pathway to become up-regulated thereby increasing cortisol levels. These stimuli can include any form of stress on the body - such as injury, burns, illness, infection,
fever, starvation and exercise (1). Cortisol is a hormone whose overall function is to help the body deal with stress. Cortisol has a wide variety of actions, all of which help to regulate overall metabolism. This is why any extreme cortisol deficiency will result in metabolic and physiologic collapse and eventual death. What is cortisol’s defining actions? Cortisol has a direct effect in regulating carbohydrate, fat, and protein metabolism (1). Cortisol mobilizes the body’s energy reserves during times of stress. Cortisol acts to increase blood glucose concentration in two ways: first, through a decrease in insulin sensitivity (thus reducing storage of glucose inside cells) and second, by stimulating gluconeogenesis.

Glucogenogenesis is the production of new glucose from amino acids. Unfortunately, these particular amino acids are derived from the breakdown (catabolism) of body proteins - including muscle tissue. Cortisol stimulates muscle catabolism to free up the amino acids so they are available to be converted into glucose to use for energy. This is why excess cortisol causes muscle wasting. Cortisol’s effect on body fat varies somewhat according to the specific body region. Fat deposits exist in different parts of the body and these different regions have different hormone receptors. Cortisol tends to cause depletion of peripheral fat in the arms and legs, but increased accumulation of fat in the abdomen, back and face. Patients with excessive cortisol levels (or those on high dosages of prednisone) develop thin arms and legs due to both muscle and fat loss (through catabolism). Typically, they also develop obese abdomens.

Cortisol has a powerful effect on modulating the immune system (1). It does this by suppressing cytokine formation. Cytokines are messages exchanged between immune cells as they communicate to activate the immune response to injury, illness, or infection. Cortisol blocks the formation of these messages, greatly attenuating the immune response. This is why prednisone is so widely used to control autoimmune diseases such as rheumatoid arthritis and lupus. In these diseases the immune system is over-active and the body attacks itself. Cortisol helps control metabolism and cortisol also works to modulate the activity of the immune system. Cortisol also helps control fluid and water balance (1). The general effect is to cause more water to accumulate in the interstitial space. This is the space outside of the individual cells: the space between cells. When water accumulates between cells it is called edema: an extreme form of the puffiness and water retention – exactly what a competitive bodybuilder strives to avoid before competition.

Now that we have some background on what cortisol is, where it comes from, how it is regulated, and what it does - we can talk about what we can do to minimize it’s undesirable effects. For bodybuilding purposes we want to minimize cortisol because it promotes muscle loss, fat accumulation and water retention. Cortisol is secreted in response to stress of almost any kind. It should then come as no surprise that the first thing we should do to control cortisol is minimize body stress and maximize recovery time. For starters, get plenty of rest. Sleep deprivation has been shown to increase cortisol levels and the reintroduction of proper sleep habits reduces cortisol levels back to normal. Everyone knows either by intuition or experience that muscle growth is much harder if you don’t get enough rest. And don’t neglect the connection between cortisol and stress. Anger and stress are often interrelated: are you a “type A” personality? If so, attempt to remain as relaxed and calm as possible. Easier said than done. Remember this: every time you have an emotional outburst, lose your temper or fly into a rage, you are most likely dumping huge amounts of muscle-eating cortisol into your bloodstream. Hopefully, that thought will give you pause if you are serious about bodybuilding but emotional by nature.

Another cortisol-related factor is training. Over-training, literally doing too much training, while being under nourished and not getting enough rest results in decreased testosterone production and increased cortisol levels. This tips the balance rapidly from anabolism to catabolism. People who are chronically over-trained are continually tired, fatigued, weak and often depressed. They lose muscle, strength plummets and performance declines. If you look around the gym, the people who are not making progress are usually under-training - not over-training. Furthermore, if you compare the stagnant trainers to the one making the gains, you will observe the ones making gains are invariably training harder and longer. Before you conclude that you are over-training and reduce your exercise level, try getting some additional rest, eat more clean calories and add in some basic supplements to increase your nutrient levels. Generally these changes will promote growth without having to reduce exercise activity. In many cases, failure to grow is simply the result of inadequate caloric and nutrient intake in relation to the exercise level of the bodybuilder. Over-training is a result of doing too much exercise (volume) while being under nourished. Do not confuse volume with intensity. Successful bodybuilding is about intensity, not volume. Endurance exercise is about volume, not intensity. You should train intensely and workout for 60 to 90 minutes.

There are certain nutrition and supplementation strategies you can use to minimize the catabolic effects of cortisol. The
single most important and effective of the cortisol-suppressing nutritional techniques is a low-tech solution. Probably the most effective thing you can do to minimize cortisol release is to simply eat something every two to three hours. Caloric deprivation has been shown to cause a significant increase in cortisol levels (3). A small meal every two to three hours (or so) is a great way to keep cortisol excursions to a minimum. The ideal cortisol suppressing meal would contain a complex carbohydrate and some protein. Carbohydrate ingestion in particular seems to reduce cortisol levels. It is also important to eat some protein at each meal as protein slows the release of carbohydrates and provides a constant supply of amino acids to facilitate muscle growth. Most people find it difficult to eat six complete meals a day and rely on nutritional supplements for two or three of these many meals. If you are looking for a supplemental meal replacement try our with Pro-Carb™. This novel approach allows you to customize and adjust your ratio of protein-to-carbohydrates to suit your personal goals.

Frequent caloric intake (particularly carbohydrates) seems to be the most important nutritional intervention tactic we can use to reduce cortisol levels. In addition, vitamin supplementation may be helpful. In particular, the antioxidant vitamins E and C seem to reduce the oxidative stress of exercise and therefore reduce catabolism. Most bodybuilders who follow our nutritional guidelines don’t eat fruit (since fruit sugar is preferentially converted into fat) and therefore vitamin supplementation becomes an even better idea. Glutamine and the branched chain amino acids - leucine, isoleucine, and valine - may not affect cortisol levels directly, but are very effective at shifting the anabolism-catabolism balance more towards the anabolic side. These amino acids seem to have a powerful effect in stimulating protein synthesis. Glutamine has been shown to increase glycogen storage as well as increase growth hormone levels (3,4). Our protein products (Optimized Whey™, Hi-Protein™, 50-50 Plus™) all have high amounts of amino acids mixed into a well-balanced protein base.

Recent research suggests that a special lipid called phosphatidylserine (PS) may decrease the exercise-induced cortisol significantly (5,6). We’ll keep you posted on this development. In summary: to help minimize the catabolic effects of cortisol you should get plenty of rest, minimize stress in your life and avoid over-training. You should eat small, frequent meals, containing both carbohydrates and protein. Your protein choices should contain high levels of glutamine and the BCAAs. Try to eat every three hours if possible. Three conventional meals per day, combined with three servings of 50-50 Plus™ or your own Pro Carb™/Hi-Protein™ or Optimized Whey™ concoction will assure that you are obtaining adequate protein intake and obtaining high levels of glutamine. By applying and following a few common sense diet and exercise guidelines, we can minimize the catabolic effects of cortisol. Just remember to stay cool calm and collected the next time the boss or your kids do something that makes you angry. By subduing stress, getting plenty of rest, adequate nutrients and exercising hard and intensely, cortisol-related muscle wasting can be a non-event in your bodybuilding career.

References


Workout recovery is a very important issue for the serious athlete. There is some confusion about what is the best nutritional strategy to optimize recovery and growth after exercise. As is the case with many issues in nutrition, there is no single best answer. The best approach depends on what kind of athlete you are and what your goals are. There are some common questions we at Parrillo Performance receive relate to the role of carbohydrates in the post-exercise environment. We are often asked: should my post-exercise meal include protein or carbohydrate? Or both? And just how much is enough? Is timing important? When is the best time to take Creatine? Optimal nutrition for a bodybuilder is different from that for an endurance athlete. Optimal nutrition varies individual to individual and circumstance to circumstance. Are you trying to optimize your physique strength or endurance performance? Different goals require different methods. So when you hear conflicting opinions about the best diet or supplement, remember there is no single correct answer. We have to tailor the answer for each individual I will share with you the principles that will allow you to customize your very own diet and nutritional supplementation program.

For some background let’s re-hash some biochemistry. During exercise your muscles use mainly carbohydrate and fat as fuel. Sometimes, during prolonged activity (like distance running) you will burn protein stores. Protein oxidation in exercise occurs after glycogen stores are significantly depleted. For high intensity activity such as weight lifting (as opposed to long duration exercise like aerobics), carbohydrate is the primary fuel. For endurance activities like jogging or cycling, a mixture of carbohydrate and fat is used. As the exercise proceeds, muscle and liver glycogen stores become progressively depleted. It would make sense to replace the depleted fuel in order to keep our work output high. Furthermore, if our goal is to gain muscle then we need to supply the raw materials to support growth. We can do both simultaneously.

Insulin levels decrease markedly during exercise and this allows the release of fat from adipose cells. The goal of our post-exercise recovery meal is to replenish energy stores depleted during the just-completed session. Insulin plays a central role in nutrient storage, acting to transport carbohydrates and some amino acids from the bloodstream to the individual cells. Insulin also stimulates the storage of carbohydrate as glycogen. Significantly, carbohydrate is a potent stimulus for insulin release while protein’s effect on insulin is far more subdued. Athletes have long practiced eating a high carbohydrate meal after exercise and this makes a lot of sense. A high carb post-workout feeding serves to increase insulin levels and replenish glycogen stores. And this is a good thing: by replenishing drained nutrients and dousing exhausted muscles with nourishing carbohydrates, we promote muscle healing and growth in the post-workout state.

Should this post-workout feeding also contain protein? And exactly how much carbohydrate and protein is optimal? What type? Are simple sugars or refined carbohydrates better in the post-workout environment?

I never recommend eating simple sugars or referred carbohydrates - post workout or any other time - for several reasons: simple sugars and refined carbohydrates are far more likely to be converted to fat than complex carbohydrates. It’s all a matter of chemistry. If the sugar enters your bloodstream faster than it can be stored as glycogen, the excess will be converted to fat by the liver. No doubt about it! Some endurance athletes replenish glycogen with simple sugars or refined carbohydrate but this strategy is bad news for bodybuilders. A serious bodybuilder wants to minimize fat accumulation and therefore simple sugars and refined carbohydrates have no place in the diet of a top bodybuilder - even after a workout.

Every meal should supply a mixture of protein and carbohydrate, including the post-exercise meal. In addition to replenishing glycogen stores, the post-exercise meal serves to re-supply amino acids used to repair muscle tissue. Several medical studies have examined how the composition of the recovery meal affects hormone levels critical for muscle growth (1-3). I have reviewed some of these studies in detail in the August, 1997 edition of the Parrillo Performance Press: you can access this data through our online web-site at www.parrillo.com/press/970804.htm. A post-workout feeding of carbohydrate and protein is demonstrably more effective at increasing insulin and growth hormone

The Parrillo Energy Bars are a conventional way to get quality calories in after a workout.

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levels than ingesting carbohydrate alone. This translates into a far more potent anabolic stimulus, resulting in greater muscle accrual. Also, this combination is more effective at replenishing glycogen stores than carbohydrate alone (3). Since the goal is to heal and build muscle, the optimal recovery meal should contain a mixture of protein and carbohydrate.

How much carb and protein per post-workout feeding is optimal? The answer is not precise - and may never be. It varies depending on your goals and bodyweight. If you want to gain size the post-workout meal should contain more calories than if you are desirous of losing bodyfat. In previous articles I have explained at length how to determine the proper number of calories to consume to effect muscle gains or fat loss. After you determine your caloric breakeven point, divide your daily allotment of calories into five or six meals, each containing approximately the same number of calories. One of these meals should be your post-workout meal. Theoretically, your post-workout meal should actually be your biggest meal of the day. Why? The body is more efficient at oxidizing food in the post-workout state. If you are seeking to add quality muscle size, I suggest calculating how many calories each meal should contain on average and make the recovery meal one-and-a-half times the average meal calorie total. Conversely, if you are trying to lose weight, then the post-workout meal should contain the same caloric content as the other meals.

Through scientific research and years of working with the world’s top bodybuilders, I have found that a mixture of about 50% protein and 50% carbohydrates is ideal for a post-workout feeding. This is the rationale and basis for our 50-50 Plus Powder™, which is the ideal post-workout recovery drink. Many people rely on supplements after working out because few are hungry for solid food immediately after exercise. Our nutrition Bars are another easy way to get quality calories in after a workout - and convenient also. They are available in several different protein-carbohydrate ratios to suit your individual needs. Timing is important: the sooner you eat after a high intensity training session the better off you will be.

There exists a “window of nutritional opportunity” that opens immediately after exercise during which glycogen re-synthesis rates are maximal. This window stays open for roughly two hours after the cessation of exercise (6). Considering that it takes some time for the nutrients to be digested and absorbed, I would suggest you eat your recovery meal as soon as you can after exercise, to take advantage of the open window before it snaps shut. This is another reason why supplements are ideal as post-exercise meals. They are easy to prepare and quickly absorbed. A shaker bottle with four to six scoops of 50-50 Plus Powder™, placed in your gym bag makes an ideal post workout recovery drink. In edition to the 50/50 Plus Powder™ it is imperative you get a meal within 2 hours of completion of your workout. Next month we can talk in more detail about carbohydrate metabolism during exercise and go into carbohydrate and fluid repletion during exercise.

50/50 Plus Power™ provides your body with the protein & carbohydrates it needs to recover from your workouts.

References


Last month we talked about some general concepts relating to carbohydrates and how they can influence exercise performance and recovery. First, a few words about what not to do: stay away from sugars found in fruit and table sugar. Specifically fructose and sucrose. Fructose is a monosaccharide, a simple sugar, and is found in fruit and fruit juice. Sucrose is table sugar, a disaccharide: a molecule formed when two sugar molecules are linked together, glucose and fructose. Sucrose is half fructose and you should keep that in mind. I received a question (prompting me to write these last two articles) about the popular notion of consuming a high sugar meal or feeding immediately after exercise to purposefully stimulate an insulin release. Which would, theoretically, replenish depleted glycogen stores quickly and speed-up the recovery process. This idea has become increasingly popular over the last year or two among serious weight trainers. The thinking goes, since insulin also increases Creatine absorption, why not use sugar in combination with Creatine Monohydrate after the exercise session to help boost intramuscular creatine levels? We at Parrillo Performance feel this is a bad idea with potential problems galore. Besides, we have a better ‘vehicle’ to help you upload your Creatine as fast or faster than the ever-popular grape juice/ Creatine cocktail so popular among top bodybuilders.

Why is eating fruit and drinking fruit juice a bad nutritional idea? First and foremost: both are loaded with sugar and sugar is easily converted to fat. Complex carbohydrates, on the other hand, are an excellent source of energy (if you can master the timing) and are near impossible to convert into body fat if taken moderately. Certain types of complex carbs will do the job of sugar without the negative side effects. When you refill depleted glycogen there is a limit as to how fast you can replenish and store glycogen. If you use sugar to replenish, you risk ‘spillover’: the sugar enters your system faster than it can be utilized and the excess is converted into body fat. Fructose has certain properties that are undesirable for athletes and athletes. Most sport nutrition bars contain fructose or high fructose corn syrup as the first listed (main) ingredient. Fructose is favored because it makes bland ingredients tasty. And good taste sells while bad taste generates few if any sales and zero repeat business. Fructose is great for making a bar taste sweet but bad for your bodyfat percentage. So beware and read labels carefully.

Fructose has a molecular structure that allows it to bypass one of the key regulatory enzymes in glycolysis, the breakdown pathway of sugar metabolism. This enzyme, phosphofructokinase (PFK) directs sugars either to be stored as glycogen or degraded and converted to energy. The problems begin when sugar is degraded too fast and exceeds the energy needs of the cell. Sugar that bypasses PFK is not stored as glycogen and is preferentially converted into fat by the liver. It exits the liver - not as carbohydrate but as triglyceride (fat) - and is stored in fat cells. Bottom line: fructose is mostly converted to fat and then stored as fat. So that is why we suggest you avoid fruit and especially fruit juice. They contain sugar and sugar consumption will make you fat.

Fat and glycogen, the storage form of carbohydrate in the body, are the primary fuels for exercise. The relative contribution that each makes, depends on: substrate availability, exercise intensity, exercise duration and the level of athletic conditioning. In extremely light and mild exercise, walking for example, fat serves as a primary energy source. As exercise intensity increases more of the energy demand is supplied by carbohydrate sources. Keep in mind that in an intense aerobic exercise, such as running or stair climbing, fat continues to serve as an important fuel source. Even though a higher percentage of the calories burned during walking come from fat, you will burn more grams of body fat per hour doing intense exercise. If you want to get lean in a quick, efficient fashion, approach your aerobic exercise seriously and intensely. Mall walking does not make you lean - although it’s better than no aerobic activity at all. Intensity is the key to productive exercise, whether in weight lifting or aerobics. A further benefit of intense aerobics is that it stimulates mitochondrial proliferation within a muscle. The more of these miniature cellular blast furnaces you possess, the quicker and more efficiently you will oxidize fat, even at lower exercise intensities. When we exercise intensely over a protracted period of time, mitochondria will multiply. The more mitochondria per square inch of muscle tissue you have the more efficiently you can burn fat for energy.
Fat utilization requires oxygen. There is no such thing as anaerobic fat metabolism. As exercise intensity increases, the rate of oxygen delivery to the muscle will become a limiting factor. At some point, no matter how well conditioned, you will reach a point where fat can not be metabolized rapidly enough to meet the immediate energy demands of the cell. Then carbohydrates become the second fuel source. At lower exercise intensities, say 65% of VO2 maximum; fatigue is usually determined by depletion of glycogen stores. At higher exercise intensity, say 90% of VO2 maximum, muscle fatigue occurs before glycogen depletion occurs. Fatigue is then determined by the accumulation of anaerobic waste products (such as lactic acid) and by the depletion of the high-energy phosphate pool. Intense exercise (such as weight lifting) is almost exclusively fueled by carbohydrates simply because fats cannot be oxidized fast enough to supply the required level of energy production. Carbohydrates can be metabolized anaerobically. This allows for very quick bursts of high energy that are short-lived but maximally intense. A weight lifting set lasts a few seconds, maybe a minute, rarely longer. You deplete ATP and creatine phosphate stores when you lift and you deplete them quickly. At that point the anaerobic carbohydrate metabolism kicks in. It too, is limited: within one or two minutes it also fails.

To maximize carbohydrate energy during a workout, it is advisable to have a pre-workout feeding. Take into account that liver glycogen stores are depleted during sleep and this can limit glucose availability during exercise. This can negatively affect exercise performance done first thing in the morning. It is advised to eat something before exercise. How much, what, and when are important questions and we have some excellent nutritional solutions. Studies have demonstrated an improvement in exercise performance by ingesting a glucose polymer solution (contained in our Pro-Carb or 50-50 Plus Formula) or a sport nutrition bar with glucose polymer (as in the Parrillo Sport Nutrition Bar) anywhere from 5-60 minutes prior to exercise.

One study fed participants a liquid formula supplying 45 grams of carbohydrates five minutes before exercise. The test participants demonstrated a 10% improvement in performance. Another study supplied athletes between 1.1 to 2.2 grams of carbohydrates per kilogram of body weight, in a liquid formula. They were fed this carb mixture a full sixty minutes before the exercise period and on average experienced a 12.5% increase in performance. This increase in performance can be attributed to greater carbohydrate availability during exercise. Bodybuilders do aerobic exercise for very different reasons than endurance athletes who perform this type of training. Endurance athletes are interested in maximizing cardio capacity and improving speed and performance. Bodybuilders perform aerobic training to burn fat not to improve their endurance. To maximize endurance, you want to maximize glycogen stores in order to maintain glucose availability. However, in order to maximize fat burning we need to perform aerobic exercise under conditions of glycogen depletion. This forces the body to rely on fat as a prime fuel source. Sure, this will compromise our aerobic performance a bit, but the goal is fat burning, not improving our 5k time. This is why I suggest doing your aerobics first thing in the morning before breakfast, when glycogen stores are relatively depleted.

I invented 50-50 Plus to fill a need: athletes demanded an easy way to ingest performance enhancing pre-workout and post-workout supplements. 50-50 Plus covers all the nutritional bases: it provides a perfect blending of slow-release carbohydrates to top off glycogen tanks and provides the same quick energy blast that fruit juices provide without the fatty side effects. In addition, 50-50 Plus provides anti-catabolic, high biological value protein which speeds up the recovery process and provides muscle-building protein for post-workout trauma. Is there a better post-workout food or supplement on the face of the planet? If there is, someone please contact us immediately. We at Parrillo Performance cater to the nutritional needs of some of the top athletes in the world. People who need to recover from their body-shocking workouts quickly and completely – so they can subject themselves to another muscle-building, fat-stripping workout session. String a few dozen high intensity workouts together and suddenly a person is making real physical progress. So much hinges on whether the bodybuilder has the energy for the workout and the nutrients necessary to stimulate recovery after the workout.

Now, by taking a few scoops of 50-50 Plus both before and after a grueling exercise session, you can stimulate your progress by ensuring that you have all those important nutritional bases covered. Instead of grape juice, upload your Creatine with 50-50 Plus. We engineer supplemental carbohydrates for optimal performance, so take advantage of these fabulous products that magnify the benefit you derive from your hard, intense workouts. Oh, and don’t forget to eat a well-rounded ‘Parrillo Meal’ (high protein, low fat, a fiber carb, a starchy carb) upon completion, but no longer than two to three hours after a killer workout. I preach that there is no such thing as over training only under eating. Just make sure your eating is clean and nutritious. Follow these few tips and watch your progress gather ever-increasing momentum. Let’s get serious and start supplementing with 50-50 Plus after every single workout!

For additional reference see Liebman and Wilkinson’s, Carbohydrate metabolism and exercise. Chapter 2 in Nutrition in Sport and Exercise, Wolinsky and Hickson, editors. CRC Press, Boca Raton, 1994. This is an excellent resource text.
What role does counting calories have in the Parrillo Nutrition Program? Is it necessary? Do I need bother counting calories if I get enough quality protein and carbohydrates and keep my fat intake low? The answer is unequivocal and absolute: yes, you need to count calories. Calorie counting, in its own way, is as important as knowing how much weight you have on a barbell during a set. Is it really necessary to pay attention to sets, reps and intensity? Of course it is, and counting calories is a definitive nutritional benchmark and an important guide for the serious bodybuilder. Caloric miscalculation is probably the single most common nutritional mistake that people make. I talk every day with aspiring bodybuilders who train hard and correctly yet struggle to put on a few pounds of muscle. After a few questions regarding their diet habits, typically I discover that they are underfed. Food has an anabolic effect and underfed bodybuilders often make great gains when they wise up and eat a little more. Weight training is the stimulus that causes muscle growth and the raw material to build new tissue comes from food. If you’re eating barely enough to sustain your present bodyweight and activity level you’ll have very little left over to build new tissue. And that is the great dilemma of leaning out.

On the other side of the coin, if your goal is to lose body fat you need to burn more calories than you consume in order to achieve a net energy (calorie) deficit. How can you strike the delicate balance and lose fat while retaining hard-earned muscle? Consistently, day in and day out, you must pay attention to how many calories you consume. Calories matter. There are three general principles behind the Parrillo Program: consistency, dedication and hard work. That is what we ask you to supply. We provide the rest. We provide the program, the formula and the road map for your success. If you follow our program you will see fantastic results. How can I say that with such unflinching confidence? Our program is not based on guesswork or random chance or happy, wishful thinking, but rather on refined scientific principles and careful control. Our approach is a rigorous, structured, controlled approach and has been proven to work, over and over again. You might wonder how one program could work successfully for everyone. There are huge differences between people’s physiques and varying degrees of fitness, and common sense would indicate that everyone needs a different game plan. This is true. We teach you how to modify and adjust the basic elements of the Parrillo Performance Program to suit your individual goals and body type.

Exactly how many calories you should ingest depends upon your basal (baseline) metabolic rate and the amount of calories you expend in daily activities. Muscular people have a high metabolic rate in terms of their rate of energy expenditure. Why? Muscle is an active tissue that requires a lot of energy (calories) to fuel and sustain its activity. Active people require a lot more calories than their inactive contemporaries do. I bet you didn’t need Colombo to figure that one out! Serious athletes need a lot more calories than the average couch potato. A shortcoming of many current caloric calculation methods is that they fail to distinguish between the caloric requirements of men and women, who differ drastically due to differences in lean body mass. A 250-pound bodybuilder will have a greater caloric requirement than a 250-pound obese individual, even though they weigh the same. A pound of muscle burns a lot more calories than a pound of fat.

A more precise and sophisticated method is known as the Harris-Benedict equation, the exact details of which are not necessary to discuss because I’m about to teach you a better way. The HB equation takes into account gender differences and takes into consideration body fat percentage, though crudely in my opinion. Harris-Benedict is routinely used to estimate energy needs of hospital patients. There is another hi-tech technique that can actually measure a person’s rate of energy expenditure: calorimetry. This is a fairly accurate method for determining a person’s resting energy expenditure. However, it fails to take into account differences in activity level and caloric expenditure during exercise and therefore calorimetry is not especially useful for our purposes.
Counting Calories

The best approach for our purposes is a homespun method that depends on some trial and error. To determine your rate of total daily energy expenditure you will need a food scale and a nutrition composition guide, both of which are included in the Parrillo Performance Nutrition Program™. Here’s how it works: Stay on your usual diet and continue your usual activity level and exercise pattern for one week. Count every calorie you eat everyday for a full week while maintaining your normal lifestyle. Check your bodyweight first thing in the morning. If you gain weight from one day to the next, you are in a caloric surplus. If you lose weight you are in a caloric deficit. Liquid intake needs to remain stable during our experimental period as fluid excess or deprivation can radically influence bodyweight from one day to the next. Women should not try our seven-day experiment when menstruating. If your weight remains constant the number of calories you are consuming equals the number of calories you are burning. This allows you to determine baseline energy requirements – calories needed to maintain your current body weight.

This is an incredibly useful number to know. Calories occupy a central planning position in our nutrition program. If you don’t know how many calories you consume you won’t know what to do. If you don’t know how many calories you’re eating you’re working in the dark, guessing, hoping to gain or lose, but having no scientific basis to control the outcome. Calorie counting takes considerable effort, especially at the beginning. After a few weeks it will become second nature and you will find that you have memorized the nutritional composition of your favorite foods. Soon you will be able to prepare precisely constructed meals with carefully controlled nutrient composition. You will find building muscle and stripping fat works far better when you use natural, whole, unrefined foods. These foods are healthier and easier to control. When you eat out, ask that your food be prepared without oil, grease or butter.

Once you have determined your baseline caloric requirement it becomes much easier to control what happens to your physique. The fast track way to determine your calories needed to gain or lose at your desired rate is to pick a number (an educated guess) as to how many calories you think you need per day and just adjust your calories until your desired goals (either gaining a pound per week or losing a pound per week) are met. To gain quality bodyweight increase your caloric intake by 300-500 calories a day above your baseline requirement. This should add to a weight gain of one pound per week, if not adjust your calories accordingly. This will provide the extra nutrients and energy that your body needs to build new muscle tissue. If you eat according to the Parrillo Nutrition Program and train hard and do aerobics, little of the weight you gain will be fat. Your body can only build muscle so fast and if you increase calories too quickly the excess will be stored as fat. To lose weight (fat) we want to aim for a loss of around one pound of fat per week. It is certainly possibly to lose fat faster but the faster you lose the greater the risk of losing muscle at the same time. The fastest I would advise is two pounds per week. A pound of body fat contains 3,500 calories. To lose a pound a week we need to create a net calorie deficit of 3,500 calories a week or 500 (7 x 500 = 3,500) calories a day. Time and again, I have seen that the most effective stimulus for fat loss is a combination of a modest energy reduction (food intake) combined with an increased level of high intensity aerobic exercise. I would suggest you reduce caloric intake by 250 calories per day (below your baseline requirement) and perform aerobic exercise that burns 250 calories.

I find this approach is twice as effective as classical caloric restriction. You could achieve the target net energy deficit by simply reducing your caloric intake by 500 calories a day below your maintenance requirement - but this has drawbacks. Despite its mathematical equivalency, depleting 500 calories a day will eventually lower your baseline metabolic rate and decrease your rate of energy expenditure. You will lose fat much more slowly. Better to reduce by only 250 and increase your exercise activity to expend the additional calories. Experience has proven over and over that this approach stimulates rapid fat loss while retaining gym muscle. Caloric consumption is extremely important and a key determinant in weight gain or weight loss. To ignore the calorie factor is to throw away one of your most important control elements. Conversely, by using this information intelligently you can control with great exactitude the whole process of muscle gain and fat loss. This is the same methodology used by top professional bodybuilders to dial in their physiques.

For additional reading and more detailed information on the specifics of diet construction refer to the Parrillo Performance Nutrition Program™ and purchase the Parrillo BodyStat Kit™. The book describes in detail which foods to eat, which foods to avoid, how to construct a diet, how to structure a meal and how to adjust things to keep your body composition moving in the right direction. The BodyStat Kit is the report card tool, able to tell you your percentage of fat-to-muscle. Good luck and don’t forget to count those calories!
Rut Blasters: The How and Why of Target Amino Acid Supplementation

by John Parrillo

Amino acid supplementation can push your physique up to the next level of development assuming you have a quality product and a proper understanding of usage, timing and dosage. Different amino combinations produce differing results and are highly effective if used correctly. Most Parrillo supplements are what might be termed ‘core’ products, because they are used daily by serious bodybuilders; possess a high name recognition and their use and purpose is widely known. Creatine, protein, carb powder, sports nutrition bars, vitamins and minerals make up our core group of well-known products. There is a second group of Parrillo supplements, a little less known yet just as effective. We currently offer four amino acid supplements: Ultimate Amino, Liver Amino, Advanced GH and Muscle Amino. Each is designed with specific formulation for a specific purpose (or series of purposes) using specific amino groupings to stimulate results. Used correctly, target amino supplementation can blast you out of whatever rut you find yourself currently in. But the Devil, as they say, is in the details.

First and foremost: obtain the bulk of your nutritional needs from plain, wholesome food. They are called nutritional supplements are not nutritional replacements and our products should be used in addition to regular food, not instead of it. Your most important nutritional purchases happen at the grocery store, not the local Health Food Store. It has long been my contention that food is the cornerstone of proper nutrition. Whole foods are the foundation of bodybuilding nutrition and if you’re not dieting right your supplements won’t make up for bad eating habits. Initially, concentrate on food content and meal timing and then add on lots of heavy lifting and high intensity aerobics to complete the solid nutritional and training foundation. I’m not going to go into deep detail on our philosophy of food. We have a multi-dimensional approach based upon science and empirical knowledge gained preparing the world’s top pro bodybuilders. We have in the past devoted article after article on food selection and will continue to do so in the future.

On a related note: In my estimation, the single most valuable nutritional product we offer is not a supplement but rather the Parrillo Nutrition Manual. Why? Knowledge is power and never was this statement truer than as it applies to bodybuilding. The nutrition manual has turned average bodybuilders into physique champions and as a system has many famous proponents. Come look at the incredible number of signed endorsements from the great champions of past and present hanging in our Hall of Champions at Parrillo HQ. Do you have a copy of the Manual? Why not dial up our 800-number right now and obtain a copy? Maybe it will change your life as it has innumerable others – But I digress.

Eat 5-8 times a day using clean foods (low fat and sugar) in proper balance and combination. When is the optimal time to supplement? After your basic diet is in place and operational. Layer on top of a good eating program one or more of the core Parrillo nutritional supplements: Optimized Whey, Hi-Protein Powder, Energy Sport Nutrition Bars, High Protein Bars, 50-50 Plus, Pro-Carb, CapTri. Creatine is another ‘must’ supplement as are Essential Vitamin Formula and our Mineral-Electrolyte tabs. Both are required to round out the ‘basic game plan.’ Step two involves integrating the core products with the base diet. There is yet another level to the Parrillo nutritional supplementation program and it is subtle and precise. Sports supplements are designed to enhance performance, add muscle and improve body fat composition. In bodybuilding competition winning or losing is determined by small differences. Amino acid products each with a different purpose and formulation. Taken correctly, these products will give you the physical and competitive edge.

**MUSCLE AMINO FORMULA**

This amino grouping provides you with Leucine, Isoleucine, and Valine, the three branched-chain amino acids (BCAAs). The time to use this product is immediately before and after training. Hard dieting is a great time to supplement with branch-chain amino acids. During times of energy insufficiency (dieting) your body will actually break down its own muscle to use as fuel if no other is available. Catabolism is a dreadful metabolic state that occurs when glycogen stores have been depleted and fat oxidation has maximized. Metabolically, your body requires a certain level of glucose (blood sugar) to be maintained in order for the
brain to function. While body fat provides a long-lasting energy supply, fat cannot be converted into carbohydrate by the human body. But protein (amino acids) can. Under adverse conditions, carbohydrates are exhausted and your body breaks down protein stores (muscle tissue) to convert into carbohydrate to supply energy. Branched Chain Amino Acids are effective because they form a substrate for growth and are metabolized as fuel directly within muscle cells. A handful of Muscle Amino Formula™ capsules will help prevent the onset of catabolism (1-4) and has both anabolic and anti-catabolic properties. Hi-Protein and Optimized Whey are fortified with extra BCAAs for just this reason. We suggest two or more with every meal. Remember that BCAAs require insulin for absorption into muscle cells so take them with food (carbs) rather than on an empty stomach!

ULTIMATE AMINO FORMULA

Think of an amino acid as the filet cut of the protein molecule, the essential essence. Ultimate Amino is a scientifically balanced profile of 17 free-form amino acids and is specifically designed to supply the base building blocks necessary for muscle growth. Ultimate Amino Formula™ includes a complete profile of all twelve “essential” amino acids, which are those that the body cannot manufacture itself (3,4). Some amino acids are convertible into other aminos and therefore if you have a deficiency in one amino your body can correct the balance, if all the corrective elements are present. There are some amino acids that your body cannot make on its own and these have to be supplied by the diet (1-5). Ultimate Amino Formula™ insures that all the essential amino acids are supplied in the proper ratio and there will be no missing links in the amino profile chain. This is our best all-round amino acid product, complete unto itself. If you have money enough for only one amino product, this might be the one for you. We suggest two or more capsules be taken with each meal and make sure to take Ultimate Amino Formula™ with a starchy or fibrous carbohydrate as specified in the Parrillo Performance Nutritional Manual.

LIVER AMINO FORMULA

An oldie but a goody. Bodybuilders since the heyday of Steve Reeves and Clancy Ross back in the 1950’s have known all about the muscle-building properties of beef liver condensed into tablet form. A steady stream of Liver Aminos will help keep the body in positive nitrogen balance. Concentrated protein is stuffed into a potent tablet and each Liver Amino Formula supplies 1.5 grams of pure beef liver. Among the various cuts of meat, organ meat contains the highest concentration of protein, far exceeding the amino density of other beef cuts. But how many people can stomach a steady diet of liver and onions or sweetbreads (brains)? Parrillo Performance has engineered a liver formulation that is a tremendously concentrated source of amino acids. Our unique product provides high quality amino acids plus heme iron from purified, de-fatted liver extract. Anemia, a low red blood cell count, is surprisingly common among athletes, particularly women who suffer from iron deficiency anemia. Serious athletes often suffer from “sports anemia” which is primarily the result of the cortisol secretions and the catabolic demands of extensive and intense exercise (6-9). To make hemoglobin you need iron and to make red blood cells you need protein. If you are deficient in either, anemia can result.

Most iron supplements provide metallic iron in the form of ferrous sulfate. This sulfate is absorbed poorly by the body, perhaps 10% at best. When iron is obtained from a biological source it is already incorporated into heme, a building block of hemoglobin. Heme iron is absorbed through the intestine far more efficiently then ferrous sulfate. Liver Amino Formulation contains expensive heme iron and is combined with amino acids - plus a complete array of B vitamins. Competitive endurance athletes are in need of hemoglobin to deliver oxygen to muscles and should gobble these potent tablets eagerly. For many endurance athletes, especially women, Liver Amino Formula™ is a ‘must’ supplement. We recommend 5-8 tablets with each meal depending on your bodyweight. Take a handful at bedtime to forestall the catabolic effects of the fast period we call sleep. This is our most economical amino formulation. Arnold used to eat up to 100 liver tablets a day in his competitive days and he was a man never known to make a foolish move.
ENHANCED GH FORMULA

Is there a natural way to stimulate the release of growth hormone in the body? Several prominent studies indicate that this is a distinct possibility. Amino acids, two in particular, have shown great promise. Arginine pyroglutamate and lysine monohydrochloride have been shown to increase the natural release of growth hormone in scientific studies (10-14). The idea is to douse the body with Arginine and lysine (particularly before sleep) and allow this specific combination to work its magic. Growth hormone increases lean muscle mass by increasing protein synthesis and by stimulating nitrogen retention. GH increases the utilization of fat for energy and has fabulous muscle-sparing characteristics. Growth hormone is generally considered the most anabolic of all hormones and has been shown to alter body composition by increasing lean mass while simultaneously decreasing body fat. I suggest taking 2-3 capsules on an empty stomach first thing out of bed in the morning and again the last thing at night before sleep. If possible, Enhanced GH should be taken when the stomach is empty.

References


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Eating For Muscle
by John Parrillo

Have you noticed how people in the gym where you train don’t make much progress? The reasons are not all that complicated, either they are not training right or they are not eating right. It doesn’t take magic or a miracle to build muscle but it does take correct training and eating. We could argue for years about how many sets and reps or how much weight to use or if you should do your inclines at 30 degrees or 40 degrees, but the bottom line on training is to train hard every time. While there is a science to it, the basics are simple, train real hard, use a variety of exercises, sets and reps. Most Parrillo Press readers are people who understand this idea and do a fair job of it. Don’t worry so much about over-training as more often than not people under-train, they do not work hard enough or long enough to stimulate growth. Concern yourself with training harder, not training less. And concern yourself with improving your recovery rather than cutting back on amount of exercise. The problems associated with muscle growth often relate to improper eating, the kind that is insufficient to support recovery and growth. Folks tend to not eat right and not eat enough. At Parrillo Performance we have dedicated the last two decades to developing and refining the art and science of performance eating.

I typically work with people who need to eat more and when they do they suddenly make great gains. They discover they are not the ‘hard gainers’ they thought they were after all. You can’t gain muscle without eating enough calories to support growth. Start by cleaning up your diet. People typically take in more calories than they expend and because they are relatively sedentary they store excess calories as bodyfat. Weed out saturated fat first and foremost then crank back on the refined carbs and sugar but replace these lost calories with ‘clean’ calories. To gain quality muscle you need to train like a madman and consume more calories than you expend. The issue is what should we eat to supply those calories and does it make a difference? Fat should be limited to 5-10% of our diet and when you do this will knock a lot of calories out of your diet. Fat is used to supply energy but cannot be converted to muscle or per pound of body weight daily. A 200-pound bodybuilder would intake 300-grams each day to achieve a 1:1 protein to pounds ratio. Good food sources for lean protein include skinless chicken breast, skinless turkey breast, egg whites, and fish. Most bodybuilders find it impossible to eat as much protein as they need and use a protein supplement. Our Hi-Protein Powder™ and Optimized Whey Protein™ are excellent protein product with two scoops of Optimized Whey™ providing 33 grams of the finest quality protein on the market and a superb profile of essential amino acids, with only four carb grams and zero fat.

To get started, eat three meals daily and drink a protein shake one to three times a day, in between meals. Is there a better way to intake muscle-building protein? Your carbohydrate foods should include both starchy and fibrous carbohydrates. High quality starches include potatoes, rice, corn, and beans. Fibrous vegetables include salad greens, broccoli, green beans, and so on. Fiber and protein are the constants of the Parrillo approach to performance eating. Starch is modulated up or down to trigger muscle gain (bulking) or fat loss (cutting). The Parrillo Performance Nutrition Manual goes into exhaustive detail explaining which foods to eat and how to combine them appropriately at meals. Meal frequency is a hugely important component of our performance eating philosophy. It works best to eat frequently so your muscles will always have a ready supply of nutrients to support growth. Try eating five or six meals a day. Each solid food meal should include a protein source, a starch and a fiber.

If you’re wondering how to include a good fiber source with breakfast, try oatmeal. While primarily a starch, it also supplies a lot of fiber and is perfectly acceptable for the serious performance eater. Bodybuilders, in my experience, eat more oatmeal than any other identifiable
group. Supplements are a very effective way to support growth. We offer a wide variety of products and choosing among them is sometimes perplexing. The most widely used are Optimized Whey Protein™, Hi-Protein Powder™, Pro-Carb™, 50-50 Plus™, CapTri®, and the Parrillo Bars™. CapTri® is an interesting supplement that can be used to bulk up or rip up. CapTri® is a special type of dietary fat that follows a different metabolic pathway than conventional fat. While conventional fat is preferentially stored as body fat, especially during times of caloric surplus, CapTri® has very little tendency to be stored as body fat. CapTri® is rapidly converted to ketones that are used as fuel to supply energy for your training. It also spares protein and carbohydrates thereby allowing spared nutrients to be used to fuel muscular growth and hasten recovery.

If you are naturally thin and want to gain size, clean carbohydrates would be the best choice to supply extra calories. Carbohydrates cause your body to produce insulin, a powerful anabolic hormone. The problem with insulin is that it can easily promote fat if used in excess. Pro-Carb Formula™ is a medium to short-chain starch that provides a very favorable insulin profile. If you need a carbohydrate supplement, this is an excellent choice. 50-50 Plus™ is 20 grams of protein and 17 grams of carbohydrate per serving. This combination of nutrients has been shown to be very effective at supporting muscular growth, especially when used immediately after training. If you have money for only one supplement consider one of our protein powders. If you need to gain quality size then consider 50-50 Plus™. There is no single right answer to the dilemma of dieting and diet details should be customized in each individual circumstance. Consult your Parrillo Nutrition Manual for the basic commandments of performance eating as the Manual goes into great detail about how to construct a diet to meet your specific needs. And if you still have questions, give us a call. We’re here to help.

The Parrillo Sports Nutrition Bars™, Energy Bars™ and Protein Bars™ are all excellent formulations; each with a slightly different profile and each provide an excellent combination of protein, carbohydrates and CapTri®. They are convenient: you don’t need to make a meal or mix a drink to get clean nutrients in a hurry. Just put one in your gym bag, attaché case, purse, pocket, desk or glove compartment and you have a precisely formulated muscle snack whenever you need it. Bars are another way to continually flood the muscles with nutrients, provide the calories needed to support muscle growth and keep you in positive nitrogen balance and away from catabolism. Don’t forget Creatine Monohydrate. Creatine makes your muscles bigger and stronger in a many different ways. It does not supply calories instead it enters muscle cells and acts as an energy donor to supply ATP, the fuel used to power muscle contractions. Creatine has been shown to increase strength as well as high intensity exercise endurance. Also, it attracts water into the muscle cells and this makes them noticeably bigger. 70% of first time Creatine users experience a muscular weight gain of between 3-10 pounds within the first month or two of using it. Strength gains of 10-15% are common. We have the best Creatine available so call our 800-number and experience the magic of Creatine Monohydrate for yourself. Good luck until next month!
Rest and recuperation are critical elements if your desire is to be successful in bodybuilding. Everyone needs rest but athletes, bodybuilders and people who have occupations that involve hard physical work need more rest than sedentary people. There are different categories of rest. One quantifiable type is the rest interval between sets. How much time do you allow before commencing the next set? A second type of rest is the rest interval between training sessions? How long before you train the same muscle again? Then there is sleep: how long do you sleep each night and are you getting enough quality sleep?

Use different rest intervals between sets to elicit different muscular effects. The length you choose will trigger a different physiological effect. If you want to get cut-up and lean you would naturally and physiologically effect. If you want to get is to increase your muscle mass you will elicit different muscular effects. The Use different rest intervals between sets. Length you choose will trigger a different effect.

Strength occurs when additional poundages are handled or more reps are performed. In order to handle heavier weight or perform more reps per set you need to be totally recovered from the previous set. Allow plenty of time between sets when you are tackling the big weights. Heavy, compound exercise movements, those which involve the movement of two or more joints to push the weight to completion: i.e. squats, bench presses, rows, cleans, overhead presses, deadlifts, etc., will require more recovery time between sets than isolation exercises like curls or deltoid raises. Again, this is common sense stuff but basic concepts need to be repeated periodically.

Weight training is incredibly intense exercise and within seconds of the commencement of a heavy set, energy reserves are depleted and waste products begin to accumulate(1-4). Creatine phosphate serves as an energy donor and helps to maintain the supply of ATP, the molecule used by muscles to power contractions. ATP is rapidly depleted and strength fades as a heavy set proceeds, muscular contractions soon stop altogether. During the rest interval between sets ATP and creatine phosphate stores are repleted. Supplementation with Creatine Monohydrate can help the entire depletion-regeneration process as it increases

The question is often asked of me, when should I take a day off? What is the strategy behind rest and recuperation? What is the relationship between exercise, nutrition, rest and muscle growth? Generalizations are dangerous since everyone is different and circumstances are never the same. In addition to weight training, a Parrillo-trained bodybuilder needs to do aerobics on a regular and systematic basis. Pre-contest bodybuilders will do aerobics twice a day in addition to regular weight training. This is a lot of work, particularly since we insist the athlete train intensely whatever the discipline. Our rule of thumb is that you should take off the least amount of days you need in order to recuperate. If you are eating properly and plentifully and getting plenty of sleep at night you can train harder, longer, heavier and more often.

You hear a lot of talk on how to avoid over-training but often this is an excuse for laziness. Over training can be avoided if you take in lots of quality calories and get plenty of sleep, restful sleep. In fact, at Parrillo, if an athlete thinks they are overtraining we advise that they up their calories rather than cut back on the weight training or aerobic activity. It is tough to make progress by exercising less. If you are not making good gains and feel zapped and tired, try increasing your calories and adding another hour of sleep to your nightly allotment. Make sure you are training intensely enough to stimulate
growth. What is intense enough? Pushing the envelope and upping poundage or weights every session. Push hard and make gains, then refuel and rest.

Another key recovery factor is the characteristic of the muscle itself. Large muscles need more time to recover between workouts. Because big muscles are stronger you can lift more poundage and are subjected to greater stress you need longer to recover. You might find that your arms recover faster than your legs, for example. Or your triceps recover quicker than your lower back. Be aware of these muscular phenomena when scheduling your sessions. Always try to get enough sleep. If you are unable to sleep optimally your recovery will suffer and you won’t be able to train each muscle group as frequently. Stress can be a definite detriment to recovery. Emotional stress is a very real factor as is illness. During stress your body produces cortisol, which helps you through the stress but has the unfortunate side effect of breaking down muscle. Cortisol is a catabolic hormone that breaks down muscle tissue so that the protein can be used as fuel. Illness reduces your ability to recover as your body devotes its energy to fighting the sickness rather than repairing muscle tissue. If you have a cold and don’t feel too bad, then go ahead and train. But if you have a fever or are too sick to work take a few days off from the gym.

Nutrition plays an absolutely central role in the recovery process. The foods you eat supply you with the building blocks the body needs to repair itself. If you are training intensely and getting enough sleep but not eating right, then your growth potential will be severely limited. You should be getting one to two grams of protein per pound of body weight every day for optimal growth and recovery(7-10). Most bodybuilders use a protein supplement as the foundation for their nutritional program. We think the best protein on the market is our Hi-Protein Powder™ or Optimized Whey Protein™. Our whey protein is fortified with extra glutamine and branched chain amino acids. In terms of recovery and growth the two most important supple-

ments are protein powder and Creatine Monohydrate.

Carbohydrates are needed to maintain muscle glycogen stores. When muscle glycogen is depleted, strength and endurance drop off markedly(1-4). If you are no longer getting a good pump after a set, this is a sign that you are running low on glycogen. In this case, increase your carbs by using two to four scoops of Parrillo Pro-Carb™ after your workout. This is the perfect time to supplement with carbs as they will be stored as glycogen. Don’t forget to take your vitamins and minerals. I suggest six meals a day, spaced at regular intervals. Each meal should include a protein source (such as lean chicken or turkey), a starch, and a fibrous vegetable. Good starches include potatoes, rice, beans, and corn. Stay away from simple sugars and refined carbohydrates such as pasta or bread. Metabolically, refined carbohydrates behave much like simple sugars. Also avoid milk and fruit, which are rich in sugars. Consult the Parrillo Performance Nutrition Manual for detailed instructions. Adequate nutrition and sleep are two critical ingredients in achieving optimal recovery. Don’t be afraid to vary and experiment with your rest intervals and training frequency. Good luck!

References

Vitamins and Minerals, Part I

by John Parrillo

Vitamins and minerals are not the most exciting supplements, but to the bodybuilder, fitness enthusiast or serious weight trainer they are among the most important. Many governmental, medical and nutritional authorities suggest that vitamin and mineral supplementation is not necessary, and that you can get all the nutrients you need from eating a balanced diet, and while this might be true in the strict sense it is senseless in the practical sense. If you eat perfectly and do not engage in any strenuous exercise, then adequate vitamins and minerals may be derived from the foods we eat but think how much easier it to obtain all we need by taking a few inexpensive tablets each day? And what about those of us who diet? How does the strict dieter make up for vitamin deficiencies? The answer is to supplement. Vitamin and mineral deficiencies are relatively common. Most people don’t eat a “balanced” diet and this is true even for Parrillo-style bodybuilders who typically avoid fruits and dairy products because of the high content of naturally occurring sugars. Eliminating fruits and dairy from your diet is one of the smartest things you can do to strip off bodyfat and maintain mass, but eliminating these two food groups removes some of the richest sources of natural vitamins and minerals. People who eat a balanced diet, as defined by the FDA, are still at risk for deficiencies because so many of our foods are refined, bleached and processed. In my opinion virtually every serious strength athlete or bodybuilder should be on a “core supplement” program that includes vitamins and minerals, a high quality protein supplement and Creatine Monohydrate. I strongly believe (and continually remind athletes) that wholesome food should serve as the bedrock foundation of any serious nutritional program. Bodybuilders will obtain astounding results in very short order if they use wholesome foods in combination with a core supplementation program. Supplemental protein for the serious weight trainer is a no-brainer. The scientific evidence is strong, persuasive and plentiful that those athletes who exercise vigorously need extra protein. This is common sense backed up by decades of empirical data from the gym and scientific data from the lab. Tremendous gains in size and strength occur when high intensity weight training is combined with heavy protein supplementation. Two scoops of my Optimized Whey protein contain 33 grams of high biological-value protein, zero grams of fat, 3 grams of carbohydrates and zero sugar — plus it tastes incredibly good. I usually recommend that the serious bodybuilder start by consuming 1 to 1½ gram of protein for every pound of bodyweight, spread as evenly as possible over 5-6 meals each day. When you plateau in training (poundage or muscle size) jump up to 2 or more grams per pound of bodyweight. This plateau-busting method has worked for over a thousand individuals I have worked with personally in my 25 years of contest prepping top bodybuilders. So serious protein supplementation is a requirement if you are serious about progressing.

Creatine Monohydrate is another nutritional supplement that is clearly valuable to virtually everyone who trains with weights. The science is plentiful and the enthusiastic adherents are everywhere. It would be nearly impossible to consume enough Creatine Monohydrate from whole foods to consume the quantity necessary to trigger growth. Besides, with our modern high technology processing methods we can offer you a Creatine Monohydrate product so powerful that two small scoops contain the nutritional punch of several 6-ounce steaks without the saturated fat or the hassle of cooking. You can derive all the Creatine you need with a couple of scoops taken daily. The cost is pennies a day and the results are sensational. Creatine Monohydrate has had the fastest growth curve of any natural supplement in the nation over the last few years, largely on word-of-mouth advertising by the users. The word is out: Creatine Monohydrate works!

Many athletes have vitamin and mineral deficiencies and aren’t even aware of it. Restricted diets, though effective at stripping fat, are often woefully short on vitamins and minerals. Your system needs vitamins and minerals to operate at peak efficiency and the solution to this problem is convenient, cheap and easy: use vitamin and mineral supplementation. I recommend one tablet of each of my products, Mineral Electrolyte Formula™ and Essential Vitamin Formula™ to be taken with each meal. This way, the body is being continually refueled with the trace minerals and potent vitamins it needs for growth and recovery from hard, mineral-leeching workouts. And at about $1.0 a tablet, these products are one of the most economical supplements available on the market.

Vitamins are divided into two general categories based on their solubility properties (1-4). The water-soluble vitamins include vitamin C and the B vitamins (thiamin, riboflavin, niacin, pyridoxine, and cobalamin), folic acid, pantothenic acid, and biotin. The fat-soluble vitamins are A, E, D, and K. Generally speaking, the water-soluble vitamins function as coenzymes that bind to enzymes and make them active. Mostly they are involved in biochemical pathways that produce energy.
The fat-soluble vitamins function (primarily) without binding to enzymes.

Vitamin C (ascorbic acid) is a critical vitamin for the serious weight trainer. Performance deficiencies for those who lack ascorbic acid have been documented for centuries. Sailors up until the 1800's would routinely contract scurvy, a horrible wasting disease, as a result of diets lacking in vitamin C. They discovered that packing dried fruit on long voyages cured the problem but until that fateful discovery many sailors died from vitamin C-depletion. (1). Vitamin C deficiency can cause shortness of breath and reduce endurance. Vitamin C has multiple functions in the body and many of these relate to physical activity. Vitamin C is required for collagen synthesis. Collagen is a structural protein within the body, the primary component of cartilage, tendons, and ligaments. Weakness in these structures will reduce performance as well as predispose the individual to injury. A little known fact is that vitamin C is required for the production of carnitine, a molecule that is required for fatty acid oxidation. Vitamin C deficiency can lead to impaired fatty acid utilization (1). Neurotransmitters require vitamin C for their formation and a deficiency can result in reduced nervous system function. Vitamin C is an antioxidant that protects cells from damage by oxygen radicals that are generated in greater number during exercise.

The current “recommended” daily allowance of vitamin C is 60 mg per day. This is sufficient to prevent the symptoms of overt vitamin C deficiency but is somewhat lacking for the hard working bodybuilder. Stress increases the requirement for vitamin C (1) and infection, smoking, and extremes of temperature or altitude (1) will deplete vitamin C within the body. It is suspected that exercise would also increase vitamin C requirements, although official recommendations for athletes do not exist. Furthermore, C seems to be the best antioxidant protection. Food sources for vitamin C include specific fruits and vegetables. Strawberries and oranges are fruits loaded with C and the best vegetables for C are green: bell peppers, Brussels sprouts, collard greens, spinach, and broccoli.

One interesting scientific study tried to determine C requirements for athletes and found that athletes consuming 100 mg of the vitamin per day still had decreased blood levels after hard training. By upping intake to 300 mg per day normal blood levels returned (1). Several studies have reported decreased urinary excretion of vitamin C in athletes, suggesting a relative deficiency. Several studies have shown an increase in exercise performance after vitamin C supplementation. One involved comparing supplemented and placebo groups on a cycle ergometer. The group given 1000 mg of vitamin C per day had increased mechanical efficiency and wasted less energy than the placebo group. Other studies have shown vitamin C to reduce oxygen consumption, oxygen debt, VO2 max, and total energy expenditure. Vitamin C seems to play a major role in exercise endurance and prevention of fatigue. If your vitamin C level is low or marginal, correct it and you will derive benefit. Supplemental vitamin C is a must!

There is convincing data to show deficiencies in vitamins - thiamin, riboflavin, pyridoxine (B6), C, E, and iron are also detrimental to exercise performance (1). Thiamin, also called vitamin B1, is required for energy production. Significant numbers of athletes and young people are thought to be low or marginal in thiamin (1). Exercise increases thiamin requirements and thiamin is required for energy production. The Krebs citric acid cycle needs thiamin and this critical vitamin is needed for the breakdown of branch chain amino acids. The Krebs cycle is the primary energy-producing pathway in cells and its smooth function is required to produce energy from carbohydrates, protein, and fat. The branched chain amino acids (leucine, isoleucine, and valine) are unique in that they can also be converted to energy within the muscle cell. Without thiamin, energy production comes to a standstill. The present guidelines suggest 0.5 mg per 1000 calories. This works out to be between 1.1 to 1.5 mg per day for most people. Food sources high in thiamin include pork, whole grains, beans, peas, and orange juice (1). Most other foods contain only small amounts of thiamin unless the food has been fortified with added vitamins.

The Parrillo Performance Essential Vitamin and Mineral-Electrolyte Formulas are specifically designed for athletes and provide high levels of the B vitamins needed for cellular energy production. These supplements also contain high levels of the antioxidant vitamins C and E. The Parrillo formulations are a rich source of calcium, especially important for women. The scientific logic for vitamin and mineral supplementation is irrefutable, the cost negligible and the benefits are incredible. So what are you waiting for?

References


Vitamins and Minerals, Part II
by John Parrillo

Last month we discussed vitamins and minerals and took a long look at vitamin C and thiamin, two vitamins both very important for athletes. This month I want to talk about calcium. Calcium is essential for strong bones and teeth and also plays a central role in the activation of muscular contractions. Many people don’t get enough calcium, especially women. Women are at risk for a very common disease, osteoporosis: a condition in which the bones slowly lose calcium and weaken as a result. A simple fall can result in a fractured hip and something as minor as stepping off a curb can crush vertebrae. Human bone lacking in calcium becomes brittle. Osteoporosis is most common in post-menopausal women. The problem is the reduction in estrogen production. Estrogen helps keep bones strong. It is important to have plenty of calcium in your bones when you enter menopause because if you start into menopause with low mineral density (“thin bones”) then problems can occur quickly. To help in preventing osteoporosis, or reduce its impact, take in plenty of calcium to make sure your bones are strong. Though osteoporosis is more common in women, men can get it too. Build a strong skeleton when you’re young so you’ll have a strong skeleton when you’re old (1).

Dairy products are high in calcium. Milk, yogurt, and cheese are all rich calcium sources. This is a problem in that milk and cheese are forbidden for serious bodybuilders. We like the calcium and protein content of dairy products but the fat and sugar create disadvantages that far outweigh the advantages. Milk has an ample amount of protein but contains lactose, a simple sugar that promotes fat storage. These naturally rich sources of calcium are out of bounds. Still, we need calcium. Some vegetables contain a fair amount of calcium, especially the green leafy vegetables like spinach (1-5), but the intestines do not absorb the calcium from vegetable sources very efficiently. Vegetables contain oxalic acids, which bind to calcium and reduces its bioavailability. Bodybuilders generally avoid dairy products and vegetable calcium has absorption problems, so supplementation becomes very important.

Calcium carbonate and calcium citrate are both good supplemental forms of calcium but avoid oyster shell calcium since it does not absorb well. Anyone with a history of kidney stones should probably choose calcium citrate since it is less prone to form kidney stones. The adult human body contains 1,000 – 1,200 grams of calcium, 99% of which is in the skeleton. If calcium intake is inadequate the skeleton serves as a pool from which calcium will be withdrawn for other purposes. Bones are in a state of continual turnover and are constantly being replaced and remodeled. Existing bone is reabsorbed and new bone built. Three hormones are directly involved in calcium metabolism: parathyroid hormone (PTH), calcitonin (CT), and vitamin D (vitamin D functions like a hormone) (1-3). Parathyroid hormone acts to release calcium from bone to increase the plasma calcium level. Calcitonin has the opposite effect, causing calcium uptake into bone.

A daily intake of 1,200 mg per day of calcium is recommended - unless a person has a diagnosis of osteoporosis, in which case 1,500 mg per day is usually recommended (2). It is virtually impossible to obtain this amount of calcium without the use of dairy products or supplements. No problem, we at Parrillo Performance recognized the importance of calcium for athletes long ago and our Mineral-Electrolyte Formula™ provides 250 mg of elemental calcium per tablet. Two tablets of Mineral-Electrolyte Formula™ taken with five meals (or shakes) per day will yield 1250 mg of calcium per day. At less than a 8¢ per tablet, can you afford not to calcium supplement? Statistically, most women consume only about half the recommended daily amount of calcium, making it one of the most common nutritional deficiencies among the female population. Osteoporosis is an insidious disease that presents few clinical signs or symptoms until a fracture finally occurs and then it is too late to do anything about it. It is very important for women to maintain a regulated, adequate calcium intake during their youth and middle age in order to avoid osteoporosis in later years.

Vitamin D has several actions that increase plasma calcium levels. Vitamin D increases the efficiency of intestinal calcium absorption, acts to decrease urinary calcium excretion, and promotes the release of calcium from bone. Since vitamin D increases calcium absorption, vitamin D deficiency will lead to low calcium. Vitamin D is an interesting compound that in some ways acts more like a hormone than a vitamin. It was originally classified as a vitamin because it is associated with specific deficiencies: rickets and osteomalacia (3). Unlike other vitamins, your body is able to make its own vitamin D. It is a derivative of cholesterol called 7-dehydrocholesterol and is converted to...
pre-vitamin D3 in the skin during exposure to ultraviolet light. As an interesting side note, in northern climates where it is cold in the winter and people don’t spend much time in the sun, inhabitants sometimes develop low vitamin D levels which lead to low calcium levels. 25-hydroxyvitamin D3 is further metabolized in the liver and then the kidneys to produce its active form, 1,25-dihydroxyvitamin D3. The dietary form of vitamin D is also a pre-vitamin and must be converted into the active form by sequential reactions in the liver and kidney (1,2).

The main function of vitamin D is to help regulate calcium and phosphorus metabolism. Both calcium and phosphorous are required for bone formation, nerve and energy function, and other cellular processes. When calcium or phosphorous levels are low it causes the kidneys to make more of the active form of vitamin D, which in turn goes to the intestines and stimulates the synthesis of binding proteins for calcium and phosphorous. These binding proteins increase the absorption of the minerals by the intestine (3). Vitamin D also acts on the kidneys to reduce urinary excretion of calcium and phosphorous. It stimulates the release of calcium and phosphorous from bone (a good thing) and acts to maintain normal calcium and phosphorous concentrations. Vitamin D seems to have no direct value as an ergogenic aid. There seems to be no performance boost from “extra” amounts of D but a vitamin D deficiency will certainly decrease performance. Actually, megadoses of D could be toxic if calcium levels exceed the normal range. Vitamin D deficiency in children causes rickets; a wasting disease in which in bones weaken and go soft, legs become bowed and growth is stunted. Vitamin D deficiency in adults is called osteomalacia and produces skeletal weakness and pain (3).

Your body can make enough vitamin D to meet your needs if you receive adequate sunlight exposure. Many people, workaholics, the aged and sick, do not get a lot of sun. Supplementation is highly recommended for these groups. In this country, milk and other dairy products are fortified with vitamin D and this represents the main dietary source (1-6) for most Americans. Serious bodybuilders and fitness enthusiasts usually won’t drink milk or eat dairy. In order to prevent calcium or vitamin D shortfall they should supplement. The RDA for vitamin D is 200 IU for adults beyond 24 years of age, and 400 IU for people between six months and 24 years of age (2). The solution is an easy one: take our Essential Vitamin Formula™ and Mineral-Electrolyte Formula™ as proscribed and get on about the rest of your muscle building business. The calcium/vitamin D base is covered. We’ll talk again next month!

References


Vitamins and Minerals, Part III
by John Parrillo

So far in our series about vitamins and minerals we have discussed vitamin C, thiamin, calcium, and vitamin D. This month I am going to talk about iron, one of the most important minerals for athletes. Endurance athletes and women are particularly at risk for low iron status or iron deficiency anemia (1-6). Anemia is a condition where your body doesn’t have enough red blood cells. This compromises the ability to provide oxygen to the tissues thereby reducing sports performance. It is well documented that anemia reduces athletic performance and that correcting the anemia improves performance. Anemia can be caused by a wide variety of things, including deficiency of iron, folate, or B12. Another cause of anemia in athletes is hemolysis (4). This is the destruction of red blood cells by physical stress. “Sports anemia” refers to anemia in athletes undergoing severe training. It occurs in endurance athletes such as marathon runners. It seems to be caused by a combination of iron deficiency and hemolysis.

Iron deficiency is the most common nutritional deficiency in the world. It is estimated that about 500 million people worldwide are iron deficient (4). The main biological function of iron is to bind oxygen. Most of the body’s iron stores (70%) are contained in hemoglobin. Hemoglobin is an iron-containing protein in red blood cells. When the blood circulates through the lungs it binds oxygen, then the hemoglobin lets go of the oxygen when it circulates through the tissues. If iron intake is inadequate the first thing that happens is iron is released from ferritin, a protein that stores iron. If iron intake remains inadequate eventually body iron stores become depleted. Then the new red blood cells which are maturing in the bone marrow can’t make as much hemoglobin as they need, resulting in microcytic (small cells), hypochromic (pale cells) anemia. This impairs oxygen delivery to tissues thus limiting aerobic metabolism and work performance.

Good dietary sources of iron include red meat and liver (2). Vegetables generally are not very good sources of iron. Although spinach contains a fair amount of iron it is not very bioavailable (not very well absorbed by the body). It is useful to consider dietary iron in two ways. It can be classified as “heme iron” or “nonheme iron.” Heme iron is iron that is already incorporated into hemoglobin. This improves its absorption dramatically. Obviously heme iron will only be found in meats or liver. The fact that red meat is a good source of iron is no doubt one of the reasons for its reputation for making you stronger. Non-heme iron is found in plants and most iron supplements. Our Liver-Amino Formula™ contains liver extract and is an outstanding source of heme iron. It should be considered a core supplement for endurance athletes (particularly women), for anyone with a known anemia, and anyone who doesn’t eat red meat. If you seem low on energy it might be worth a try. Iron deficiency is surprisingly common in athletes.

Iron has several other important functions besides its role in hemoglobin. Notably it is also found in myoglobin, a protein similar to hemoglobin that is found in muscle. It’s function is to help transport oxygen inside muscle cells. In addition to decreased work performance, iron deficiency is also associated with impairments in cognitive performance, thermoregulation (maintaining body temperature), thyroid hormone regulation, glucose metabolism, nervous system function, immune function, and growth (4).

Iron deficiency seems to inhibit normal growth in children. One study demonstrated that 56% of iron deficient children were below the tenth percentile of weight for their age (4). It seems iron status plays some role in modulating growth rates in children. While it is clear iron deficiency negatively impacts sports performance, it is not known if iron deficiency hinders muscle growth in adults, but it seems possible. A group of iron deficient children were treated with either just vitamin C or vitamin C plus iron. The group receiving iron had more of an increase in height and weight than the group receiving only vitamin C. Interestingly, this effect seemed not mediated through increased food intake, suggesting some direct effect of iron in regulating growth (4).

In addition to its central role in oxygen transport iron is also important to many basic processes of energy metabolism. Iron deficient animals are characterized by increased metabolic rate and increased glucose oxidation (4). They rely more heavily on glucose as fuel, meaning they burn less fat. Overall, iron deficiency results in reduced growth, increased metabolic rate, lower feed efficiency, and increased reliance on glucose as fuel (4).
Iron status also affects thyroid hormone. Iron deficient human beings are functionally hypothyroid. When cold stressed these individuals fail to adequately thermoregulate and core temperature drops. Studies in iron deficient rats show they have half as much active thyroid hormone as control rats. Normal thyroid hormone function is required for growth hormone function. This might be one reason low iron status negatively affects growth. You may be wondering why iron deficiency results in increased metabolic rate. This is mediated by an increase in sympathetic nervous system activity and is thought to represent a compensatory step in response to impaired thermoregulation secondary to low thyroid status.

Not only does iron status affect exercise performance, but exercise affects iron status too. There is quite a lot of evidence showing that intense exercise causes iron loss and decreased hemoglobin. This seems to affect mainly distance runners. The mechanism behind it is not fully understood. Some people have suggested increased iron loss through sweating, increased gastrointestinal blood loss, or red blood cell rupture from footstrike (trauma). For whatever reason, it would appear intense, prolonged exercise has a negative impact on iron status (4,5).

Most iron supplements you see at the store are ferrous sulfate – a form of nonheme iron. Parrillo Performance Liver-Amino Formula™ contains heme iron which is much more efficiently absorbed. I usually recommend 10 to 15 tablets a day or up to 40 tablets for serious athletes. It doesn’t matter if you take them all at once or in divided portions. This should be a core supplement for any endurance runner. Other people who might benefit from it include any menstruating female and anyone who has anemia. Symptoms of anemia include fatigue and weakness and a decrease in performance. Also, if you have anemia, I would suggest eating red meat or liver once or twice a week. If you have true anemia you should also take a multiple vitamin supplement. Besides iron, you also need folate and B12 and protein to make red blood cells. So I would suggest two servings a day of Hi-Protein Powder™ or Optimized Whey Powder™. Of course, if you’re treating anemia the most important product is the Liver-Amino Formula™. That in itself is a good source of heme iron, protein, and B vitamins. Take your Vitamin C at the same time you take your iron, since Vitamin C improves iron absorption (2). If after a month or two you still are fatigued you might want to see your doctor to establish if there is another reason for the problem.

The recommended daily allowance of iron is 15 mg per day (2). Only about 10% of nonheme iron is absorbed, so this would provide about 1.5 mg of non-heme iron. (In comparison about 20% of heme iron is absorbed.) This is thought to be enough for most of the population except for women with exceptionally high menstrual blood losses. Also, female endurance athletes are likely to need more. Daily iron losses average about one mg per day in men and 1.4 mg per day in women. Pregnant women are generally encouraged to take extra iron, about twice the normal daily amount. The RDA for children is 10 mg. These guidelines are developed for people who normally eat 30 to 90 grams of meat, poultry, or fish per day. Vegetarians may need a higher intake because of the decreased availability of iron from those sources. Also, adequate vitamin C intake is important.

References

Carbohydrates: The Bodybuilders Best Friend or Worst Enemy?

by John Parrillo

Your body needs fuel to power its activities. During low level activity, like casual walking, fat serves as a primary fuel source. As exercise intensity increases your body comes to rely more heavily on carbohydrates for its source of energy. During prolonged endurance activities such as aerobics (and especially after glycogen reserves become depleted), amino acids can contribute significantly to the fuel mix, accounting for as much as ten percent of oxidized substrate. Since most of us exercise intensely, we are dependent on carbohydrates for optimal performance. This is true for both bodybuilders and endurance athletes. Of all the ergogenic (performance enhancing) substances available, evidence suggests that carbohydrates and water work best for powering through a workout. Without these critical nutrients the body cannot generate power and perform work at the optimal level. When endurance athletes “bonk” or “hit the wall” glycogen stores are depleted and blood sugar levels start to drop. This causes a dramatic reduction in muscular power output and causes fatigue of the central nervous system.

The human body can store roughly 400 grams of glycogen, which is the storage form of carbohydrates. This amounts to about 1,600 calories and is not enough energy to last most of us even one day. Since we can’t store very much, it is critical to maintain an adequate supply of carbohydrates. The optimal carbohydrate intake varies from person to person, depending on athletic goals, body size and training pattern. Endurance athletes burn the most fuel and thus have the highest carbohydrate requirements. Bodybuilders who follow our Parrillo prescription of high intensity aerobics and weight training should consume a diet fairly high in carbohydrates. During the growth season, while the emphasis is on gaining lean muscle, a diet relatively higher in carbohydrates will help support weight gain. During pre-contest dieting, when the goal is fat loss, a reduction in carbohydrates works better. Carbohydrates are almost exclusively derived from plant sources. Meat is a very poor source of carbohydrates. We divide carbohydrates into several categories.

The first two are simple sugars and refined carbohydrates. Simple sugars include sugar and honey as well as fruit and fruit juice. Fruit is sweet because it contains the sugars glucose and fructose. It is advisable to avoid simple sugars and refined carbohydrates because they readily promote fat storage. To some extent they are converted into fat, but more importantly they cause a big insulin release from the pancreas and this blocks the use of fat as fuel. If you don’t burn any fat as fuel then it slowly accumulates. Fructose is found primarily in fruit but also in artificial sweeteners like high fructose corn syrup—which is especially bad since it is preferentially converted to fat in the liver. Examples of refined carbohydrates include bread, pasta and anything made with flour. That would include muffins and cookies, cake, crackers, pretzels and so on. Chips, even the low fat kind, will fall into this category since their carbohydrates are refined. During refining the grain which supplies the carbohydrate is pulverized and the fiber is removed. The carbohydrates are ground into a fine powder and this increases its surface area-to-mass ratio.

These factors, taken together, result in certain carbohydrates being digested, entering the bloodstream very rapidly and triggering a powerful release of insulin. Refined carbohydrates behave in the body much like simple sugars and we recommend that athletes trying to get in shape avoid all simple sugars and refined carbohydrates, including sugar, fruit, fruit juice, bread and pasta. Milk is not a good bodybuilding food since it is rich in the simple sugar lactose. A glass of milk actually contains more sugar than protein, something a lot of people don’t realize. Starches and fibrous vegetables are “good” carbohydrate sources and we encourage our athletes to eat these. Starch is a long chain of glucose. Glucose is sugar released into the bloodstream and a primary fuel for muscles. Glucose is the storage form of carbohydrates in plants. Glycogen is very similar to starch and is the storage form of carbohydrates in animals. The difference between starch and glycogen has to do with the branching pattern and starch is a good energy source that is digested slowly compared to refined carbohydrates. This results in a more favorable insulin profile for starch. Starch is the best food source of carbohydrate for athletes. Good examples of starchy carbs include oatmeal, corn, peas, rice, beans, potatoes, sweet potatoes, lentils, legumes, and whole grains.

Fibrous vegetables don’t supply many calories but are the prime sources of fiber, a critical nutrient for bodybuilders. Fiber slows the rate of release of glucose into the bloodstream thus helping to moderate insulin levels. Good fibrous vegetables are lettuce, spinach, asparagus, broccoli, cauliflower, brussel sprouts, beans (not canned), lentils, peas, turnip greens, squash, zucchini, okra, oatmeal, oat bran, All-Bran cereal or Fiber-One cereal (check to make sure these have no sugar), cabbage, celery, peppers, sweet potatoes, eggplant, cucumbers, onions and whole grain brown rice. Generally any other veg-
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etable is acceptable. I would stay away from avocados, olives and nuts, as they are high in fat. It is important to combine foods properly when you prepare a meal. We call this “meal structuring.” Each meal should contain a protein source, a starchy carbohydrate and a fibrous vegetable. By combining protein and fiber with your starch, and by avoiding simple sugars and refined carbohydrate, the rate of release of glucose into the bloodstream is greatly reduced. This helps keep insulin levels low which permits the continued use of fat as fuel. This style of eating encourages ingested nutrients to be stored as muscle or glycogen rather than compartmentalized in fat storage.

How many carbohydrates should you eat in a day? This varies from person to person, so I can’t give you some magic number, but I can teach you how to figure it out for yourself. The first thing to consider is your daily caloric requirement. If you don’t already know what that is, start weighing your food and use a calorie chart to calculate how many calories you are consuming each day. The Parrillo Performance Nutrition Manual comes with a food scale and diet trac sheets along with detailed instructions. Next, construct your diet so that fat is limited to 5-10% of calories consumed and eat one to two grams of clean (low fat) protein per pound of body weight each day. If you’re lean and are trying to gain weight add more carbohydrates. If you are trying to strip off fat try eating two grams of protein per pound of body weight each day and cut back on your slow-release carbohydrates and ideal for both improving exercise performance and providing post-workout glycogen replacement. In terms of convenience it’s impossible to beat Parrillo Bars. Keep some in your gym bag and have one when you finish your workout to start replenishing glycogen right away. Try and get a handle on the different types of carbohydrates. Eliminate the refined carbs and those that contain sugar. Manipulate your starch and fiber intake to achieve your desired results. Keep tabs on your carbs and how much you ingest. You will be well on your way to achieving the physical goals to which you aspire.

References

Build Muscle While Simultaneously Stripping Off Body Fat—Part 1
by John Parrillo

With summertime fast approaching, shedding any excess fat you might have put on over the winter is a hot topic. How would you like to get into super shape by summer? Now is the time to start. There are specific strategies of diet, exercise, and supplementation that maximize fat loss while retaining hard-earned muscle. When I use the word “diet” I’m NOT referring to classical “low calorie” diets. Restricting calories will work over the short term but always fails in the long run. The body has specific defense mechanisms in place to defend against body weight loss (specifically fat stores) and these biologic mechanisms are triggered when a drastic reduction of calories occurs. During severe caloric restriction you lose as much muscle as fat - and this bodybuilding nightmare reduces the metabolic rate like slamming into a wall. It also brings fat loss to a screeching halt. Reduced caloric intake primes your enzymes and hormones to preferentially replenish fat depots after normal caloric intake is resumed. Rather than restricting calories and call into play the body’s starvation response, we need to work with our bodies, giving them the nutrients and energy they require - but in a clever way that promotes fat loss while retaining hard-earned gym muscle. There is no magic here and it’s really not too complicated once you know what to do.

The single best move you can make - if you want to lose fat and gain muscle - is to purchase the Parrillo Performance Nutrition Manual. This amazing book discusses my philosophy and introduces you to the method by which you can make it all happen. Food is the foundation of good nutrition and you will derive the maximum benefit from your supplements and training only if they are combined with a proper and plentiful diet of wholesome foods. The foundation of our diet is based on the idea that in order to maximize fat loss you need adequate amounts of protein. Protein helps prevent muscle loss while you are losing fat and protein generates a hormonal and thermodynamic milieu that is optimal for fat loss. Normally I recommend protein consumption of around 1.5 grams per pound of body weight per day. During a serious fat loss program I would suggest you increase that: take in up to two grams or more of protein per pound of body weight, per day. To avoid increasing your caloric intake while increasing your protein consumption reduce your starchy carbohydrate intake by an equivalent amount of calories. Exchange starch calories for protein calories and you will jump-start the fat loss process.

For example, if you weigh 200 pounds and normally consume 200 grams of protein per day, to facilitate fat loss while minimizing muscle loss, you would increase your protein intake to 400 grams per day and decrease your starch intake by 200 grams per day to compensate. Since a gram of protein and a gram of carbohydrates generate the same caloric amount, 4 calories per gram, the net result is no change in the total amount of calories you consume. Our research and knowledge gleaned in preparing some of the best bodybuilders in the world indicate that you benefit tremendously by tilting the ratio of calories contributed by protein and away from carbohydrate. Detailed information about how to precisely adjust this ratio is provided in the Parrillo Nutrition Manual. Upping protein has several metabolic effects. Increased protein reduces insulin levels. Insulin is not a bad thing and is required for many vital functions but the problem is that too much insulin blocks the use of fat as an energy source. And that is a bad thing.

Carbohydrates stimulate insulin release and by reducing the amount we take the brakes off the fat-burning process. This is why low carb/high protein diets are so popular these days. Another consequence of increasing the protein-carbohydrate ratio has to do with thermodynamics. Every time you eat a meal a certain percentage of the calories are lost as body heat during the process of digestion and metabolism. This is called the thermic effect of feeding, or TEF. Whatever calories are lost as body heat are no longer available for storage as fat. These calories are no longer available for use as fuel by the body to perform its work and the body is forced to rely on stored fat for fuel. This procedure automatically promotes fat loss without reducing calories or lowering the metabolic rate.

The TEF for dietary fat is 2-3%. This means 2-3% of the fat calories you eat will be lost as body heat during the process of digestion and metabolism. Under conditions of normal caloric consumption the rest of
Build Muscle While Simultaneously Stripping Off Body Fat—Part 1

these calories are retained as body fat. The TEF for carbohydrate is 8%, while the TEF for protein is 25%. This means that 25% of the calories you consume as protein “go up in smoke” before they can be used as fuel to perform work - or be stored as fat. That’s a good thing. Protein’s high TEF makes it roughly 23% better than fat insofar as TEF efficiency. Another benefit of increased protein intake during weight loss is that protein reduces the loss of muscle tissue. Usually (but not always) when you lose fat you lose some muscle as well. By increasing protein intake we minimize this undesirable result. Why? Protein, in addition to having a high TEF also provides essential amino acids that muscle needs to maintain itself. The higher the protein intake the more likely the hard dieting athlete has of retaining muscle mass throughout the process. By increasing protein, reducing fat intake and lowering starchy carbohydrates, we minimize muscle loss and end up leaner and more muscular as a result. We “trick” the body into burning fat as fuel and keep our metabolic rate elevated.

Good protein sources include skinless chicken or turkey breast, egg whites and most fish. Our Nutrition Manual includes a food scale and a nutrition composition table listing the nutrient breakdown of all the foods you should be eating. Many people have trouble eating enough protein in food form so we manufacture two excellent protein powders, Optimized Whey™ and Hi-Protein™. Each supplies 31-33 grams of pure protein per serving. This is the way top bodybuilders, strength and professional athletes ingest high amounts of “clean” protein without having to eat and cook all that food. Parrillo Performance Hi-Protein™ Powder and Optimized Whey™ Protein are both ideal for this application. Good starchy carbohydrate sources include oatmeal, corn, peas, potatoes, sweet potatoes, beans, legumes, and brown rice. Examples of fibrous vegetables include lettuce, spinach, squash, zucchini, spinach, greens, green beans, broccoli, cauliflower and Brussels sprouts. See the Nutrition Manual for a comprehensive list of preferred foods as well as their individual nutritional profiles.

A common misconception is that when you want to lose fat you should shift your weight training from training heavy to training with lighter weights for high reps. This is a big mistake and has no basis in physiology. The reasoning commonly presented is that you’ll burn more calories if you train lighter, longer and for higher reps: this might be true but it is irrelevant. Weight lifting doesn’t burn many calories no matter how you do it and by training for high reps you may burn a few more calories but not enough to notice. Weight lifting is an anaerobic exercise fueled almost exclusively by carbohydrates. Fat cannot be used as an anaerobic fuel. It can only be oxidized in an “aerobic” metabolism. Whatever few extra calories you might burn by training with high reps will be supplied by carbs anyway. The main issue is how do we maintain muscle mass while shedding fat? Intense training with heavy weights provides the stimulus necessary to increase muscle mass - and is also the best stimulus to maintain muscle mass while you’re losing fat. Your body will adapt to heavy training by increasing muscle mass. If you back off on the intensity of your training, or the amount of weight you lift, your body will realize it no longer needs hypertrophied muscles and you will experience varying degrees of muscle wasting.

To promote fat loss, add or increase your aerobic (cardiovascular) exercise. Aerobic exercise is fueled in large part by fat, especially while on a reduced carbohydrate diet. If you couple aerobics with a low fat diet whatever fat you use to fuel your aerobic exercise must be derived from stored body fat. A good rule of thumb is to keep weight training hard and heavy as usual, but double your aerobic exercise. Thirty minutes of aerobics in the morning before breakfast and another 30 minutes before bed works very well for most people. The advantage of doing aerobics before breakfast is that time of day glycogen stores are at the lowest level and more energy will be derived from stored body fat.

Use the protein powder as needed to obtain your required number of protein grams. Use CapTri® if you are going low in carbs and feel a loss of energy or strength. The proper way to use CapTri® in our shape-up scenario is as a replacement for calories derived from conventional fat or starch. Replace the equivalent number of calories from CapTri®, which has a very high TEF.
Build Muscle While Simultaneously Stripping Off Body Fat—Part 1

and has almost no capacity to be retained as body fat. It is used-up, almost immediately as an energy source (as rapidly as glucose) while having little effect in terms of increasing insulin levels. Unlike conventional fats, CapTri® is not stored as body fat and unlike carbohydrates CapTri® does not block the use of body fat as energy. It is an ideal energy source to use while losing fat.

You may also want to consider our Muscle Amino Formula™ and Advanced Lipotropic Formula™. Muscle Amino Formula™ provides the ideal balance of branched chain amino acids (BCAAs), leucine, isoleucine, and valine. These amino acids are used as fuel by muscle cells and supplementing the BCAAs has been shown to decrease muscle catabolism. This is a high-tech product that can help you maintain muscle mass while losing fat, resulting in a leaner, more muscular physique. Advanced Lipotropic Formula provides l-carnitine along with several other nutrients required for fat metabolism. L-carnitine works as a transporter molecule to shuttle fat into mitochondria, the tiny furnaces inside cells where fat is burned. I hope this article spurs you into action. Hopefully, by the time the summer arrives you will have a total physical makeover. Best of luck!

References
There are roughly 100 grams of protein in a pound of muscle tissue. At four calories per gram, that accounts for 400 calories. To build a pound of muscle tissue we suggest you intake 300-500 or an average of 400 additional calories a day. It takes a lot of energy to build a house and it takes a lot of energy to assemble the protein and cells that make up a pound of muscle tissue.

A pound of stored body fat yields 3,500 calories upon oxidation. This is enough energy to supply the metabolic cost of building a pound of muscle and to power daily activities. When a person adds muscle and loses fat at equal rates, the energy intake will roughly match the energy expenditure. The net result is confusing; despite no change in your body weight, you have undergone an astounding transformation. So how do we do it? The first question out of everyone’s mouth when they ask me how to gain muscle and lose fat at the same time is - how many calories should I consume? The answer is whatever number of calories you would normally consume to maintain your current constant body weight. Although this is not a precise methodology, it is a good starting place. Supplying enough calories to maintain your current body weight is referred to meeting your maintenance energy requirement. You ingest enough calories to maintain a constant body weight, yet not too many, as the excess will be directed into weight gain.

Although gaining muscle and losing fat at the same time is certainly possible (we see it happen all the time) it is not easy. There’s not much room for error. You have to do everything right and I strongly suggest you read The Parrillo Performance Nutrition Manual if you haven’t already. There is simply too much information for me to summarize it all in a short article like this. More important than how many calories you eat is, what kind of food do you eat? The Nutrition Manual has a detailed list of the foods you should be eating to build muscle and lose fat. The Manual also comes with a food composition guide and a food scale so you can precisely control your nutrient intake. To build muscle while stripping off fat you need to keep your protein intake high, carbohydrate intake moderate and fat intake low. You should increase protein intake and decrease carbohydrate intake, compared to the way you normally eat. A good rule of thumb would be to ingest one to two grams of protein per pound of bodyweight each day. Fat intake should be limited to 5-10% of calories. Unrefined, complex carbohydrates should be used to meet the remainder of your caloric requirement. I recommend that you keep your protein intake level and adjust your caloric
intake by modulating the carbohydrates in your diet. Try and keep your body weight constant throughout the process.

The Parrillo Performance Body Stat Kit™ is an invaluable tool here. Following scale weight doesn’t tell you how much muscle you’ve gained or how much fat you’ve lost. Gaining ten pounds of muscle and losing ten pounds of fat will change your appearance and body composition dramatically, but your body weight will remain unchanged. The Body Stat Kit™ allows you to monitor body composition and this allows you to follow muscle gain and fat loss. The instruction manual that comes with it tells you exactly what to do to keep progress moving in the right direction. By increasing the protein-carbohydrate ratio in your diet, you’re supplying calories that are more prone to be stored as muscle than as fat. Also, by decreasing carbohydrate intake you induce hormonal and metabolic changes that encourages the use of stored body fat as fuel. Rely on lean protein sources such as skinless chicken or turkey breast, white fish and egg whites. Most people find it impossible to consume two grams of protein per pound of body weight each day from conventional foods. It’s simply too much food. This is where high quality protein supplement is very useful. Our Optimized Whey Protein™ is an excellent choice here. It contains high levels of glutamine and the branched chain amino acids that help to maximize protein worked very hard, but doesn’t spend much time under tension. Low rep sets are more intense and this is a very potent stimulus for growth. Time under tension is another important growth stimulator and you’ll need to do more reps at a slower pace, which will require the use of lighter weight. High rep sets should be carried to failure. I suspect you’ll find they’re more painful than the low rep sets. The combination of both training styles is very effective at stimulating muscle growth.

Losing fat and gaining muscle at the same time can bring about rapid and dramatic changes in your appearance and body composition. It’s hard work. You have to be very strict on your diet and train harder than you normally do. As a rough guideline I would recommend weight training an hour a day, and possibly more, five or six days a week. Instead of worrying about over-train-
Creatine Update
by John Parrillo

Few sports supplements have been more intensely researched in recent years than creatine monohydrate. Already this year, significant findings on this amazing supplement have been published in leading scientific journals - findings that can help you achieve that ultimate physique. Before I share those findings with you, here’s some background information on how creatine works. Inside muscle cells, creatine helps produce and circulate adenosine triphosphate (ATP), the main energy-producing molecule of all living cells. By taking supplemental creatine, you can build the volume of creatine in your muscle cells. Inside cells, creatine increases levels of a high-energy compound called creatine phosphate, which serves as a tiny fuel reserve, enough for several seconds of action. Creatine phosphate also allows more rapid production of ATP. The more ATP that is available to muscle cells, the longer, harder, and more powerfully you can work out. Thus, creatine can indirectly help you lose body fat, since longer, more intense workouts help demolish fat and build lean muscle. The more muscle you have, the more efficient your body is at using energy and burning body fat. Additionally, in many studies, creatine has been found to affect protein synthesis - which ultimately leads to muscle growth. Now, here’s a look at some creatine news you can use:

Build Bigger Arms

If you’re familiar with the Parrillo Training Program, you know that I recommend some very specific techniques for building arm mass. Exercises such as drag curls for the biceps, preacher curls with elbows pressed toward the center of the pad, various triceps exercises, and, of course, fascial stretching between arms sets. In addition to these training techniques, make sure you’re supplementing with creatine. A recent study found that supplementation with creatine monohydrate produced remarkable effects on arm mass. In this study, 23 male weight-trainers took either a placebo, or five grams of creatine, four times a day, for five days. After five days, they took two grams of creatine a day, while the other group continued to take the placebo. All the men trained their arms twice a week, starting with six-rep maximums and progressing to two-rep maximums. The experimental period lasted six weeks. At the end of six weeks, the creatine-takers experienced extraordinary gains. Combined with weight training, creatine supplementation produced greater arm strength, boosted muscle mass, and increased upper arm girth. Those in the placebo group had no such gains whatsoever, even though they were exercising.

Creatine can indirectly help you lose body fat, since longer, more intense workouts help demolish fat and build lean muscle. The more muscle you have, the more efficient your body is at using energy and burning body fat.

Aerobic Power

The ability to train longer without feeling pooped is certainly a plus when you’re trying to build quality muscle. Time and again, creatine has proven its merit in delaying the onset of fatigue. One of the most recent studies to look into this involved 14 men who were tested on stationary bicycles at varying levels of exercise intensity after having supplemented with 20 grams of creatine daily for five days. Half the group took a placebo. Some interesting effects were observed in the creatine-supplement takers. First, creatine appeared to decrease ammonia build-up in the body. This is significant. Ammonia is a waste product generated during intense exercise. It is very toxic and will stop energy production in the cell. When your body can eliminate it efficiently, you have more energy to train. Creatine may help the body clear ammonia from the system. Second, creatine enhanced “oxygen uptake.” This represents your body’s maximum capability to deliver oxygen to the working muscles. With greater oxygen delivery, you can increase your aerobic performance. Third, the creatine-supplement takers had more endurance and could train longer before becoming tired.

More get-up and Go

It’s a fact of life: Some people just naturally slow down physically with age and can’t last as long in the gym as their younger counterparts. Creatine to the rescue. In a recent study, twenty men (aged 60 to 82) took either a placebo or 20 grams of creatine daily for 10 days, followed by either four grams of creatine or a placebo daily for 20 days. Researchers measured the subjects’ exercise performance on leg and arm exercises and found that creatine supplementation reduced muscle fatigue.

How to Supplement With Creatine

Probably no other sports supplement (to date) has been as thoroughly researched as creatine. In addition to its performance advantages, creatine has virtually no side effects according to research. Building the levels of creatine and creatine phosphate in your muscles gives you another fuel source in addition to glycogen from carbohydrates. The question is, how much creatine do you need?
To use creatine in your supplement program, I recommend taking four 5-gram doses a day for five days. This is known as the “loading phase.” From there, five to ten grams a day will keep your muscles saturated with enough extra creatine. This period is called the “maintenance phase.”

One of the best times to supplement with creatine is with your meals. That way, you can load it into your muscles at just the right time to start replenishing muscular reserves and restocking ATP. Taking it after your workout is a good idea too. Creatine enhances the movement of amino acids in cells for tissue growth and repair following exercise. Creatine has no flavor, and you can mix it with plain water or a sports drink. Coffee is not a good choice. Research shows caffeine counteracts creatine and blocks its strength-producing benefits. I recommend that you take the Parrillo Creatine Monohydrate™ with our ProCarb Formula™. Scientific research shows that taking creatine with a liquid carbohydrate supplement boosts the amount of creatine accumulated in muscles by as much as 60 percent. This is not to say, however, that taking Creatine with an exorbitant amount of sugars would be beneficial. It would not. Diet is critical too. To support muscle growth, creatine works best if you follow the Parrillo Nutrition Program™, which supplies ample calories from the proper categories of lean proteins and natural, high-fiber carbohydrates.

References
Doing Carbs Right: Controlling Insulin Release
by John Parrillo

These days you can’t pick up a magazine or look at the best seller list in the bookstore without seeing something about low carbohydrate diets. Low carbohydrate ketogenic diets have their primary application in facilitating fat loss. Such diets work to help you lose weight in part by reducing insulin levels. Insulin is a storage hormone and promotes the storage of carbohydrate as glycogen as well as promoting the use of carbohydrate as fuel. What many people don’t realize is that insulin also inhibits lipolysis, the release of stored fat from fat cells. Insulin shifts the body’s metabolism into a carbohydrate mode and shuts off fat burning. This all makes perfect sense if you think about it. The role of body fat is primarily to store energy for times when food is not available. When you eat, insulin is released in response to the carbohydrate content of the meal and acts to promote the utilization of that carbohydrate for energy. If carbohydrate is available as a fuel source your body will prefer to use it instead of fat, since it wants to save body fat as an insurance policy against starvation.

If your only goal is fat loss, reduced carbohydrate diets do make some sense. We’ve used this strategy with our bodybuilders for years, having them progressively reduce starch intake before a contest to help get them ripped. During this time we have them increase their intake of CapTri® to make sure energy levels don’t suffer. CapTri® is a proprietary medium chain triglyceride (MCT) formula that is used immediately for energy-more rapidly than glucose in fact. CapTri® has minimal effects on insulin so it is an ideal energy source during reduced carb dieting. Using CapTri® in place of some portion of your normal starchy carbohydrate intake will reduce insulin levels and shift your metabolism into a fat-burning mode. CapTri® itself is used immediately for energy and is not stored as body fat. CapTri® is a dieter’s dreams come true.

While reducing carbohydrate intake works well to assist fat loss, it’s not the best diet for all situations. Athletes, particularly endurance athletes and team sports players, need the quick energy that carbohydrates provide. Bodybuilders are equally as interested in gaining muscle as they are in losing fat, and carbs provide energy for muscular growth. Bodybuilders also enjoy having full, hard muscles, and that comes, in part, from glycogen stored in the muscle cells. Athletes, whether they are aware of it or not, want to store glycogen in their muscles in order to look and perform their best, and glycogen storage requires eating carbohydrates. Is there some way we can derive the benefit of carbohydrates and still get leaner?

Yes, there is. You can include a significant amount of carbo-hydrate in your diet and still lose fat-if you do it right. The strategy behind a reduced carbohydrate diet is not to avoid carbohydrates per se—but rather to reduce insulin levels. Carbs don’t make you fat—it’s the insulin release following carbohydrate ingestion that is the culprit. This biochemical sequence prevents you from losing the stored body fat you already have. At Parrillo Performance we have developed a dietary plan that allows you to eat carbohydrates while minimizing the insulin response. This gives you the best of both worlds: the benefits of carbohydrate in providing energy for growth and athletic performance—plus the benefit of reducing insulin levels.

Understanding how the Parrillo diet works is really not too complicated once you understand some basics about metabolism. Both protein and carbohydrate stimulate insulin release from the pancreas, but carbs are a significantly more potent stimulus than protein is. And not all carbs are created equal. Gram for gram, some carbs elicit a much stronger insulin response than others. We divide carbs into four categories. First are simple sugars and refined carbohydrates, then there are starches and fiber. You want to avoid simple sugars and refined carbs since these are the most potent insulin secretors. Simple sugars are found in desserts and sweets and are major ingredients in soft drinks. Last month I stated that the average American consumes a staggering 153 pounds of refined sugar per year. Most of this is concealed in processed foods, convenience foods, soft drinks, and sweets. Many cereals also are very high in sugar. When you’re reading the labels to check for sugar content remember that high-fructose corn syrup is a sweetener loaded with the sugar fructose, which is even more potent in promoting fat storage than table sugar.

You might be surprised to learn that fruit, fruit juice and milk are high in sugar. Almost all of the calories in fruit and juice derive from natural fruit sugars. Although milk is an outstanding protein source, it contains more calories from sugar than from
Doing Carbs Right: Controlling Insulin Release

protein. Fruit and dairy products have many healthy attributes but are relatively high in sugars and the fact that these sugars occur naturally doesn’t make it any better for you. So for people seeking to achieve ultimate leanness, I strongly suggest they avoid fruit, juice, and dairy products. Refined carbohydrates are made from grains milled to produce flour. The problem is that in the manufacturing process the fiber is removed from the grain, leaving only starch. Then the grain is pulverized to produce a fine powder. This greatly increases the surface area of the starch, thus increasing its rate of digestion and absorption. Refined carbs are absorbed as quickly as sugar, and thus have essentially the same effect on insulin levels as eating sugar does. Anything made from flour is a refined carbohydrate. This includes bread and pasta and baked goods like cakes and muffins. Most snack foods (including pretzels, commonly misconstrued as being flour is a refined carbohydrate. This includes and muesli. Most snack foods (including as eating sugar does. Anything made from flour is a refined carbohydrate. This includes bread and pasta and baked goods like cakes and muffins. Most snack foods (including pretzels, commonly misconstrued as being 

If you want to reduce insulin levels and still be able to eat carbohydrates, start by eliminating the carbs that are the most potent insulin releasers. This includes simple sugars, sweets, refined carbs, fruit, milk, bread, pasta, and most cereals. Eliminating these foods from your diet will make you noticeably leaner. The best carbohydrate choices are unrefined, complex carbohydrates and fibrous vegetables. Good starchy carbs are oatmeal, whole grain rice, potatoes, sweet potatoes, corn, peas, lentils, beans, legumes, and any whole grain. While primarily starch, these foods are natural and unrefined and are high in fiber. The presence of fiber in the stomach reduces the rate of digestion and absorption of the carbohydrate, thus reducing its insulin response. Good examples of fibrous carbohydrates include salads and other greens, broccoli, cauliflower, Brussels sprouts, green beans, onions and peppers. The Parrillo Performance Nutrition Manual™ contains a food composition table giving an extensive list of this type of category, and the best food choices, along with the nutritional breakdown of the individual food.

If you want to do carbs right the first step is to avoid the carbohydrate sources which elicit a big insulin release and instead select foods that are digested more slowly. Two important concepts are meal structuring and meal patterning. Meal structuring is simply the proper construction of each individual meal. Each meal should contain a protein source, an unrefined complex carbohydrate to provide starch, and a fibrous vegetable. (The exception to this is the pre-contest diet in which starch is eliminated from some meals, particularly those late in the day.) The presence of protein in the stomach slows the rate of digestion and absorption of carbohydrate, as does fiber. The exact ratio of protein to carbohydrates varies among individuals depending on what are the specific training and dietary goals.

**If you want to do carbs right the first step is to avoid the carbohydrate sources which elicit a big insulin release and instead select foods that are digested more slowly.**

As a good rule of thumb, during a weight gain period eat one to two grams of protein per pound of body weight each day and supply the rest of your calories from unrefined, complex starchy carbs and fibrous vegetables. Minimize fat intake. For weight loss, most people get good results by increasing their protein intake and simultaneously decreasing carbohydrate intake. The ratio of protein to carbs will change depending on whether your goal is weight gain or fat loss. This will vary from individual to individual.

People who store fat easily do better with less carbs and more protein. People who are naturally thin and want to get bigger achieve better results by consuming more carbohydrates. Some people are more sensitive in their metabolic response to carbohydrates than others. Thin people generally tolerate more carbs without getting fat. The Parrillo Performance Nutrition Manual goes into extensive detail in teaching about food combining and meal structuring and does a more complete job than I have room for here.

Meal patterning refers to how many times you eat per day. Eating small, frequent meals gives better results than eating a few larger ones. That’s because a large meal supplies more calories and generates a larger insulin response. By eating small, frequent meals you never get that big insulin release. Also, you have a more uniform energy level. I recommend eating six small meals per day spaced out evenly every two-and-a-half to three hours. Try to get at least a minimum of five meals. If you have trouble eating regular food meals that frequently, make two meals a day supplement meals. Our 50-50 Plus drink mix and the Parrillo Nutrition Bars are ideal for this purpose. Implementing these dietary concepts will allow you to eat carbohydrates while also moderating insulin levels. You will feel better, have more energy and get leaner and stronger. Eliminating sweets and refined carbs makes most people feel more energetic, not less.

For more detailed information refer to the Parrillo Performance Nutrition Manual™.
Perhaps you’ve leaned out as a result of competing in a contest recently or you’ve been maintaining a ripped physique over the summer.

Now, ask yourself this question: How can I maintain most of that leanness, so that next time, I don’t have to diet so hard to zap the body fat?

While losing body fat is a challenge, keeping it off can be more difficult. One point to remember is: Don’t restrict or cut calories to manage your body fat levels. It simply won’t work. If you fall off that wagon, you’ll regain your weight, plus a lot of extra weight. In fact, nearly 95 percent of those who go on low-calorie diets regain their lost weight, plus some, within five years. Not a resounding endorsement for low-calorie dieting.

Why do people put weight back on so easily following a low-calorie diet? There are several possible answers. First, 25 to 50 percent of body weight lost by cutting calories is muscle. Because muscle is the body’s most metabolically active tissue, losing so much of it slows the metabolism down.

Also, cutting calories tricks your body into thinking it’s starving. This perceived famine speeds up the activity of a special enzyme that primes your body to store fat. Once you go off your diet and start eating again, the food is converted more easily to fat. In fact, fat stores stand first in line to be replaced after a period of dieting. You return to your original body weight or above, this time with even more body fat than before.

Restricting calories affects this relapse in other ways too. Less food energy is given off as body heat and turned into weight instead. Low-calorie diets also suppress the activity of certain thyroid hormones, further slowing down the metabolism.

One of the factors that has a significant effect on nutrient partitioning is your endocrine system. It’s involved in such processes as metabolism, energy production, and growth. The endocrine system consists of several organs in the body, including the pituitary gland, the thyroid gland, the parathyroid gland, the pancreas, the testes or ovaries, and the kidneys. This specialized system is like a chemical “messenger service” in the body; it transmits messages in the form of hormones, carried by the blood to specific targets (organs, tissues, or cells) in the body. The messages sent are things like “build muscle proteins,” “store fat,” “burn fat,” or “store carbohydrates.”

Once these messages are received by the targets, the commands are carried out by enzymes, special proteins that control chemical reactions inside cells. Through these reactions, enzymes can make or break down proteins or fat.

Two of the most important hormones involved in muscle growth and fat loss are insulin and glucagon, both produced in the pancreas. They regulate carbohydrate metabolism and fat metabolism by exerting control over the enzymes that carry out these processes.

When blood sugar (glucose) levels rise - usually after carbohydrates are eaten - insulin is released. It transports glucose into cells where it is burned for energy or stored as glycogen. If carbohydrates are released into the bloodstream too fast, an overpro-
duction of insulin occurs. Consequently, some of the carbohydrates are deposited as fat - instead of being stored as glycogen. Simple sugars and refined carbohydrates are rapid-release foods that trigger too much insulin. This channels calories to the fat compartment of the body - not the avenue of nutrient partitioning you want.

Interestingly, insulin is involved in muscular growth because it transports certain amino acids into muscle cells. To make this happen, you need carbohydrates. The key, however, is eating the right kinds of carbs, in the right amounts.

Glucagon opposes the effect of insulin. When blood sugar is low, glucagon is released, and this typically occurs several hours after a meal is eaten. Glucagon then activates the conversion of glycogen to glucose in the liver in response to low blood sugar levels. It also signals the body to start burning fat for energy, because the body is running low on carbohydrates, its preferred fuel source.

The ratio of insulin to glycogen in your body largely determines whether you will gain fat or lose it. You can control this ratio naturally by adjusting the protein and carbohydrate proportions in your diet and combining foods in the proper manner. Here’s how you can partition your food more effectively, so it can be used to burn fat (and keep it off), plus build fat-burning muscle tissue:

1. When trying to gain lean muscular weight, you want a higher ratio of insulin, so you would increase your carbohydrate intake, perhaps as high as 400 to 500 grams or more a day.

   A carbohydrate supplement such as ProCarb™ or 50/50 Plus™ that is formulated with the complex carbohydrate maltodextrin is a good way to increase carbohydrate consumption. At the same time, be sure to meet your lean protein requirement by eating 1.25 to 1.5 or more grams of protein per pound of body weight each day. At least 1 gram should come from chicken, fish, turkey, or egg whites, with at least another .25 or .5 gram of additional protein per pound of body weight from vegetable sources, which contain some protein as well. Consult the Parrillo Nutrition Manual™ for instructions on how to plan protein-rich meals.

2. To lose body fat and keep it off, decrease insulin and increase glucagon by eating slightly less carbohydrate and more protein.

   A good rule of thumb is to adjust your carbohydrate-to-protein ratio to between 1 to 1 or 1.5 to 1. One problem with reducing carbohydrate intake is the potential decline in energy levels. To compensate, try supplementing your diet with CapTri®, our medium-chain triglyceride supplement. This is a special type of lipid that provides quality calories and, unlike conventional dietary fats, it has very little tendency to be stored as body fat.

3. Don’t take nutrient partitioning to extremes by going on a “zero-carb” diet in an attempt to burn more body fat.

   Under extremely low-carb conditions, muscular growth is impossible. There’s not enough insulin available to transport amino acids into muscle cells. Furthermore, the body begins to break down its own proteins into amino acids for conversion into glucose, needed by the brain for fuel.

4. Rate of digestion is important.

   Your meals (five, six, or more a day) should include the proper combination of lean proteins, starchy carbohydrates, and fibrous carbohydrates. This combination of foods slows your digestion to keep carbohydrates from being released into the bloodstream too fast, thus preventing an overproduction of insulin.
Boost Endurance Naturally—and Safely

by John Parrillo

The spotlight at the 2000 Olympics in Sydney, Australia, was not only on the games’ amazing athletes, but also on what has turned out to be one of the most abused performance-enhancing drugs ever - erythropoietin (EPO).

EPO is a synthetic version of a natural hormone in our bodies that is produced in the kidneys and stimulates the formation of red blood cells. Synthetic EPO is used medically to treat certain types of anemia and other diseases. But as a black market sports drug, EPO is used by athletes to increase the body’s production of red blood cells, which transport oxygen to muscles. The net effect is to boost endurance - a job EPO does well, by 5 to 15 percent.

Synthetic EPO, however, has troublesome side effects when not taken under medical supervision. It thickens the blood, increasing the risk of heart failure and stroke, particularly during intense exercise. The drug is believed to be responsible for the deaths of 26 athletes.¹

But this bulletin is not about EPO. It is about how to increase endurance through nutrition and supplementation, without resorting to dangerous drugs.

I’ve seen amazing results from athletes who are willing to take the natural route. Case in point: I once worked with a pro triathlete who regularly consumed 6,000 calories a day from lean proteins and natural carbohydrates. In a qualifier race for his third Ironman, the toughest, most grueling triathlon in the world, he was able to maintain a sub-six minute pace and turned in the third fastest race of the day.

Once in the Ironman, he was fueled by a breakfast of egg whites and oatmeal with CapTri®. During the first half of the bike race, he consumed 32 ounces of a special carbohydrate drink (Pro-Carb™), mixed with a medium-chain triglyceride supplement (CapTri®). He dismounted his bicycle in 240th place (out of 1,450 professional competitors). At the 19th mile marker, he had moved up to 110th place. With seven miles to go, he picked up his pace and finished in 79th place - his strongest Ironman showing ever.

If that’s the kind of endurance and stamina you’re looking for, no matter what your sport, here’s what to do to get it.

Eat a Natural Carb-Laden Diet.

Carbohydrate is the body’s preferred fuel source during exercise. It is stored in the liver and muscles as glycogen. More than 99 percent of the carbohydrates you eat are used by the body to make adenosine triphosphate (ATP). This is a molecular fuel used by the muscles to power contractions. The more carbohydrates you include in your diet, the better your muscles run.

In 1967, a now-classic study was performed to look at the effects of carbohydrate intake on glycogen levels and endurance. Endurance was measured by exercise time to exhaustion, with the subjects training at 75 percent of their maximal aerobic capacity.

The researchers found a direct relationship between carbohydrate content of the diet and endurance time. A low-carbohydrate diet (5 percent of calories) provided enough muscle glycogen stores to sustain one hour of exercise. A moderate carbohydrate diet (50 percent of calories) resulted in glycogen levels to sustain 115 minutes of exercise. The high-carbohydrate diet (82 percent of calories) supported 170 minutes of high intensity exercise. Clearly, a high-carbohydrate diet is beneficial for endurance.²

The best source of carbohydrate to meet the energy demands of the body are starchy carbs and fibrous carbs. I recommend that you eat at least one to two servings of starchy carbs and one to two servings of fibrous carbs at each meal, along with a lean protein source. For guidelines on how to do this, see The Parrillo Nutrition Manual™.

Fuel Your Body with Carbohydrate Supplements

The longer and harder you train, the more depleted your glycogen reserves become, and the sooner you fatigue. One way to prevent the onset of fatigue and help extend energy is to use a powdered carbohydrate supplement in your diet.

Select a formulation that contains low DE dextrines, either maltodextrin or rice dextrin. These are slow-releasing carbohydrates derived from grains that provide sustained energy levels. This type of formulation is found in Parrillo ProCarb™ and Parrillo 50-50 Plus™.

For even greater energy and endurance, sip that carbohydrate beverage during your workouts. This provides a source of carbohydrate other than muscle glycogen. With glycogen spared, fatigue is delayed.

Mix in CapTri®

CapTri® is a medium-chain triglyceride (MCT) supplement. MCT oil is preferentially used as fuel for energy, instead of being stored by the body. Medium chain fatty acid fragments can diffuse into the cell very quickly, where they are burned immediately for energy - at the same time as glucose. The
ability of MCTs to enter the cells in this manner has a glucose-sparing effect, meaning that glucose and its stored counterpart, muscle glycogen, last longer without being depleted. The longer glycogen reserves last, the more energy you have.

To boost your endurance during exercise, take CapTri with a carbohydrate sports drink. At the University of Capetown Medical School in South Africa, researchers mixed 86 grams of MCT oil (nearly 6 tablespoons) with two liters of a 10 percent glucose drink to see what effect it would have on the performance of six endurance-trained cyclists. The cyclists were fed a drink consisting of glucose alone, glucose plus MCT oil, or MCT oil alone. In the laboratory, they pedaled at moderate intensity for about two hours and then completed a higher-intensity time trial. They performed this cycling bout on three separate occasions so that each cyclist used each type of drink once. The cyclists sipped the drink every ten minutes. Performance improved the most when the cyclists supplemented with the MCT/glucose mixture. The researchers did some further biochemical tests on the cyclists and confirmed that the combination spared glycogen while making fat more accessible for fuel.

Supplement with Endurance-Enhancing Nutrients.

These include the following inosine, L-phenylalanine, D-phenylalanine, ferulic acid (FRAC), and magnesium and potassium aspartates, which is the formulation in our Max EnduranceT Formula.

Inosine improves oxygen utilization for better stamina, possibly by forcing additional production of ATP. L-phenylalanine is an essential amino acid that acts as a potent mental stimulant for improved concentration during workouts. The mirror image of L-phenylalanine is D-phenylalanine, an amino acid that inhibits the breakdown of endorphins (a protein-like substance with analgesic properties) for a higher pain threshold. Ferulic acid (FRAC), stimulates the endocrine system to aid recovery and boost workout capacity.

Hard training produces certain waste products, including ammonia. By turning ammonia into uric acid, aspartates help filter waste products from the system, giving you extra stamina and extending endurance.

Supplement with Liver Tablets.

Among the most crucial supplement for anyone who wants to increase endurance is desiccated and defatted liver, the basis for our Liver-Amino™ Formula. I can’t overemphasize the importance of this supplement, because defatted liver is an excellent source of heme iron.

Iron is essential for the manufacture of two important proteins in the body: hemoglobin, a constituent of red blood cells that gives them their color; and myoglobin, an oxygen-carrying protein in muscle cells. Hemoglobin picks up oxygen from the lungs and transports it to the body’s cells where it is used to produce energy from the foods you eat. Myoglobin allows oxygen to be consumed inside muscle cells. Without adequate iron, the oxygen delivery system won’t work well, nor will oxygen be burned properly inside the cells. Clearly, iron has a central position in producing energy.

For best results, I recommend that you take several Liver Amino™ Formula tablets with each meal. Along with ample calories from high-density foods, desiccated liver supplements should help you reach peak levels of performance.

There you have it - ways to boost endurance, naturally and safely - as long as you’re willing to go the extra mile nutritionally, and not take short cuts.

References
The Effect of Adenosine Triphosphate (ATP) on Cellular Energy
by John Parrillo

Understanding something about cellular energy production will allow you to make intelligent decisions about how best to supply fuel for your body, depending on your goal. Is it weight gain, weight loss, or maximum performance in terms of strength or endurance?

The immediate source of chemical energy which cells use is a chemical called “ATP,” which stands for adenosine triphosphate. The “triphosphate” part of the molecule is made of three phosphate groups, as the name implies. Each phosphate group is strongly negatively charged, causing them to repel one another. ATP is thus an inherently unstable molecule. When ATP breaks down it releases one of its phosphate groups, forming free phosphate plus ADP (adenosine diphosphate). This chemical process releases energy which is used to power cellular work, such as muscle contraction. So the energy contained in food must first be converted into ATP before cells can use it.

Your cells are constantly using ATP, so it must continually be replaced. There are three basic energy pathways which maintain ATP levels. These are the phosphagen system, the anaerobic pathway, and the aerobic pathway. The phosphagen system relies on a molecule called creatine phosphate to supply energy to the system. It is no wonder that creatine has become one of the most popular sports supplements on the market today. Once creatine gets inside cells, it is combined with phosphate to form creatine phosphate. Creatine phosphate then is able to donate its phosphate group to ADP, thereby re-forming ATP. So as ATP is used, the phosphagen system acts to immediately restore it.

Your body makes about a gram of creatine a day on its own, plus most people get about another gram from diet each day. Using a creatine supplement can significantly increase creatine intake. Orally administered creatine is absorbed into the bloodstream and taken up by muscles. Creatine phosphate itself is NOT well absorbed. Some supplement manufacturers sell creatine in the form of creatine phosphate, but that’s a bad idea. It’s not absorbed nearly as well as regular creatine. By increasing the intracellular concentration of creatine, you provide the phosphagen system with a larger energy reserve. This means that you can perform maximal bouts of exercise longer than before. Creatine helps for very intense exercises of relatively short duration. It helps in weight training and in other sports where quick bursts of energy are required, like football, wrestling, and sprinting. It improves peak power output, duration of peak power output, and recovery between bursts of near maximal activity. It is less helpful in endurance activities, since the phosphagen system is not the major energy producing pathway there.

The phosphagen pathway by itself can supply energy only for a few seconds of maximal effort. Cells store enough ATP to last for two or three seconds, and the creatine phosphate reserve can last for maybe eight seconds or so. It is clear we need an energy pathway that can sustain longer durations of exercise. The primary energy producing pathways in cells are the anaerobic and aerobic pathways. Ultimately, it is the aerobic pathway which meets the body’s energy needs, but the anaerobic pathway helps to sustain very intense activity for between one and two minutes. First, let’s define what these terms mean.

“Aerobic” means “with oxygen,” and “anaerobic” means “without oxygen.” Food molecules are “burned” inside cells to produce energy. When a log burns on the fire, carbohydrate molecules in the wood combine with oxygen and become “oxidized.” This change in chemical state is the heat energy you feel emitted from the flames. Inside the cells of your body, food molecules are combined with oxygen to release energy. The difference is, when food is oxidized inside a living cell, instead of all the energy being lost as heat, some of it is used to form ATP. Before cells can use the energy that is released from the oxidation of food, it first must be converted into ATP. In the end, all the energy your body uses is derived from the oxidation of food. This is aerobic metabolism. And that’s why if you’re deprived of oxygen for more than a few minutes, you die - your cells run out of energy.

The only problem is, aerobic metabolism can only supply energy so fast, and sometimes you want to supply energy quicker. That’s where anaerobic metabolism comes into play. During times of intense exertion, when the energy demands of the body exceed the ability of the aerobic system to supply energy, food molecules are partially broken down but not oxidized. This
initial metabolism can yield only a relatively small amount of energy, but can do so very quickly. Let’s look at some examples. You can sustain low intensity exercise, like walking, all day long. That’s because the aerobic energy pathway can supply enough energy to sustain that activity, and the aerobic pathway can yield vast amounts of energy. At the other end of the spectrum, consider intense weight lifting. You can lift a heavy weight for maybe eight to ten reps, which takes about 30-40 seconds to do, and then you reach failure. There are many reasons for muscles to reach fatigue at the end of a set, but the primary one is depletion of ATP. The phosphagen system works well for the first few reps, and the anaerobic pathway can supply energy for about a minute, and then you just cannot replenish ATP fast enough to keep up with the demands of the exercise.

During any form of activity, the aerobic and anaerobic systems are both at work. During long duration, endurance exercise it’s mainly the aerobic system which supplies the energy. During short duration, intense exercise, like weight lifting, it’s mainly the anaerobic system. During your rest intervals between sets your body is completing the oxidation of the food molecules that were anaerobically metabolized during the set. That’s why you breathe hard for a minute or so after a set - you’re using a lot of oxygen to replenish your ATP stores.

If you’re involved in short duration, intense exercise, such as weight lifting or sprinting, you will derive some benefit from creatine supplementation. Parrillo Performance Creatine Monohydrate™ is the highest purity creatine supplement available. Creatine can help improve strength, duration of maximal exercise output, and recovery between maximal exercise bouts. You should realize that carbohydrate can be metabolized anaerobically, but fat cannot. Therefore, carbohydrate is a better energy source for very intense exercise than fat is. Fat can only be metabolized aerobically. That makes it a fine fuel for low intensity exercise like walking, but not good for weight lifting or most team sports. Most competitive athletes will do well to rely on carbohydrate as their primary fuel source rather than fat. Two scoops of Pro-Carb™ before your workout can markedly improve your work output and duration. Since fat can only be metabolized aerobically, it is important that you include some aerobic exercise in your workout protocol. You will burn essentially no fat during a weight lifting session. If being lean is part of your goal, you will get the best results if you do some cardiovascular exercise in addition to your weight training.

In summary, keep protein intake between one and two grams per pound of body weight each day, minimize fat intake, and supply the remainder of your caloric needs with unrefined, complex carbohydrates. This will provide the optimum fuel mix to power intense exercise. And don’t forget to do some aerobic exercise activity, as this is required to burn fat.
Nutritional Supplementation: An Overview, Part 1
by John Parrillo

Many of the calls we get on our information line are questions regarding supplement selection. There are so many choices available that sometimes it can be confusing trying to decide which ones are the best for you. In this bulletin I want to highlight a few of our supplements, describing what they are, how they can help, and how to use them. This knowledge will help you make intelligent choices about which supplements are best for your particular needs.

Before I get started, two general comments: First, what are the best supplement choices for you depend on your immediate goals, and will change as your goals change. For example, the best supplement program to support muscular weight gain will not be identical to the best supplementation program to facilitate fat loss, although there will be some common features. Also, strength athletes, such as bodybuilders and power lifters, have somewhat different nutritional needs than endurance athletes. Finally, dietary intake varies from person to person according to food preferences, so different people will require supplementation in different areas. Vegetarians, for example, will likely benefit very much from protein supplementation, since vegetarian diets are relatively low in high quality proteins. Second, I want to emphasize that wholesome, natural foods form the basis of any healthy nutritional program. Parrillo Performance is perhaps the only supplement company that puts the emphasis on food before supplements. Contrary to popular misconception, no amount of supplements can correct a bad diet. The first step is to eat right, selecting wholesome, nutritious foods. Then, supplements can add to the amount of nutrients at the cellular level beyond what you are able to derive from food alone. In other words, you will get the best benefit from whatever supplements you use if they are used in conjunction with a healthy diet from natural foods. This is why we strongly encourage anyone who wants to use our supplements to buy the Parrillo Nutrition Program first. The Parrillo Nutrition Manual provides detailed instructions on which foods to eat, how much to eat, how many meals to eat, and how to combine foods to construct a meal. It is an invaluable resource for anyone wanting to be healthy and fit.

Essential Vitamin Formula and Mineral-Electrolyte Formulas

I will discuss these two supplements first because I believe virtually everyone should use a vitamin and mineral supplement. While it is generally accepted that you can avoid an overt vitamin or mineral deficiency disease state by eating a balanced diet, it is also widely known that athletes do not, in general, eat a balanced diet. Numerous studies have shown that many, if not most, athletes are deficient in one or more vitamins or minerals. This is not only because athletes usually don’t eat a balanced diet, but also because intense training depletes the body of various vitamins and minerals. On top of this is the concern that while consuming the RDA for vitamins and minerals may be enough to prevent a deficiency disease, in no way is that an assurance that you are getting enough to allow peak athletic performance. Furthermore, non-athletic people as well often do not consume a balanced diet. And, virtually no one eats enough dairy products to satisfy the body’s calcium requirement.

Many athletes, especially bodybuilders, eat very little fruit. That is because nearly all the calories provided by fruit come from sugar. Even worse, much of that sugar is in the form of fructose, a sugar with a very high tendency to be converted to fat. Bodybuilders have learned from experience to avoid fruit because it makes them fat. As you know, fruit is a good source of many vitamins and minerals, some of which are not very abundant in other types of food. Also, bodybuilders generally do not use many dairy products for much the same reason. A cup of milk contains eight grams of high quality protein, and 12 grams of carbohydrate. The form of carbohydrate in milk is also sugar (mainly glucose and galactose). So while milk and other dairy products are a good source of protein, and the best whole food source of calcium, bodybuilders generally avoid them because of the sugar content. So, by limiting fruit and dairy consumption, as most bodybuilders do, they are missing some of the best food sources of many vitamins and minerals. Even most non-athletic people don’t get enough vitamins and minerals. In reality most people do not eat enough fruits, vegetables, and dairy products to meet their body’s requirements for vitamins and minerals.

Parrillo Performance Essential Vitamin Formula™ and Mineral-Electrolyte Formula™ provide a complete array of vitamins and minerals. The suggested use is one tablet of each with each meal, for a total of at least four tablets of each per day. Rather than overwhelming your body with a huge dose of vitamins once a day, we feel it makes more sense to distribute your intake of vitamins and minerals evenly throughout the day. This will enhance absorption and assimilation as well as reduce GI upset (that can occur from taking too many vitamins at once). Furthermore, this method of delivery provides your muscles and other organs with a constant supply of the nutrients they need to grow and function optimally. Each Parrillo Performance Mineral-Electrolyte Formula™ tablet contains 250 mg of calcium. That means if you take four per day you will
Nutritional Supplementation: An Overview, Part 1

get 1000 mg of calcium, the RDA. (Note the recommended calcium intake for treating established osteoporosis is 1500 mg per day.) Most people are surprised how much calcium they need per day. It takes four extra strength antacid tablets to supply 1200 mg of calcium. If you can imagine combining this into one pill, you can see how big it would be. And that’s just the calcium - it doesn’t even include any other vitamins or minerals. So most multi-vitamin-mineral supplements they sell at the grocery store are really short-changing people on calcium intake. Read the label next time you’re in the store.

Many athletes, especially bodybuilders, eat very little fruit. That is because nearly all the calories provided by fruit come from sugar. Even worse, much of that sugar is in the form of fructose, a sugar with a very high tendency to be converted to fat. Bodybuilders have learned from experience to avoid fruit because it makes them fat.

Vitamins and minerals support many essential bodily functions. Most vitamins act as co-enzymes, meaning that they bind to enzymes and help them work better. Many enzymes are almost devoid of activity unless supplied with the proper co-enzyme. Why should you care? Because enzymes are crucial for cellular energy production, including muscle contraction. Enzymes are also required for fat burning. Vitamins and minerals are required for a multitude of body functions, and athletic training increases many of these needs. Our vitamin formula contains high amounts of B vitamins, vital for energy production and required in extra amounts by athletes. Our mineral formula also contains chromium, which is required for the proper functioning of insulin. Many Americans, including athletes, are chromium deficient. In addition to their function as co-enzymes, some vitamins function as anti-oxidants. Vitamins C and E are potent anti-oxidants, but considerably more than the RDA is required to attain any significant anti-oxidant activity. The RDA was established as the amount needed to prevent deficiency diseases, not the amount required to derive anti-oxidant benefits. Parrillo Essential VitaminT Formula contains high levels of the anti-oxidants, well above the RDA.

Hi-Protein Powder™ and Optimized Whey Protein™

These supplements will be discussed second because nearly every athlete will derive benefit from a high quality protein supplement. As recently as ten years ago it was still debated whether or not athletes really do need more protein than sedentary people. This argument is settled now that more sensitive analytical methods of protein metabolism have become available. Also, several studies have looked directly at the effect of increased protein intake on muscle growth and strength development during strength training. These studies show conclusively that increasing protein intake to 2-3 times the RDA will facilitate increases in muscle mass and strength resulting from weight training. Something else that has come out of these studies is the realization that endurance athletes also need extra protein.

Why has this issue been so controversial? Because nutritionists (of old) argued that the RDA supplied plenty of protein to facilitate muscle growth. What they failed to consider was that athletic training increases protein catabolism (protein breakdown). Intense weight training and endurance training cause a lot of damage to muscle that sedentary (inactive) people don’t experience. So while it may not take many extra grams of protein intake per day to build muscle at a reasonable rate, you also have to consider that exercise training is quite catabolic. Most of the “extra” protein athletes require is needed to compensate for the wear and tear that happens to muscles during exercise. Furthermore, a certain amount of protein is used as fuel during endurance exercise. Around 10% of the energy requirements of a 10k run are met by amino acid oxidation. So while muscle growth is not the primary goal of endurance athletes, they also need extra protein just to prevent muscle wasting caused by the catabolic effects of intense endurance exercise.

Parrillo Performance Hi-Protein Powder™ and Optimized Whey Protein™ are two of the very best protein supplements available. Both are derived from milk proteins, but don’t contain the sugar or fat found in milk. Hi-Protein Powder™ is a mixture of casein and whey proteins, while Optimized Whey Protein™ is a pure whey isolate. Each has its own unique advantages for both the endurance athlete and the bodybuilder. The casein in Hi-Protein Powder™ slows the digestion of the protein and causes a slower, more gradual release of amino acids.

Theoretically that may facilitate assimilation into muscle, although that has never been studied scientifically. Pure whey protein is digested more rapidly, which some people may consider an advantage. Also, the Optimized Whey Protein™ is somewhat higher in branched chain amino acids, which are preferentially oxidized as fuel during endurance exercise. This may make Optimized Whey Protein™ a better choice for endurance athletes. For bodybuilders, either one is a perfect choice, and selection depends mainly on personal preference regarding taste and gastric emptying characteristics.

In addition to improving gains in muscle and strength during weight training, many people are finding that a diet higher in protein helps them stay lean. That’s because of all the major nutrients (protein, carbohydrate, and fat), protein is the least likely to be stored as body fat. Many people, and especially athletes, find it practically impossible to get as much protein as they want from food alone. As a closing note, if you’re one of the millions of people who use nutritional supplements in place of a regular food meal once or twice a day, make sure you’re using a supplement that’s high in protein. Many of the supposed weight loss supplements or meal replacements are nothing more than chocolate milk with some vitamins and sugar added.

References


In Bulletin #93 I discussed some of the most basic and important supplements for athletes: vitamins, minerals, and protein. This month I want to continue with some other core supplements: Pro-Carb™ and CapTri®. These two supplements are excellent energy sources for bodybuilders and endurance athletes alike. They also provide a good source of clean calories for anyone trying to gain weight.

Pro-Carb™

Pro-Carb™ is primarily a carbohydrate supplement, with a small amount of protein added to slow digestion. Each serving of Pro-Carb™ provides 33 grams of carbohydrate and 6 grams of protein. The carbohydrate supplied by Pro-Carb™ is low DE maltodextrin, a medium-chain carbohydrate. Maltodextrin is a much more desirable carbohydrate source than sugar because it elicits a much lower insulin response. Therefore it will sustain a more uniform energy level than the highs and lows associated with simple sugars.

Pro-Carb™ is an ideal energy source for endurance athletes, or for bodybuilders who want to maintain a high energy level throughout long workouts. Carbohydrate is the preferred energy source of intensely exercising muscles. Carbohydrate is stored in muscles and liver in the form of glycogen. When glycogen stores are depleted, exercise performance is severely curtailed. This is referred to as “hitting the wall” by marathon runners, or “bonking” by cyclists. This is because fat cannot be metabolized rapidly enough to sustain maximum exercise performance. Stored body fat contains many thousands of calories, but those calories are relatively slowly metabolized. Body fat can sustain activities like walking nearly indefinitely, but does not supply energy fast enough to fuel running or intense cycling. Furthermore, fat is not an effective energy source for weight lifting. Weight lifting is probably the most intense exercise, requiring short bursts of maximal effort. Muscles must have carbohydrate to generate peak contractile force. Once muscle glycogen (carbohydrate) stores are depleted, weight lifting performance declines dramatically.

Muscle glycogen is also important in obtaining a pump, and in having that round, full look you want your muscles to have. Before competition bodybuilders usually undergo a protocol called “carb loading,” to maximize muscle glycogen stores. This helps their muscles look bigger and fuller. Endurance athletes also do this before a competition, not so much to make their muscles bigger, as to store as much “on board” energy as possible. Carb loading has been shown to improve endurance performance as well as increase muscle size and density. To perform carb loading, the athlete begins about six days or so before the competition by decreasing carbohydrate intake while continuing to train. This depletes stored muscle glycogen. After three days of glycogen depletion, the athlete increases carbohydrate intake beyond normal levels, while decreasing training activity. This causes the muscles to super-compensate, and store more glycogen than they normally would. After three days of loading, the muscles have reached their maximum storage capacity for glycogen. This gives bodybuilders big, hard muscles, and endurance athletes a topped off gas tank. Refer to the Parrillo Performance Nutrition Manual™ for detailed carb loading protocols, including directions on how much carbohydrate to consume when depleting and the loading.

Pro-Carb™ is an ideal carbohydrate supplement for both bodybuilders and endurance athletes. To maximize daily training performance use two scoops of Pro-Carb™ about 20-30 minutes prior to training. If you engage in particularly long workouts, you might derive more benefit from increasing this to two scoops two or three times a day.

Pro-Carb™ also works very well during carb loading. Here you generally would use one to two scoops three times a day, depending on your size and your carbohydrate intake from conventional food.

Pro-Carb™ works very well for so called “hard gainers,” as a source of calories to support weight gain. Most people who have a hard time gaining weight simply don’t eat enough calories. Usually they feel full, and can’t eat enough food to put on any weight. These people are naturally thin, and often do well on a carbohydrate supplement. Of course, they also need to pay strict attention to protein intake, to ensure they are getting enough protein to support an increase in muscle mass.

CapTri®

CapTri® is another energy supplement, but is entirely different from Pro-Carb™. CapTri® is a medium-chain triglyceride (MCT) supplement - the most pure and highly refined on the market. MCT’s are a special kind of fat, which are metabolized very differently than conventional fats. Conventional fats are combined with carrier
proteins in the intestine to form particles called chylomicrons. The proteins help make the fatty acids more soluble, like the way detergent makes oil more soluble in water. The chylomicrons are then released into the lymphatic system, and enter the bloodstream via the thoracic duct. This results in conventional fats entering the bloodstream without first passing through the liver. Most of the fatty acids are then taken up by fat cells (adipocytes) for storage. When fat is consumed along with carbohydrate, the chylomicrons are broken down in the liver and transported to muscles where it is used for energy. CapTri® is not taken up and stored in fat cells, because it is metabolized in the liver. Therefore, CapTri® does not contribute to stored body fat, as does conventional fat. CapTri® does not require the carnitine shuttle to be oxidized, therefore it is used as fuel at the same time as carbohydrate.

That CapTri® can be used as fuel by muscles at the same time as carbohydrate has important implications for endurance athletes as well as bodybuilders. This means it has a "carbohydrate-sparing" effect, helping muscle glycogen stores last longer before being exhausted. CapTri® is metabolized as a fuel source as rapidly as glucose (blood sugar), and at the same time as glucose, which is very different from conventional fats. This makes it an ideal energy source for bodybuilders and endurance athletes alike.

CapTri® is a very efficient source of calories to help support weight gain, particularly lean mass. Adding CapTri® to your diet provides extra calories, supplying energy to support weight gain. However, since CapTri® is metabolized in the liver to produce energy, it does not contribute to body fat stores. CapTri® is not converted into muscle tissue, but it does spare the oxidation of amino acids and glucose, allowing these nutrients to be retained as muscle mass and glycogen, respectively. CapTri® is rather unique among caloric supplements in that it provides calories in a way that cannot be stored as body fat. To use CapTri® to support weight gain, add one-half to one tablespoon to each meal. CapTri® is an oil, and works well in salad dressings or on vegetables. Each tablespoon supplies 114 calories.

Unlike carbohydrate, CapTri® also works well as a supplement to help with fat loss. To use CapTri® to facilitate fat loss, use it in place of carbohydrate. For example, at each meal decrease carbohydrate content by 100 calories and replace this with 100 calories of CapTri®. This will decrease insulin levels, promoting the use of stored body fat as energy. Many people trying to lose weight simply cut calories. This works for a while, but backfires in the end, because your body will slow down its metabolic rate to match the new, decreased, level of caloric intake. Using CapTri® will allow you to maintain energy levels and metabolic rate, but by providing a nutrient array less prone to be stored as fat, and more prone to promote oxidation of stored body fat. Detailed instructions on the ways to use CapTri® are provided in the CapTri® User’s Manual, supplied with each bottle of CapTri®. Also, the Parrillo Performance Nutrition Manual explains this in more detail.

Don’t take CapTri® by itself on an empty stomach, because it can cause cramps. It is best mixed with food or a drink. A combination of two scoops of Pro-Curb™ and one-half tablespoon CapTri® makes a very effective pre-workout drink. You may experience the highest workout energy levels ever. Increase your intake of CapTri® slowly, allowing your stomach to get used to it. Start with one-half tablespoon mixed with food, and gradually increase by one-half tablespoon increments until you achieve the desired intake.

References
The Protein Packed Diet
John Parrillo

Any bodybuilder or athlete knows the importance of eating a sufficient amount of protein each day. Protein has a number of functions in the body: It is involved in the growth, maintenance, and repair of tissue; it helps create hemoglobin, which carries oxygen to cells; it is required for the formation of antibodies to ward off disease and infection; and it helps produce enzymes and hormones for the regulation of body processes.

Three Classifications of Amino Acids

Protein is made up of organic compounds called amino acids, which are required by every metabolic process. Your body needs 22 amino acids in a certain balance to synthesize protein for muscular growth. All but eight of the amino acids can be manufactured by the body. Those eight are called “essential amino acids,” and they are supplied by animal proteins such as chicken and fish. Essential amino acids include lysine; methionine; phenylalanine; threonine; tryptophan; and the branched-chain amino acids, isoleucine, leucine, and valine. Foods that contain the eight essential amino acids are called “complete proteins.”

Of the 22 amino acids, seven are considered “conditionally essential,” which means that under certain conditions such as extreme stress the body cannot manufacture enough of them. These amino acids include arginine, cysteine, glutamine, histidine, proline, taurine, and tyrosine. The remaining seven amino acids are termed “nonessential amino acids,” which the body makes on its own. These amino acids include alanine, asparagine, aspartic acid, citruline, glutamic acid, glycine, and serine.

Protein and Your Metabolism

Of all foods, protein has the highest “dynamic action” on the metabolism. This describes the ability of a food to stimulate the body’s metabolic rate. All foods do this to some extent. Studies, however, have shown that a high-protein meal raises the metabolic rate more than 30 percent in a 10 to 12-hour period, whereas carbohydrates and fats increase the metabolic rate approximately four percent over the same time period. This is significant, since increasing metabolism aids in fat-burning. Without enough protein in your diet, the body cannot properly drive the metabolic processes or support growth and repair.

How Much Protein Do You Need?

Bodybuilders have higher-than-normal requirements for protein because the muscles use more amino acids during training. For most bodybuilders, strength trainers, and other athletes, the recommended protein intake is 1.25 to 1.5 grams of protein per pound of body weight per day. At least one gram of protein per pound of your body weight should come from complete protein sources such as lean white meat poultry, fish, egg whites, and protein supplements. The remaining should come from starchy and fibrous carbohydrates, which also contain protein. These guidelines are explained in the Parrillo Nutrition Manual™.

Each meal should be structured to include a lean protein, one or two starchy carbohydrates, and one or two fibrous carbohydrates. This combination of foods has two important benefits: First, the protein and fi-
While bodybuilders and athletes obtain their protein mostly from food, many will supplement their diets with protein in the form of protein powders or sports bars. These supplements are typically formulated with several high-quality proteins from animal and plant sources. Egg protein (ovalbumin), for example, is a very high grade form of supplemental protein. Its use in protein supplements has decreased somewhat, however, because it is expensive and high in sodium.1

Extracted from milk, caseine is another high-quality protein that is widely used in supplements. You find this protein in Hi-Protein Powder™, Pro-Carb Powder™, 50-50 Plus Powder™, and Parrillo Sports Nutrition Bars™, Parrillo Protein Bars™, and Parrillo Energy Bars™. One of the highest quality protein found in protein supplements is whey protein, which is a component of milk that is separated from milk to make cheese and other dairy products. Whey is among the most rapidly digested of all supplemental proteins. What this means to you is that the amino acids in whey are rapidly absorbed so that the processes of repair and growth can be accelerated.2 In addition, whey is loaded with various health-building nutrients, including B-complex vitamins, selenium, calcium, and iodine.3

Whey protein is found in the following Parrillo products: Optimized Whey Protein™, Hi-Protein Powder™, 50/50 Plus Powder™, Parrillo Sports Nutrition Bars™, Parrillo Protein Bars™, and Parrillo Energy Bars™.

Soy protein is also found in numerous products on the market. However, it lacks the amino acid methionin so it doesn’t have as high a protein efficiency ratio as milk proteins.

How to Use Protein Supplements

A good time to consume any of our supplements containing these proteins - particularly those supplements that contain some carbohydrate too is immediately following your workout. Scientific experiments indicate that protein/carb supplements initiates the rapid uptake of carbs by your muscles - faster than carbs alone.4

In addition, a carbohydrate/protein supplement taken following a workout stimulates the release of two hormones (insulin and growth hormone), creating an environment favorable to muscle growth and recovery.5

Protein supplements play a key role in metabolism and nutrition. Used in conjunction with the proper foods, they can assist in decreasing body fat, supporting muscular growth, extending endurance, and promoting better recovery and repair after training.

References
Creatine is one of the most powerful sports nutrition supplements available. It is remarkable in that creatine causes noticeable increases in muscle size and strength within as little as one week of use. To understand how creatine works, you have to know a little about muscle physiology.

The immediate source of chemical energy which is used to power muscular contractions is a molecule called ATP, or adenosine triphosphate. When the food you eat is oxidized, or burned, to produce energy, that energy is used to generate ATP. Then the ATP is used to power muscle contractions. A good analogy is a coal-fired generator. Coal is burned to produce heat, which then heats water to make steam, which then turns a turbine to make electricity. The electricity then runs your fan. It’s a process of transforming chemical energy (in the coal) into heat energy (in the steam) into electrical energy (the electricity), and finally re-from the ATP.

Here’s how

Once creatine gets inside muscle cells, a phosphate group is added to form creatine phosphate. Creatine phosphate is then in a position to donate its phosphate group to ADP, thereby re-generating ATP. So, the more creatine you have inside your muscle cells, the more ATP you can make, and the more energy you have to power muscle contractions.

Bottom line

More creatine allows you to constantly keep your ATP levels topped off, so you have more energy for muscular contractions. And that means more strength, and more reps.

Creatine supplementation results in an increase in strength between 5-15%, depending on what your creatine levels were beforehand. And it also increases your endurance, for another two or three reps per set. So you lift more weight, for more reps, which obviously is going to help your muscles grow faster. Regarding performance, creatine helps the most in situations of very intense exercise, when ATP is rapidly depleted. The best examples are weight lifting and sprinting, where bursts of maximal or near maximal effort are required. It is not so important in really long endurance exercise, where the intensity of effort is lower but for a longer time. The best uses are in applications such as weight lifting, sprinting, and in sports where bursts of very high intensity effort are required, like football, baseball, and basketball. In high intensity exercise, creatine has proven to definitely improve performance. Competitive athletes in sports such as these would be fools to be without it.

Muscle size

Regarding muscle size, creatine helps in two ways. A more long-term effect is that creatine supplementation allows you to lift more weight for more reps, so you get more muscle fiber hypertrophy. A more immediate effect is that as muscle cells take up creatine, it takes water along with it. So it makes the muscle fibers swell, getting bigger and harder. After a month of creatine supplementation, you might ingest only 250
grams of creatine, but gain six to fourteen pounds of muscle mass. That weight is mostly water, being drawn inside muscles cells by the extra creatine. It’s kind of like having a constant pump.

Your body makes some creatine naturally. The kidneys make about one gram per day. Creatine is also contained in meat, and the average diet of meat eaters supplies about another gram per day. So, without creatine supplementation, you get about two grams per day, unless you’re a vegetarian, in which case you get about one gram per day. Creatine supplementation allows you to propel this to a much higher level. This increases the amount of creatine inside muscle cells, making them bigger and harder and stronger.

The way to use creatine is to start with a loading phase, which usually is 20 grams a day for five to seven days. To do this, take five grams (one teaspoon) four times a day, for five to seven days. This is followed by the maintenance phase, which is five to ten grams a day. After only one month, you will see a noticeable increase in size and strength. Parrillo Creatine Monohydrate™ is the highest purity creatine supplement available.

And a word of caution: don’t be fooled into buying creatine phosphate supplements. It sounds like a good idea, until you realize creatine phosphate is not absorbed from the intestine. You need to use creatine monohydrate, which is absorbed from the intestines. Once transported inside muscle cells, it is converted into creatine phosphate. Also beware of liquid creatine supplements, as creatine will break down after a few weeks of being dissolved in water.

Supplements to use with creatine

To boost your gains through the roof, there’s an excellent supplement to use in combination with creatine: 50-50 Plus™, 50-50 Plus™ is a drink mix made from about 50% protein and 50% carbohydrate. The protein portion is very much like our Hi-Protein Powder™, and the carbohydrate part is derived from Pro-Carb™. Studies have shown that a combination of protein and carbohydrate like this works better at promoting muscular growth than either one alone. Combining creatine with 50-50 Plus™ is, quite frankly, the most potent nutritional supplement available for supporting muscle growth. The amino acid profile of the protein is ideal for supporting muscular growth, and the carbohydrate replenishes glycogen, further enhancing energy levels and strength. The best time to use this combination is after training. At that time your muscles are depleted and are begging for nutrients. The protein acts to repair muscle damage from training as well as to supply the building blocks to generate new muscle tissue. The carbohydrate replenishes glycogen, as well as increasing uptake of the amino acids and creatine by muscle cells. If you’re on a budget and want to keep things simple, try 50-50 Plus™ along with creatine. After just one month, used in combination with proper diet, you will see and feel a difference.

Another very effective supplement, which is often overlooked, is Parrillo Liver-Amino Formula™. Some people have the misconception that this is just a fancy protein supplement in the form of a pill, but nothing could be further from the truth. It is much more that that, and is a first-line supplement for many athletes. In addition to providing a very high quality protein source, this supplement also includes heme iron and B vitamins, including a rich source of B-12. Most iron supplements are very poorly absorbed. “Heme iron” is iron combined with a chemical group called “heme,” for which hemoglobin is named. Hemoglobin is the protein molecule inside red blood cells that binds oxygen, transporting it to tissues. Heme iron is absorbed much more efficiently than non-heme iron, and works much better to build red blood cells. This enhances oxygen transport, greatly facilitating endurance, growth, and recovery.

Many athletes are actually iron deficient, especially female athletes. Studies have shown that 25% of female athletes suffer from iron deficiency, without even knowing about it. Correction of iron deficiency anemia results in a dramatic improvement in exercise performance. Without adequate oxygen delivery, your muscles simply cannot work like they’re supposed to. If oxygen delivery is compromised, then energy production is compromised, and strength and endurance suffer. Many people who take our Liver-Amino Formula™ are amazed at the increase in energy level they have. And increased energy leads to longer, harder, more intense, and more productive workouts. Liver-Amino Formula isn’t really a mass-building supplement, like creatine and 50-50 Plus™ are. It’s more of a performance supplement. It enhances energy production by helping to build red blood cell mass and thereby increasing oxygen delivery to working muscles. This improves exercise performance as well as enhancing recovery and boosting energy levels.
Immuno-Nutrition
by John Parrillo

No serious bodybuilder, athlete, or exerciser wants to be sidelined by the cold, flu, or other pesky infection. But it happens - and for various reasons. One has to do with the potentially “dark side” of exercise: In certain circumstances, exercise can suppress your immune system, which is your defense against infections and illness, by altering hormonal and biochemical functions in the body. Not to worry, though: In most situations, exercise does the opposite. It enhances your immune system.

But what of those cases where exercise impairs immune defenses?

According to scientific research, these can occur under the following circumstances:

• You’re under mental stress.
• You’re undernourished. (Research indicates athletes consume about 25 percent fewer calories than they need, leading to deficiencies of many essential nutrients.)
• You exercise in a carbohydrate-depleted state (this increases the circulation of stress hormones in your body, plus harms immune-protective substances in the body).
• You’ve attempted quick weight loss through caloric deprivation.
• You’ve practiced improper hygiene.

The good news is that you can protect yourself from infections with improved nutrition and lifestyle practices. Here’s a look at how:

1. Supplement with extra carbs

Supplementation with carbohydrate beverages - before, during, and after exercise - has been shown to strengthen immune responses. For example, it reduces levels of the hormone cortisol in blood. That’s good, since cortisol suppresses immune response. Carbohydrate supplementation also appears to protect various types of immune cells from weakening. If you’re on the Parrillo Nutrition Program™ a good supplement choice is our ProCarb™ Formula, which can be used before, during, and after a workout.

2. Consume whey protein supplements

Research shows that whey protein diets increase the amount of glutathione in body tissues. Glutathione is a peptide (an amino acid derivative) that is involved in strengthening immunity. The elevation of glutathione has been shown to inhibit the development of several types of tumors, according to numerous studies.

Whey protein is found in the following products: Optimized Whey Protein™, Hi-Protein Powder™, 50/50 Plus Powder™, Parrillo Sports Nutrition Bars™, Parrillo Protein Bars™, and Parrillo Energy Bars™.

3. Beware of the “overtraining myth.”

“Overtraining” refers to poor performance in training and competition, and its symptoms include fatigue, frequent illness, disturbed sleep, and moodiness.

Overtraining, however, is simply “underrecovery” or “undereating” - not taking in enough nutrients to fully recover from your workouts. If ample nutrients are not provided, intense workouts won’t do much good. But once you get in the habit of making your nutrition as intense as your training, your workouts will be much more productive, and you’ll see results much quicker.

Make sure you remain in a calorie surplus - that is, eating ample calories and taking in supplemental nutrients to support your energy needs throughout the day. Follow a high-calorie nutrition program, and you should have enough energy stamina to blast through any workout, regardless of how long or intense it is. You’ll also have enough recuperative power to sustain you from workout to workout, without any compromise of energy or immune function.

4. Take antioxidants

Antioxidants are nutrients found in foods and supplements that protect the body from the onslaught of disease-causing free radicals. Free radical damage has been implicated in diseases such as cancer and heart disease.

Fortunately, free radicals aren’t allowed to do their bad deeds without being policed. They’re apprehended by the antioxidant nutrients, which include vitamins A, C, E, beta-carotene, and certain minerals and enzymes. These nutrients simply donate an electron to a free radical but without changing into a radical itself. This action “neutralizes,” or stops the dangerous multiplication of still more free radicals.
Supplementing with antioxidant nutrients has been found in research to help protect the body against age-related diseases. You get vitamins A and E by eating a diet rich in vegetables and whole grains. Vitamin A, in particular, is found in yellow and orange foods, such as yams - a bodybuilding staple. Nutritionists feel that our diets don’t supply all the vitamin E needed for good health. Thus, supplementation of vitamin E is recommended.

By following the Parrillo Nutrition Program™ and supplementing with the Parrillo Essential Vitamin Formula™ and the Parrillo Mineral-Electrolyte Formula™ you supply your body with the antioxidant vitamins and minerals it needs for good health.

5. Try arginine
Arginine is considered a non-essential amino acid, meaning the body can synthesize it from proteins and other nutrients. Despite the fact that arginine is labeled non-essential, it has a number of important functions in the body, including the fortification of the immune system. In studies with animals and humans, arginine has been found to improve wound healing and bolster immune responses, plus reduce the incidence of infection following surgery.6,7

Arginine has other duties, as well. It is required to manufacture creatine, an important chemical in the muscles that provides the energy for contractions. In addition, Arginine apparently helps prevent the body from breaking down protein in muscles and organs to repair itself when injured. Meat, poultry, and fish are good sources of arginine, as are numerous supplements, including our Enhanced GH Formula™ and our Ultimate Amino Formula™.

6. Get in the zinc sync
Zinc has far-reaching roles in the body. For example, it helps absorb vitamins; break down carbohydrates; and regulate the growth and development of reproductive organs. Zinc is also an important immune-boosting mineral, involved in making superoxide dismutase (SOD), an antioxidant enzyme that inactivates certain free radicals. Zinc, however, can be depleted by prolonged, high-intensity exercise if you’re poorly nourished. Because zinc is required for the activity of several enzymes involved in energy metabolism, reductions in zinc concentrations in muscle may lead to muscle fatigue.8 The best sources of zinc are lean proteins, whole grains, and mineral supplements. Zinc is one of the minerals found in our Mineral-Electrolyte Formula™.

7. Manage athletic stress
Hard-training bodybuilders and athletes can succumb to the immune-weakening effects of stress just like anyone else. Here are some ways to prevent this:9

- Vary your training routine to avoid monotony.
- Space your competitions appropriately so as to not place undue burden on your recovery and immune responses.
- Practice stress reduction strategies such as relaxation if you’re continually stressed out over competition.
- Get adequate rest and recovery.
- Reduce environmental stress by limiting the time you train in heat, cold, humidity, or polluted air.
- Practice good hygiene to limit the transmission of contagious illnesses.
- Get regular medical check-ups if you have recurrent infections.

References
A Pumped Up Supplement Strategy
by John Parrillo

Despite the abundance of information on nutritional supplements, confusion still reigns over what supplements to take and how to design a program that fits your needs. After you have established nutritious eating patterns with a nutrient dense diet of lean proteins, starchy carbohydrates, and fibrous vegetables, it’s definitely time to add in supplements.

First question: Which supplements? To develop the best possible physique and enhance your performance, you need four groups of supplements: (1) energy supplements; (2) anabolic enhancers; (3) cellular protectors; and (4) recovery supplements. These are briefly described below. By choosing supplements from each grouping, it will be easy for you to map out a supplement strategy.

Energy Supplements
These include carbohydrate supplements, Creatine Monohydrate™, CapTri®, and a trio of special energy enhancers, which are explained below. Here’s a brief look at how each of these supplements can enhance energy.

Carbohydrates are the preferred energy source for athletes, particularly strength athletes. Weight lifting is an anaerobic activity. That means the energy is produced without using oxygen. Carbohydrate is the only fuel substrate which can be broken down to yield energy without reacting with oxygen. So to start with, you should eat a high carbohydrate diet. To increase your intake of carbs, supplement your diet with a beverage such as ProCarb™, or our energy bars. That way, you’ll be well energized for more intense workouts.

Also, include a special kind of fat known as a “medium chain triglyceride (MCT oil)” such as CapTri® in your nutrition program. This type of supplement provides over twice the energy density of protein and carbohydrate (8.3 calories per gram for MCTs versus 4 calories per gram for carbs and protein) and is absorbed into the bloodstream as rapidly as glucose. MCT oil is preferentially used as fuel for energy, instead of being stored by the body. As an added benefit, MCT oil has a thermogenic effect, which means that it is converted to energy very rapidly. It is an extremely concentrated source of calories which are rapidly absorbed and metabolized for energy by the human body.

Start with 1/2 tablespoon at every meal. After a few days, increase to one tablespoon with each meal. During hard training, many athletes go as high as two to three tablespoons per meal - a level they have found to be beneficial.

Supplementing with Creatine Monohydrate™ provides energy-giving benefits too. Among other effects, creatine increases levels of a high-energy compound called creatine phosphate, which also allows more rapid production of ATP. The more ATP that is available to muscle cells, the longer, harder, and more powerfully you can work out.

To use Creatine Monohydrate™ in your supplement program we recommend taking four 5-gram doses a day for five days. This is known as the “loading phase.” From there, two to 5 grams once a day — about a teaspoon — will keep your muscles saturated with enough extra creatine. This period is called the “maintenance phase.”

To put your energy into the fast lane, supplement with Parrillo Max Endurance Formula™. It contains inosine, a natural chemical that improves oxygen utilization for better stamina; dl-phenylalanine, an essential amino acid that can act as a potent mental stimulant for improved concentration during workouts; and ferulic acid, a lipid extract with a number of healthful properties.

In combination with the Parrillo Nutrition and Training Programs™, it is recommended that Max Endurance™ be taken 20 to 30 minutes before training.

Anabolic Enhancers
There are several natural ways to encourage muscle growth. One is supplementation with branched chain amino acids (BCAAs). These include l-leucine, l-iso-leucine, and l-valine, and they make up about one-third of your muscle protein. All three of these nutrients are involved directly in the building of muscle, and deficiencies can lead to muscle loss.

On the Parrillo Nutrition Program™, we advise taking two or more capsules of our Muscle Amino Formula™ with each meal.

In addition, supplement your diet with GH releasers — those containing arginine pyroglutamate and lysine monohydrochloride. These stimulate the release of growth hormone, the most anabolic substance in the human body. Use the Parrillo Enhanced GH Formula™ before bed and before training.

Cellular Protectors
No one wants to get sidelined from ill-
A Pumped Up Supplement Strategy

ness, so it’s important to get your fill of antioxidants from a vitamin supplement such as Parrillo Essential Vitamin Formula™, and minerals from Parrillo Mineral Electrolyte Formula™. Supplementing with antioxidant nutrients, which include vitamins A, C, E, and minerals such as selenium, has been found in research to help protect the body against diseases.  

Another good move: Consume whey protein. Research shows that whey protein diets increase the amount of immune-boosting glutathione in body tissues. Glutathione is an amino acid derivative.

Whey protein is found in the following products Optimized Whey Protein™, Hi-Protein Powder™, 50/50 Plus Powder™, Parrillo Supplement Bars™, Parrillo Protein Bars™, and Parrillo Energy Bars™.

Recovery Supplements

Following a workout, your body needs certain nutrients for growth and repair. These include carbohydrates, which restock muscle glycogen; protein, which jump-starts the muscle-making process; and antioxidants, which are depleted with vigorous workouts.

One of the easiest ways to initiate recovery following a workout is to consume a mixed carbohydrate/protein supplement such as our 50/50 Plus Formula™. Scientific experiments demonstrate that this type of supplement (with the added protein) initiates the rapid uptake of carbs by your muscles — faster than carbs alone.

In addition, a carbohydrate/protein supplement taken following a workout stimulates the release of two hormones (insulin and growth hormone), creating an environment favorable to muscle growth and recovery.

What’s more, supplementing with antioxidant vitamins – namely vitamins E, C and selenium – has been found in studies to help muscles recover and regenerate more rapidly following exercise. As noted above, the Parrillo Essential Vitamin Formula™ and the Parrillo Mineral-Electrolyte Formula™ both supply the antioxidants your body needs for recovery.

References


Here’s something that happens to a lot of people about now: Summer’s here, and you’re dissatisfied that you haven’t sufficiently trimmed down for the season. Is there any way to accelerate your fat loss make up for lost time?

Absolutely. First of all, I recommend that in addition to weight training three or more times a week that you perform at least 30 to 60 minutes of aerobics – preferably before breakfast to force your body to burn fatty acids sooner.

Once you’re doing all this, there are four supplements I recommend when your goal is to lose body fat. Here’s a rundown:

**CapTri®**

CapTri® provides your body with a high-density energy source burned rapidly by the body for fuel. Case in point: In a single-blind, randomized, cross-over study, 20 healthy men ingested a single dose of either 71 grams of MCT oil or canola oil. Blood samples were taken prior to the dosing, then at one-hour intervals over five hours following supplementation. Triglycerides, or blood fats, actually decreased 15 percent as a result of taking MCT oil, whereas fats increased 47 percent with canola oil. These findings are quite remarkable: MCT oil burns up and reduces fatty substances in the body. The ramifications of this finding are important for anyone who wants to achieve and maintain a lean physique. (1)

Instead of being stored as fat, excess calories from CapTri® are converted to body heat, and this means you burn more calories per hour. This explains why calories from CapTri® contribute less to fat stores than an equivalent number of calories from conventional fats or carbohydrates (2, 3, 4).

What’s more, the replacement of conventional dietary fats with MCT oil such as CapTri® results in much less body fat (5, 6). There’s more: The enzymes that make new body fat and convert glucose into fat are less active if lipids like CapTri® are included in the diet.

If limiting carbs to accelerate fat-burning, replace some of those carbs with CapTri®. Because CapTri® is metabolized in the body like a carbohydrate, you shouldn’t feel the loss of energy usually experienced with low-carb dieting. (To learn more about how to use CapTri® in this manner, see the Parrillo Nutrition Manual.)

If you have never taken CapTri® before, gradually introduce it into your diet at the rate of a few teaspoons a day until you are eating two to three tablespoons a day. CapTri® is so rapidly absorbed that it tends to cause stomach cramping if too much is taken at one time or on an empty stomach.

**Advanced Lipotropic Formula™**

This supplement contains fat-mobilizing nutrients your body needs to efficiently metabolize fat. One of these is choline. Present in all living cells, choline has some very important roles in the body. Choline is synthesized from two amino acids, methionine and serine, with help from vitamin B₁₂ (which is why we include 200 mcg of vitamin B₁₂ in this supplement). Choline helps prevent fat from building up in the liver and works to shuttle fat into cells to be burned for energy.

Another lipotropic is inositol. Working together with choline, inositol helps prevent build-ups of fat in the arteries and keeps the liver, heart, and kidneys healthy. Each capsule in our formulation contains 200 mg of inositol.

Also included in our lipotropic formula is biotin. This B-complex vitamin is required to activate specific enzymes involved in metabolism. Without it, your body can’t properly burn fats. Biotin also influences the body’s ability to properly metabolize blood sugar (to avoid low-energy periods).

We formulate this supplement with another B-vitamin - vitamin B₆. This nutrient helps keep the body’s water balance in check, plus helps regulate blood sugar so you don’t get swings in blood sugar and the cravings they cause. Each capsule contains 20 mg of vitamin B₆.

Methionine, an amino acid in the formulation, has been linked to weight control. In combination with another amino acid – phenylalanine - methionine apparently assists in the breakdown of fat. Our Max Endurance Formula™ contains 200 mg of DL-phenylalanine, and each capsule of our Advanced Lipotropic Formula™ contains 200 mg of methionine.
An important lipotropic in this supplement is carnitine, a nutrient that shovels fat into the cells’ mitochondria (cellular furnaces) to be burned for energy. It also cleanses the mitochondria by removing cellular waste products. Thus, carnitine is absolutely vital to metabolism.

When combined with chromium picolinate, carnitine appears to boost fat loss — potentially up to two or more pounds a week, according to research. That being so, we’ve formulated this supplement with chromium picolinate too.

Chromium picolinate helps turn carbohydrates into blood sugar, the fuel burned by cells for energy. It also helps regulate and produce the hormone insulin. Manufactured by the pancreas, insulin helps control hunger, regulates fat storage and muscle-building, and assists the body in utilizing cholesterol properly.

While chromium has a good reputation as a fat burner, it also may stimulate the growth of lean muscle if you lift weights. In one study, 10 college men attending a strength-training class twice a week took either chromium supplements (200 mcg a day), or a placebo. After 40 days, the chromium supplementers gained an average of 4.84 pounds of muscle, without gaining any fat. The placebo group did not fare as well. They gained barely a pound of muscle, on average, and their body fat increased by 1.1 percent.(7) Per capsule, Advanced Lipotropic Formula™ contains 50 mcg of chromium picolinate.

Finally, Advanced Lipotropic Formula™ contains two important enzymes: pancreatin and betaine HCL. Enzymes such as these help ensure that our bodies properly break down the foods we consume so that they can be properly utilized by the body for growth and repair. Pancreatin, for example, helps the body digest fats, and is also believed to have strong fat-dissolving properties. Betaine HCL helps activate the protein digesting enzyme, pepsin. For these reasons, enzymes are often recommended as digestive aids.

I recommend that you take one capsule with each meal – which means four to six capsules daily, depending on how many meals you consume. That way, your body receives a continuing supply of important fat-mobilizing nutrients throughout the day.

Liver-Amino Formula™

The third supplement I recommend for fat loss is Liver-Amino Formula™. This supplement is a concentrated source of liver that has been processed to remove all the fat. It is rich in protein, B-complex vitamins, minerals, lipotropic agents, and heme iron (a type of iron derived from animal proteins that is well absorbed by the body). Iron is important in the body’s energy system because it helps manufacture hemoglobin, which transports oxygen from the lungs throughout the body.

This supplement also contains B-complex vitamins – a vitamin group that is active in converting carbohydrates into glucose, which the body burns to produce energy. The B-complex vitamins in this supplement include choline, inositol, and biotin, which are lipotropics.

Together, all the nutrients in this supplement are necessary for energy production when carbohydrates are limited for the purpose of accelerating the fat-burning process.

For best results, I recommend that you take several liver tablets with each meal. Along with ample calories from high-density foods, this supplement should help you achieve your fat-loss goals.

Essential Vitamin Formula™ and Mineral-Electrolyte Formula™

Consuming a balanced intake of vitamins and minerals is vital during a fat-loss program. If you’re reducing your carbohydrate intake to shed fat, you may be losing some basic nutrients your body needs. Use of these two products ensures that your body gets the essential nutrients it needs to run as an efficient fat-burning machine. I recommend that you take one tablet of each of these supplements with each meal.

References


An accumulating body of recent research points to the fact that many athletes, particularly those who include endurance training in their training programs, are deficient in iron. Specifically, about 10 percent of male athletes are iron-deficient, compared to 22 to 25 percent of females.\(^1\)

Deficiencies can occur with aerobics and endurance training. Both activities can actually destroy red blood cells rather than build them up — if nutrition is faulty. Many female athletes are at risk of iron deficiency due to blood losses of iron during menstruation. The daily iron requirement for women is 18 mg per day, while on average they obtain only 10-12 mg per day. Because men have lower daily iron requirements, they are somewhat less vulnerable to deficiencies. Many times a feeling of fatigue or low energy is the result of an unrecognized iron deficiency.

An iron deficiency, technically known as anemia, should be of concern to anyone who is active – for a variety of reasons. First, iron is essential for the manufacture of two important proteins in the body: hemoglobin, a constituent of red blood cells that gives them their color; and myoglobin, an oxygen-carrying protein in muscle cells. Hemoglobin picks up oxygen from the lungs and transports it to the body’s cells where it is used to produce energy from the foods you eat. Myoglobin allows oxygen to be consumed inside muscle cells. Without adequate iron, the oxygen delivery system won’t work, nor will oxygen be burned properly inside the cells. Clearly, iron has a central position in producing energy. (2)

Another reason that iron is important is because it plays an important role in metabolism, particularly in the metabolism of thyroid hormone, involved in increasing your metabolic rate, the speed at which your body burns calories. Thus, an iron deficiency may compromise resting metabolic rate, which includes the basal metabolic rate (the energy it takes to exist), plus non-exercise activities like digestion, stress responses, reactions to heat and cold, and sitting. (3) Quite possibly, a short supply of iron may alter your body’s ability to burn fat.

If you want to make continued progress in your training and be stronger as a result, you have to feed your body with the iron it needs. Dietary sources of iron are classified into either “heme” iron or “nonheme” iron. Heme iron is chemically bound to “heme” — the component of hemoglobin that is responsible for its ability to carry oxygen in red blood cells. Heme also gives these cells their color.

Good sources of heme iron are red meat and liver. White meat chicken and turkey breast also contain heme iron but in lower amounts. The advantage of heme iron is that it’s very well-absorbed by the body. About 15 to 20 percent of the iron in red meat and liver is taken up. The problem with these foods, however, is their high fat and cholesterol content. Desiccated liver tablets, such as the Parrillo Liver Amino Formula, are defatted and contain almost no cholesterol, and are excellent sources of readily absorbed heme iron.

Plants have a different form of iron, one that is not bound to heme, and it’s called “nonheme” iron. The body doesn’t absorb nonheme iron as well as it does heme iron. Less than two percent of the iron in spinach is absorbed, for example.

In addition to providing heme iron, the Parrillo Liver-Amino Formula also supplies extra protein. This is important. Here’s the deal: Aerobic training in a protein-deficient state can lead to a condition called “sports anemia,” in which red blood cells and iron levels are reduced. One explanation for this is that aerobic training appears to increase myoglobin, an oxygen-carrying protein in the muscles. The formation of myoglobin requires protein and heme iron. If protein is in short supply, red blood cells are destroyed to obtain the necessary protein and iron to make myoglobin.

In addition, muscle fibers are damaged during training and must be repaired following the exercise period. If your protein intake is low, the body draws on red blood cells and blood proteins as a source of protein for muscular repair. When this happens, little protein is left to rebuild red blood cells at the normal rate, and sports anemia can be the result.

Clearly, you need ample protein, along with iron. Individual protein needs vary and depend on a number of factors, including a bodybuilder’s training intensity and level of conditioning. I’ve seen many bodybuilders improve their physiques by increasing their protein intake up to 2.5 grams per pound of body weight a day — nearly seven times the RDA.

Based on my experience, hard training bodybuilders can achieve excellent results — including muscular hardness — by consuming 1.25 to 1.5 grams of protein per pound of body weight a day. One gram per pound of body weight should come from lean protein sources such as white meat poultry, fish, and egg whites; the other .25 to .5 gram per pound of body weight, from all your other foods, particularly high-protein vegetables like beans, corn, and legumes.
The Parrillo Liver-Amino Formula also contains B-complex vitamins. This vitamin group is active in converting carbohydrates into glucose, which the body burns to produce energy. B-complex vitamins are also involved in the metabolism of fats and proteins.

Increasingly, sports nutritionists are recommending that hard-training athletes supplement with iron. For best results, I recommend that you take several liver tablets with each meal. Along with ample protein and ample calories from high-density foods, desiccated liver supplements should help you reach peak levels of performance, growth, and recovery.

References
Recharge with Glutamine
by John Parrillo

Have you been training super-hard, with all-out aerobic exercise, in addition to push-to-the-max weight training? If so, a crucial amino acid called glutamine could be depleted from your body.

The most abundant amino acid in your body, glutamine is stored mostly in your muscles, although rather significant amounts are found in your brain, lungs, blood, and liver. This important amino acid serves as a building block for proteins, nucleotides (structural units of RNA and DNA), and other amino acids and is the principle fuel source for cells that make up your immune system. Glutamine is also one of the amino acids found in our Ultimate Amino Formula™.

Under certain conditions – including injury and intense exercise – the body’s tissues demand more glutamine than the normal amount supplied by diet (which is five to 10 grams a day) and more than can be synthesized normally by your body.

During intense exercise, for instance, your muscles release glutamine into the bloodstream. This can deplete muscle glutamine reserves by as much as 34 percent. Such a shortfall can be problematic, since a deficiency of glutamine promotes the breakdown and wasting of muscle tissue. But if ample glutamine is available, muscle loss can be prevented.

Glutamine is the amino of the moment; that is, it has been in the nutritional spotlight because of its amazing versatility. There was a time when glutamine was thought to be a non-essential amino acid, but now it has been re-christened “conditionally essential.”

If you are highly active, glutamine should be a part of your supplement program, for reasons described below.

Glutamine is an immunonutrient.

Glutamine is the favored fuel of your immune cells. This means you need it when you’re ill, stressed, or recovering from surgery. During such times, the demand for glutamine exceeds its production and the body’s nitrogen stores become rapidly depleted — a sign that muscle protein is being broken down.

This is a problem since glutamine is required for healing internal tissues and manufacturing muscle protein. Patients hospitalized for surgery, trauma, or infection often receive supplemental glutamine in their feeding solutions.

Researchers have also discovered that many athletes are deficient in glutamine - a shortage that makes them more vulnerable to infections. One group of investigators measured plasma levels of glutamine in runners following their participation in a marathon. For about an hour after the event, glutamine levels declined, but slowly returned to normal within about 16 hours of the race. But during this period, the runners’ lymphocyte (white blood cell) count declined. Interestingly, lymphocytes rely on glutamine for growth.

In a separate study by the same group of researchers, athletes supplemented with 5 grams of glutamine right after exercise and again two hours later. Only 19 percent of the glutamine-supplemented athletes reported infections during the next week, while 51 percent of those who took a placebo got a cold or other infection.

Studies like this one have led researchers to believe that the increased incidence of colds, infections and other illnesses among athletes after intense exercise sessions may have something to do with the glutamine/lymphocyte connection. Thus, supplementing with glutamine may fend off infections that can sideline your training.

Glutamine stimulates the synthesis of muscle glycogen.

Glutamine is technically described as a “glucogenic,” meaning that it assists your body in manufacturing glycogen, the chief muscle fuel. In a study involving subjects who cycled for 90 minutes, intravenous glutamine, administered during a two-hour period following exercise, doubled the concentration of glycogen in the muscles. It’s not clear exactly how glutamine works in this regard, though. Scientists speculate either that glutamine itself can be converted into muscle glycogen or that it may inhibit the breakdown of glycogen.

Glutamine may enhance muscle growth.

Also, supplemental glutamine has been shown to elevate growth hormone (GH) levels, theoretically influencing muscle growth. Physiologically, GH is the most important hormone in the body for exercisers and bodybuilders because it acts as a powerful stimulus for muscle growth and fat loss. Growth hormone is a substance that makes cells multiply faster. Among other functions, growth hormone helps mobilize fat from storage and makes more fat available for energy. It also promotes the transport of certain essential amino acids inside muscle cells to stimulate muscle growth. Many of the effects of exercise in increasing muscle mass and decreasing body fat are mediated by growth hormone.

In a study at Louisiana State University College of Medicine in Shreveport, researchers found that oral supplementation with glutamine dramatically elevated growth hormone levels. Nine healthy volunteers (ages 32 to 64) were given 2 grams of glutamine over a 20-minute period, 45 minutes following breakfast. Blood samples taken every half hour over 90 minutes revealed a 430 percent hike in growth hormone levels. Theoretically, supplementing with glutamine may help you build and maintain muscle tissue, particularly if you exercise regularly. The research into the glutamine/growth hormone connection is preliminary, but promising nonetheless.

Glutamine may aid in fat loss.

Some research hints that supplementing with glutamine can curb the desire for sugary foods — an excess of which leads to fat gain. For these reasons, glutamine may turn out to be an important amino acid for dieters and exercisers who need to curb their desire for fat-forming sweets. Between 200 mg and one gram of glutamine can be taken with
water 30 minutes before meals to lessen the desire for sugary foods.\(^8\)

**Supplementing with glutamine.**

Clearly, glutamine has numerous benefits for any athlete who wants to maximize performance, muscle repair, and immunity. Generally, a protein-rich training diet such as that recommended by the Parrillo Nutrition Program™ should prevent your glutamine levels from dipping too low. However, supplemental glutamine provides extra insurance, plus a windfall of other benefits. What’s more, if you’re the victim of frequent colds or infections, consider supplementing with this amino acid.

Each capsule in our Ultimate Amino Formula™ contains 103 milligrams of glutamine. We recommend that you take two or more capsules of this supplement with each meal. That should supply a gram or more daily – which is appropriate for athletes and active individuals. We also add extra glutamine to our Hi-Protein™ powder and Optimized Whey™ protein powders. Both heat and acid destroy glutamine, so you should not take it with hot or acidic foods, such as vinegar.

Glutamine supplementation is well tolerated. Glutamine safety studies have been conducted using healthy volunteers who took doses of 0.75 gram per 2.2 (1 kilogram) of body weight. No side effects occurred at those doses.

People with liver or kidney disease should not supplement with glutamine, however, because it can aggravate these conditions and interfere with their treatment.

**References**

Supplementation Timing
by John Parrillo

The “when” of taking supplements is just as important as the “why.” By timing your supplements to coincide with your workout schedule, you’ll maximize your performance, energy levels, muscular growth, and more. Here’s a closer look at when to take certain supplements.

Upon Rising
Take two to three Parrillo GH Formula supplements (GH releasers) on an empty stomach. The morning is one of the periods during the day at which natural levels of growth hormone are thought to be the highest.

GH releasers are thought to burn fat, build muscle, and have a stimulatory effect on the production of growth hormone in the body.

Four Hours Prior to Training
A carbohydrate-rich meal eaten approximately four hours prior to exercise significantly pumps up muscle and liver glycogen content for better intensity for workouts, according to research. You can increase the carbohydrate content of your meal by including Parrillo ProCarb Formula, Parrillo Energy Bar, or one of our new Parrillo puddings as part of your meal.

30 Minutes Prior to Training
Also, I recommend that you take Parrillo Max Endurance Formula on an empty stomach 30 minutes to an hour before training. This supplement contains the following endurance-enhancing nutrients: inosine; a nutrient that improves oxygen utilization for better stamina, possibly by forcing additional production of energy-producing ATP; l-phenylalanine, an essential amino acid that acts as a potent mental stimulant for improved concentration during workouts; d-phenylalanine, an amino acid that promotes a higher pain threshold; and ferulic acid (FRAC), a nutrient stimulates the endocrine system to aid recovery and boost workout capacity.

This supplement also contains magnesium and potassium aspartates, which help filter waste products from the system, giving you extra stamina and extending endurance.

Immediately Prior to Training
Supplement with Parrillo Creatine Monohydrate right before your workout. That way, you can load it into your muscles at just the right time to maximizing muscular reserves and restocking ATP.

During Endurance Training and/or Competition
Energy expenditures increase by two to three times if you’re an endurance athlete undergoing strenuous activity, such as training or competition. That’s why it’s vital to consume carbohydrate during such prolonged exercise. Increasing the availability of carbohydrate improves performance, spares muscle glycogen, and thus sustains energy. Carbohydrate feeding during weight training is helpful, as well, particularly for maximizing energy levels. Your best bets are Parrillo ProCarb Formula or our Parrillo Energy Bar.

Many endurance athletes with whom we have worked like to mix ProCarb with CapTri®, our medium-chain fatty acid supplement, for super-charged endurance levels during training or competition. This practice is supported by clinical research.

Case in point: At the University of Capetown Medical School in South Africa, researchers mixed 86 grams of MCT oil (nearly 3 tablespoons) with two liters of a sports drink to see what effect it would have on the performance of six endurance-trained cyclists. The cyclists were fed a drink consisting of the sports drink alone, sports drink plus MCT oil, or MCT oil alone. In the laboratory, they pedaled at moderate intensity for about two hours and then completed a higher-intensity time trial. They performed this cycling bout on three separate occasions so that each cyclist used each type of drink once.

The cyclists sipped the drink every ten minutes. Performance improved the most when the cyclists supplemented with the MCT/sports drink mixture. The researchers did some further biochemical tests on the cyclists and confirmed that the combination spared glycogen while making fat more accessible for fuel.

Post-Exercise
Immediately following your workout, consume a mixed carbohydrate/protein supplement such as our 50/50 Plus Formula. Scientific experiments demonstrate that this type of supplement (with the added protein) initiates the rapid uptake of carbs by your muscles – faster than carbs alone.

In addition, a carbohydrate/protein supplement taken following a workout stimulates the release of two hormones (insulin and growth hormone), creating an environment favorable to muscle growth and recovery.

Taking creatine monohydrate after your workout is a good idea too. Creatine enhances the movement of amino acids in cells for tissue growth and repair following exercise.

Also, I recommend that you take creatine with our ProCarb Formula. Scientific research shows that taking creatine with a liquid carbohydrate supplement boosts the amount of creatine accumulated in muscles by as much as 60 percent.

Throughout the Day, With Meals
Because your metabolism is constantly at work, continue to take supplements throughout the day — and always with meals. Their value is increased when you spread them out into equal portions throughout the day. If you take your supplements only in the morning and work out in the afternoon, then very few supplemental nutrients remain for use by the body during training. As your body digests nutrients from food and supplements through the day, messages from the digestive process are relayed throughout

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the body, signaling your cells to use these nutrients for growth and repair.

The supplements you should take with your meals include Parrillo Essential Vitamin Formula (one per meal), Parrillo Mineral-Electrolyte Formula (one to two per meal), Parrillo Liver-Amino Formula (five or more per meal), Parrillo Ultimate Amino Formula (two or more per meal), and Parrillo Advanced Lipotropics.

**Before Bedtime**

Take two Parrillo GH Formula supplements again (on an empty stomach) to naturally elevate your body’s level of growth hormone.

**References**

Nutrition for Older Athletes
by John Parrillo

If you want to get better as time marches on, you may need to rethink and tweak your nutrition and training practices to postpone, or slow down, the effects of aging. In this month’s column, I’ll provide advice and guidelines for the 50+ crowd so that you can ensure your health well into your gold years. Here goes:

Watch your fat intake.
Curtailing fat not only keeps body fat low, it also helps you reduce the risk of heart disease and cancer. The Parrillo Nutrition Program keeps dietary fats as low as possible. You must, however, have some essential fatty acids in your diet. Each day, take one teaspoon to one tablespoon of an EFA source such as safflower, sunflower, linseed, or flaxseed oils, or supplement with Parrillo Evening Primrose Oil (which will help with joint movement and pain too). In addition, use CapTri, a special medium chain fatty acid that is less likely to convert to body fat.

Use recovery nutrients.
When you were younger, your body could bounce back from intense workouts in as little as six hours. But by the time you reach 50, it can take 48 hours to recover. That’s because aging makes your connective tissue — tendons, ligaments, and joints — stiffer and not as forgiving to the wear and tear of exercise.

Following the Parrillo Nutrition Program will help accelerate the recovery process because it provides the energy, antioxidants, and other nutrients your body needs for growth and repair. It’s also a good idea to drink ProCarb, Hi-Protein Powder, or one of our other beverages immediately following workouts.

Scientific experiments demonstrate that this type of supplement (with the added protein) initiates the rapid uptake of carbs by your muscles — faster than carbs alone.

In addition, a carbohydrate/protein supplement taken following a workout stimulates the release of two hormones (insulin and growth hormone), creating an environment favorable to muscle growth and recovery. (2)

Increase your protein intake.
Unless you’re exercising regularly, you could be losing lean muscle mass, another consequence of aging. On the Parrillo Nutrition Program, we recommend that you eat 1.25 to 1.5 grams of protein per pound of body weight. At least one gram of protein per pound of your body weight should come from complete protein sources such as lean white meat poultry, fish, egg whites, or from one of your protein powders. The remaining should come from starchy and fibrous carbohydrates, which also contain protein.

Increase dietary fiber.
As an older athlete, your chances of developing diverticulosis — small pouches that project outward from the wall of the colon — are on the rise. Should these pouches get irritated, the problem turns into diverticulitis. Its signs include cramps, fever, and nausea.

You can prevent both situations by consuming high-fiber diet, including legumes, vegetables, and whole grains. These foods are emphasized on the Parrillo Nutrition Program

Ensure an adequate intake of calcium.
Older athletes are at an increased risk of bone fractures due to osteoporosis, a bone-thinning disease in which vital minerals like calcium leach from your bones as you age. Used to be, osteoporosis was thought of as a woman’s disease. But in the past few years, its incidence among men has been climbing. Among the 25 million sufferers in the United States, two million men have osteoporosis, and three million more are at risk.

To maximize and preserve bone loss if you’re a woman, take in at least 1200 milligrams if you’re 51 or older. Many physicians recommend 1500 milligrams daily.

Similarly, men need a daily calcium intake of 1200 milligrams a day over age 51. A good source of supplement calcium is Parrillo Mineral Electrolyte Formula.

In addition, be sure to continue your regular weight-training program too. Weight-bearing and strength-developing exercise stimulates the formation of bone. It also improves strength and balance, thus reducing the risk of falls and fractures.

Shun simple sugars and refined foods.
As you get older, your body doesn’t process glucose as well, and higher levels of sugar tend to hang around in your blood. This is tough on the body and can lead to diabetes, a blood sugar metabolism disorder. If you follow the Parrillo Nutrition Program, you’ll automatically avoid refined, sugar-loaded foods in favor of complex carbohydrates, which actually help regulate blood sugar.

Prevent age-related nutrient deficiencies.
Older adults are at great risk of vitamin and mineral deficiencies because their bodies are less efficient at absorption. Further, studies show that as many as three in 10 people over the age of 65 may deficient in B vitamins, which are heart protective, as well as antioxidants, which preserve immunity and protect you from various disease.

Supplementing with antioxidant vitamins – namely vitamins E and C – has been found in studies to boost immunity, plus help muscles recover and regenerate more rapidly following exercise. Both vitamin C and Vitamin E seem to prevent exercise-generated free radicals from destroying muscle cell membranes. (3)

Most research points to a dosage of between 400 IU and 1,000 IUs of vitamin E daily and between 500 mg and 1000

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mg daily of vitamin C to get the protective effect.

The Parrillo Essential Vitamin Formula and the Parrillo Mineral-Electrolyte Formula both supply the antioxidants your body needs for recovery.

In addition to eating properly and supplementing with antioxidants, there are other measures you can take to bolster immunity so that you’re less like to get sick. One of these is using a whey-based supplement in your nutrition program. It also enhances recovery. We have two products containing whey: Optimized Whey Formula (100% whey protein isolate) and our 50-50+ Formula (formulated with whey protein isolate, calcium casein, milk protein isolates, and maltodextrin).

References
In just the past few years, research into the amino acid requirements of athletes has accelerated rapidly. Generally, the findings prove that amino acid intake stimulates protein synthesis after exercise by increasing the availability of protein to muscle tissue. The net effect, for course, is to build and maintain muscle. Other recent findings show that amino acid supplementation enhances energy (particularly when aminos are combined with carbohydrate) and stimulates the release of growth hormone. (1) Further, scientists are recognizing that elderly strength trainers can benefit from amino acid supplements because supplementation has been shown to improve muscle quantity and quality at a time in life when muscle tends to atrophy. (2)

With regard to other research into amino acids, there is more good news. Some examples:

• Glutamine, the most abundant amino acid in the body, stimulates the synthesis of muscle glycogen, resulting in improved recovery. (3)
• The BCAAs (l-leucine, l-isoleucine, and l-valine), which make up about one-third of your muscle protein, reduce muscle damage associated with endurance exercise. This is good news for bodybuilders who often fear that aerobic activity may compromise muscular development. (4)
• BCAA supplementation induces the loss of body fat. (5)
• Supplementation with essential amino acids – these include the BCAAs, as well as methionine, lysine, arginine, threonine, histidine, and phenylalanine – increases muscular endurance, the ability to contract your muscles repeatedly, without fatiguing. That’s incredibly powerful information, particularly if you’re shooting for greater workout intensities. (6)

An Amino Acid Supplementation Program

Clearly, athletes, bodybuilders, and other active people need to incorporate amino acid supplements as a part of an overall dietary strategy for building and maintaining lean muscle. Amino acid supplementation is used to provide an additional source of protein — beyond food — that can be used by the muscles for growth and repair. For optimum results, I suggest a three-pronged approach that involves the use of BCAAs, free-form amino acids, and GH releasers.

BCAAs

When you’re training hard to build muscle and burn fat, you can easily slip into a “catabolic” state, meaning your body starts feeding on its own muscle for fuel. (7,8) BCAAs can stop this detrimental process in its tracks. (9,10) They work together with insulin (required to build muscle), caused by the digestion of carbohydrates, to transport other amino acids into the muscles to be used in growth and repair. Thus, when you supplement with BCAAs, do so with a carbohydrate. We suggest taking our BCAA supplement with one of our carbohydrate drinks, such as ProCarb™ or 50/50 Plus™.

On the Parrillo Nutrition Program, we advise taking two more capsules of our Muscle Amino Formula with each meal.

Free-Form Amino Acids

During any period of intensified training, in which you’re striving to build muscle, you must give your body increased amounts of protein to feed your muscles – and that’s where Parrillo Ultimate Amino comes in.

This supplement contains a profile of 17 “free form” amino acids, a form that’s easily assimilated by your body so that the aminos are rapidly taken up by your muscles for growth and repair. This formulation also contains the BCAAs, discussed above. In addition to the BCAAs, the other aminos in this supplement and their functions are listed in the chart below.

We suggest that you take two or more capsules with each meal.

AMINO ACIDS

MAJOR FUNCTIONS

L-alanine

Energy production and regulation of blood sugar.

L-aspartic acid

Energy production.

L-cysteine

Protein metabolism.

L-arginine

Growth hormone release (with l-lysine).

L-glutamine

Energy production (with B-complex vitamins B-6, B-3, and magnesium).

L-histidine

Protein synthesis.

L-lysine

Growth hormone release (with l-arginine).

L-methionine

Choline synthesis.

L-phenylalanine

Collagen formation; alertness.

L-proline

Collagen formation.

L-serine

Production of cellular energy.

L-threonine

Energy production.
L-tyrosine
A precursor of adrenaline and thyroid hormones.

GH Releasers
Finally, consider supplementing your diet with certain amino acids. The most effective oral combination for GH release is arginine pyroglutamate and lysine monohydrochloride, the combination found in our Enhanced GH Formula. This is typically taken at bedtime and in the morning, always on an empty stomach.

Arginine, in particular, has numerous other benefits to athletes and bodybuilders. Arginine:
• Boosts immunity by stimulating the activity of the thymus gland, which shrinks as we age, and by acting as a cell-protecting antioxidant. (11)
• Helps prevent the body from breaking down protein in muscles and organs to repair itself when injured. (12)
• Initiates recovery – the period of muscle repair and growth that takes place following a workout – particularly when taken with carbohydrates. (13)

A Note on Diet
Amino acid supplements should not be your made source of protein. Make sure you’re getting amino acids from food as well. Each day, you should eat 1.25 to 1.5 grams of protein per pound of body weight. At least one gram of protein per pound of your body weight should come from complete protein sources such as lean white meat poultry, fish, egg whites, or protein powder. The remaining should come from starchy and fibrous carbohydrates, which also contain protein.

References
The Case Against Fruit
by John Parrillo

I’m frequently asked to explain why fruits and fruit juices are not included in my nutrition program. The answer has to do with a little-understood simple sugar found in fruit: fructose.

Fructose came into favor years ago because of its stabilizing effect on blood sugar. Unlike other simple sugars, it triggers neither a surge of insulin nor a corresponding drop in blood sugar an hour or so after eating it. That’s the good news. But there’s more to the fructose story.

Anyone trying to maximize muscle gain and maximize fat loss should avoid fruit and foods to which fructose has been added. Here’s why:

Fructose is readily converted to body fat.

Because of fructose’s molecular structure, the liver readily converts it into a long-chain triglyceride (a fat). Put another way, fructose is metabolized as a fat in your body. Therefore, a majority of the fruit you eat can ultimately end up as body fat on your physique. You’ll notice an incredible difference when you eliminate fruits and juices from your diet.

Incidentally, fructose may turn out to be one of the reasons we’re becoming a nation of fatties. This simple sugar is found not only in fruit, but also in processed foods in the form of high-fructose corn syrup, the chief sweetener in sodas. Get this: Consumption of soda has been linked to the rise in obesity rates in our country. And, paralleling the rise in obesity is a ten-fold increase in the consumption of fructose.

Fructose can cause your body to absorb extra fat from meals.

If you wash a cheeseburger and French fries down with a soda, or drink orange juice with your breakfast, your body could be sopping up excess fat. In a recent study, volunteers drank milkshakes flavored with either fructose, glucose, aspartame, or no sweetener at all with meals. The amount of fat absorbed from the fructose and glucose-sweetened shakes was 38 to 60 percent higher than that absorbed from the artificially sweetened or unsweetened shakes. These findings are further evidence that fructose has a fat-forming effect on the body. (1)

Fructose does not efficiently restock muscle glycogen.

After you work out, your body moves from an energy-using mode (catabolism) to an energy storage and rebuilding mode (anabolism). During the transition, dietary carbohydrate is broken down into glucose and fructose to be used for “glycogenesis,” the manufacture of glycogen to restock the muscles and liver.

Fructose is used primarily to restore liver glycogen; it’s really not a good replenisher of muscle glycogen. Glucose, on the other hand, bypasses the liver and is carried by the bloodstream straight to the muscles you just worked, where the glycogen-making process begins. Any muscle emptied of glycogen due to exercise is first on the list to get its quota of glucose.

Clearly, one of the keys to effectively restoring glycogen is the type of carbohydrate you eat. Natural, starchy carbohydrates such as potatoes, yams, whole grains, corn, and legumes do a better job at this than simple sugars do. Research has shown that a diet high in starchy carbohydrates can restock more glycogen in the muscles 48 hours after exercise than simple sugars can. (2)

If you eat simple sugars like fructose, you’re not going to be able to store as much glycogen had you consumed natural, starchy carbohydrates. What implications does this have for you as an athlete or bodybuilder?

First, you won’t be able to train as hard or as long during your next workout, because you haven’t stored as much glycogen. Nor will you be able to recover from your workouts as efficiently. Plus, the simple sugars are likely to spill over into fat stores, with just a fraction converted to glycogen. By contrast, eating ample amounts of starchy carbohydrates will extend your endurance and effectively re-supply your muscles with glycogen for better recovery. You’ll stay leaner too, since starchy carbs are fully utilized for energy production and glycogen synthesis.

Second, you’ll notice less of a “pump” while working out, also due to low glycogen stores in the muscle. The “pump” describes an exercised muscle heavily engorged with blood. If you can’t get a good pump, it’s difficult to get the full benefits of “fascial stretching.” This is my system of stretching between exercise sets. It stretches the fascia tissue surrounding the muscle so that it has more room to grow. The best time to stretch is when the muscle is fully pumped, because the pump helps stretches the fascia too. With low glycogen levels in the muscle, you can’t stretch to the maximum. This limits your growth potential.

Fructose can lead to insulin resistance.

Studies have demonstrated that diets high in simple sugars (particularly sucrose) lead to a condition known as insulin resistance. Sucrose and other simple sugars trigger a rapid spike in glucose, and the pancreas responds by pumping out more insulin into the bloodstream to handle the sugar. Over time, insulin levels in your blood remain higher than they should be. Eventually, cells ignore – or become resistant to – insulin. Because of insulin resistance, insulin can’t open the cell. Glucose is locked out, and it clutters up the bloodstream. These adverse metabolic events can lead to type 2 diabetes. Insulin resistance is also associated with excess blood levels of triglycerides, and low levels of heart-protective HDL cholesterol, conditions that set the stage for heart disease. (3)
Fructose is “hidden” in many body-building foods.

Many sports and bodybuilding supplements are sweetened with fructose – a discovery I made when surveying the ingredients of nutrition bars several years ago. I found that 25 out of 26 bars had fructose as a first or second ingredient.

High-fructose corn syrup and fruit juice are frequently used as ingredients in supplements because they are inexpensive sweeteners. But buyer beware: They can hamper your bodybuilding efforts, so read the labels.

Look instead for supplements sweetened with rice dextrin, which is found in our bars. Rice dextrin is a short chain glucose polymer made from rice. It gives you the quick energy you want from a sports bar, but without fat-forming fructose.

The Final Word on Fruit and Fructose

I’m not knocking fruit. True, it’s high in vitamins, minerals, and fiber — but so are natural, complex carbohydrates. If you want to get leaner and more muscular — and build your recuperative powers by re-stocking glycogen more efficiently — avoid fruit. Choose starchy and fibrous carbohydrates instead.

References


Make the B-Grade for Ultimate Performance
by John Parrillo

Hard training affects the status of a certain group of vitamins, collectively known as the B-complex family. These vitamins are important for the proper metabolism of protein, carbohydrates, and fats; as well as for energy production. Research shows that if you’re deficient in B-vitamins, your physical performance will suffer. (1) So for optimum training and performance, you need a good supply of these nutrients, both from food and supplements. What follows is a look at specific B-vitamins and how they relate to training status.

Thiamin (Vitamin B-1)

Found abundantly in brown rice and soybeans, thiamin is specifically involved in carbohydrate metabolism and nerve cell function. Men need 1.2 milligrams daily; women, 1.1.

Higher doses (100 milligrams a day), however, may accelerate recovery from exercise-induced fatigue, according to researchers at the University of Tsukuba in Japan. They administered high-dose thiamin to a group of exercisers, and discovered that supplementation made the exercisers feel more energetic after completing a workout on the bicycle ergometer. (2)

Riboflavin (Vitamin B-2)

This vitamin is found in whole grains, soybeans, and green leafy vegetables. It is involved in enzyme-controlled reactions that produce energy for the body. Riboflavin also protects the body from disease-causing free radical damage in the body. Men require 1.3 milligrams daily; women, 1.1.

Bodybuilders, exercisers, and athletes must be sure to get ample amounts, however, because this nutrient is easily lost from the body, particularly in sweat. Exercise increases the body’s requirement for riboflavin. (3)

Niacin (Vitamin B-3)

Besides its involvement in energy production, niacin plays a role in cholesterol and fat metabolism, which is why this nutrient is used therapeutically (as a prescription drug) to help lower cholesterol levels in the body. Food sources of niacin include legumes, whole grains, milk, eggs, and fish. If you’re deficient in this nutrient, you’re apt to suffer fatigue and muscular weakness. The recommended intake for niacin is at least 15 to 20 milligrams a day.

Pyridoxine (Vitamin B-6)

Vitamin B₆ influences nearly every system in the body. For example, it assists in: metabolizing fats, creating amino acids (the building blocks of protein), turning carbohydrates into glucose, producing neurotransmitters (brain chemicals that relay messages), and manufacturing antibodies to ward off infection.

You’ll find this nutrient in a number of natural weight-loss supplements — for a couple of reasons. First, vitamin B₆ helps maintain the balance of sodium and potassium in cells — a balance necessary to properly regulate fluids. Thus, vitamin B₆ indirectly helps prevent water retention, a condition that can make you look and feel fat. Taking 100 mg of vitamin B₆ one to three times a day on a temporary basis is often recommended to reduce fluid buildup. Also, vitamin B₆ helps regulate blood sugar. Swings in blood sugar can lead to food cravings and low energy. Finally, restrictive diets can deplete the body’s supply of vitamin B₆ and supplementation is extra insurance against a deficiency. Clearly, this nutrient is a behind-the-scenes player in many issues related to weight management.

As someone who is active, you’ll be interested in knowing that extra vitamin B₆ can help boost endurance. Research has demonstrated that supplemental B₆ may improve VO₂ max, a measurement of the body’s ability to use oxygen. (4)

Hard exercise can rob the body of this nutrient. German researchers discovered that a marathon race can cause a loss of 1 milligram of vitamin B₆ from the body — nearly a full day’s requirement. (5)

Eating a balance diet, however, guards against such deficiencies. The best food sources of vitamin B₆ include salmon, Atlantic mackerel, white meat chicken, halibut, tuna, broccoli, lentils, and brown rice. The recommended intake for men is 1.7 milligrams a day; for women, 1.5 milligrams.

B-12

Like other members of its family, this nutrient regulates many functions in the body. Among the most vital is the production of red blood cells. Vitamin B-12 directs this process, making sure that enough cells are manufactured. Without vitamin B-12, red blood cell production falls off, and the result is misshapen cells and anemia, which can sap energy. Vitamin B-12 can be obtained only from animal foods, including poultry, fish, eggs, and milk. The recommended daily intake is 2.4 milligrams.

Biotin

This B-complex vitamin is required to activate specific enzymes involved in metabolism. Without it, the body can’t properly burn fats — which is why you so often find biotin as an ingredient in natural weight-loss products. Biotin also affects the body’s ability to properly metabolize blood sugar. In addition, biotin helps the body utilize protein.

Although required in tiny amounts (30 mcg daily), biotin can be in short supply — for two reasons. First, the best sources of biotin in food are egg yolks and liver — two foods we tend to cut out because of their high concentration of cholesterol.

Second, research verifies that active people often have lower levels of biotin than those who are sedentary. One theory is related to exercise. Exercising causes the waste product lactic acid to accumulate in working muscles. Biotin helps break down lactic acid. The more lactic acid that builds up in muscles, the more biotin that’s needed to break it down. If you’re a regular exerciser, supplementing with biotin — either through a multi-vitamin formula or lipotropic supplement such as our Advanced Lipotropic Formula — offers an extra measure of protection against a possible shortfall. (6)
Choline

Present in all living cells, choline helps prevent the build-up of fat in the liver and helps move fat into cells to be burned for energy. Additionally, choline is involved in the metabolism of nutrients needed for building muscle tissue.

Choline is found naturally in eggs, fish, soybeans, liver, brewer’s yeast, and wheat germ. A few years ago, choline was recognized as an essential nutrient. The recommended intake is 550 milligrams daily for men and 425 milligrams daily for women.

Inositol

Inositol is involved primarily in making lecithin so that fat metabolism can proceed normally. Working together with choline, inositol helps prevent dangerous build-ups of fat in the arteries and keeps the liver, heart, and kidneys healthy.

Your body can make inositol from glucose (blood sugar), and the nutrient is plentiful in whole grains. In fact, there is more inositol in the body than any other vitamin, with the exception of the B-vitamin niacin. Too much coffee can deplete your body’s reservoir of inositol. This nutrient is available from whole grains, citrus fruits, brewer’s yeast, and liver. You get about a gram of inositol daily from food.

Pantothenic Acid

First recognized as a substance that stimulates growth, pantothenic acid is quite active in metabolism. It is a building block of CoA, a key enzyme that releases energy from foods. Pantothenic acid stimulates the adrenal glands and boosts production of hormones responsible for healthy skin and nerves.

Foods rich in pantothenic acid include brewer’s yeast and whole grains. Cooking and food processing destroy up to 50 percent (sometimes more) of the vitamin.

Pantothenic acid is so widespread in foods, however, that deficiencies are usually not a problem. In addition, the vitamin can be made in the body by intestinal bacteria. Many multi-vitamin supplements also contain pantothenic acid. The recommended daily intake for adults is 5 to 7 mg daily.

Getting Enough B’s

In addition to the B-complex-rich foods mentioned above, supplementation is important for preventing possible shortfalls, particularly in bodybuilders and other athletes. Various Parrillo Performance supplements are fortified with these nutrients, and these are listed in the chart below. For information on how to order these products, call our order line at 1-800-344-3404.

References


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Fat is not a four-letter word!

You need certain fats called essential fatty acids (EFAs), which must be supplied by your diet. EFAs regulate many biological functions, including the manufacture of connective tissue, cellular walls, and hormones.

After meeting your daily protein and carbohydrate requirements, be sure to include a certain amount of fat in your diet. Good sources are safflower oil, sunflower oil, linseed oil, flaxseed oil – and evening primrose oil in supplemental form. These dietary fats provide essential fatty acids and help the body absorb fat-soluble vitamins such as vitamin A, vitamin D, and vitamin E.

Evening primrose oil, in particular has specific benefits for athletes, bodybuilders – really, anyone who is interested in improving personal health and fitness.

Evening primrose oil comes from a plant that grows wild along roadsides. It is so named because its yellow flowers resemble in color real primroses, and these flowers open only in the evening.

From this oil, your body can directly obtain GLA, which stands for gamma-linolenic acid. GLA is ultimately converted into the prostaglandin E1 series, a group of beneficial chemicals that helps reduce inflammation, regulates blood clotting, decreases cholesterol levels, and lowers high blood pressure, among other functions.

Thus, evening primrose oil is indicated for various diseases or conditions in which prostaglandins are associated, and these include premenstrual syndrome (PMS); heart disease; diabetic neuropathy, a type of nerve damage that is a complication of diabetes; and arthritis.

Here’s a more detailed rundown of what evening primrose oil can do for you:

**Joint Flexibility**

If your joints are creaky and achy, don’t despair. Evening primrose oil to the rescue.

A growing number of medical experts and scientists now believe that taking GLA-rich oils such as evening primrose oil can effectively fight the inflammation - the major cause of swollen, painful joints. As explained above, GLA is a building block of a beneficial type of prostaglandin, which exerts an anti-inflammatory effect on the body.(1) Thus, supplementing with GLA increases production of these prostaglandins and may help control the pain and inflammation associated with joint problems and arthritis.

**Obesity**

Evening primrose oil may be fat fighter too. GLA, one of its beneficial constituents, has been researched for its effect on weight loss in both animals and humans. In studies with rats, GLA reduced body fat content.

As for humans, some scientists believe that people with GLA deficiencies tend to produce more fat in their bodies. Supplementing with evening primrose oil has helped them lose weight. (2)

Research shows that the supplement works best if you are more than 10 percent above your ideal weight. And, in some people, evening primrose oil promotes weight loss without reducing caloric intake. It is also believed to help rev up the metabolism, so that you burn more calories. More information on these effects are needed, however. (3)

Evening primrose oil may help reduce fluid retention, medically known as “edema.” (4) When you retain water, you bloat out, giving the appearance of being overweight. Ridding the body of excess water can make you look leaner. One way to do this is by supplementing with evening primrose oil, which can help your body regulate water more normally and prevent fluid retention.

**Immune Booster**

Among oilseeds, evening primrose oil has demonstrated some of the most powerful antioxidant activity. In one study, evening primrose oil was able to destroy the hydroxyl radical, a form of hydrogen peroxide. Once generated, this nasty free radical attacks whatever is next to it, setting off a dangerous chain reaction that generates many more free radicals. The result is cellular damage. In the same study, evening primrose reduced the formation of “superoxide” free radicals—a type of free radical that is particularly harmful to heart cells. (5)

**Heart Health**

Taking evening primrose oil may be one more defense against high cholesterol. In a small study of 10 patients with high cholesterol, supplementation with 3.6 grams a day of evening primrose oil significantly reduced artery-clogging LDL cholesterol – by 9 percent. In addition, animal experiments show that evening primrose oil reduces plaque, fatty deposits that build up in arteries, clog their passageways, and constrict blood flow.
Using Parrillo Evening Primrose Oil 1000™

Our supplement contains 1000 mg of evening primrose oil. This includes 100 mg of GLA, 760 mg of linoleic acid (which has numerous health benefits of its own), and 30 IU of vitamin E, an important antioxidant vitamin. The amount of GLA in this supplement is superior to many formulations on the market.

We recommend that you take one to three capsules daily, for general well-being. If you’re treating breast pain, you may want to up the dosage to 6 grams daily. There are virtually no side effects from supplementing with this friendly fat.

Other Conditions Treatable by Evening Primrose Oil

- Menstrual symptoms (premenstrual syndrome, fluid retention, headaches and backaches, skin problems, food cravings, depression, tension, irritability, fatigue, weeping, tantrums, and lack of concentration.

- Breast pain (mastalgia)

- Diabetic nerve disease

- Eczema and dry skin conditions

- Migraine headaches

References


Four Powerful Secrets to Physique Perfection
by John Parrillo

Over the years, many top professional and amateur bodybuilders have consulted with me - most of them in peak muscular shape. Still, they come to Cincinnati, Ohio, to learn techniques that will further refine their physiques. Most people, upon seeing a top-level bodybuilder, would feel that such athletes are flawless. Why seeing a top-level bodybuilder, would they even need help — at this pinnacle in their development? Plus, what kind of help could possibly transform their already near-perfect bodies?

Regardless of your level of training and development, you can still improve your physique, and that applies to anyone. Let’s face it, we’re all “works-in-progress.”

People who observe my one-on-one work with champions are amazed that I can find flaws in the most highly trained physique. Having worked with bodybuilders and judging bodybuilding contests for three decades have sharpened my ability to scrutinize physiques. There are some things I can see with my eyes; others, I have to test. Admittedly, I’m looking for flaws, and I’m critical. But bodybuilders don’t come to me for praise; they get that from the fans. They come to me because they know I’ll give them an honest evaluation of their physiques, and more importantly, that I’ll teach them how to become even better. Through it all, they learn that even a minor change in one variable — be it nutrition, supplementation, or training — can make a major change in the way they look and perform.

To a degree, bodybuilding is an activity of trial and error. You try umpteen diets, exercises, routines, always searching for that one formula that will magically transform your physique. But if you follow the principles that we espouse at Parrillo Performance, your search will be over. You can achieve your best shape ever. To understand how, here are 4 “secrets” get you started:

Secret #1: Gain muscle by manipulating carbohydrate intake.

When trying to gain muscular weight, you want a higher bodily level of the hormone insulin, which regulates carbohydrate metabolism by helping to usher glucose into cells for energy. Interestingly, insulin is also involved in muscular growth because it transports certain amino acids into muscle cells. To make this happen, you need carbohydrates. The key, however, is eating the right kinds of carbs, in the right amounts. The right carbs are the natural ones, such as brown rice, yams, sweet potatoes, whole grain cereals, potatoes, and the like. By contrast, simple sugars and refined carbohydrates are rapid-release foods that trigger too much insulin release. This process results in the accumulation of body fat.

Accordingly, you should increase your carbohydrate intake, perhaps as high as 400 to 500 grams or more a day. One way to do this is by taking a carbohydrate supplement such as Parrillo ProCarb, which is formulated with the complex carbohydrate maltodextrin.

Secret #2: Burn body fat by manipulating protein and carbohydrate intake.

To lose body fat, decrease insulin but increase another hormone - glucagon — which helps unlock fat stores. You can do this by eating slightly less carbohydrate and more protein. A good rule of thumb is to adjust your carbohydrate-to-protein ratio to between 1 to 1 or 1.5 to 1. One problem with reducing carbohydrate intake is the potential decline in energy levels. To compensate, try supplementing your diet with CapTri, our medium-chain triglyceride oil (better known as MCT oil). This is a special type of lipid that provides quality calories and, unlike conventional dietary fats, is not likely to be stored as body fat.

Secret #3: Achieve muscular hardness with ample protein.

Protein, because of its role in supplying amino acids for growth and repair, is the key to muscular hardness. Which brings up a key question: How much protein do you actually need?

The National Research Council sets the recommended daily allowance (RDA) at 0.8 grams per kilograms of body weight a day — the equivalent of 0.36 grams per pound of body weight a day. Based on the RDA, a 200-pound bodybuilder would require a mere 72 grams of protein a day — the equivalent of three tiny chicken breasts. Unfortunately, the RDA was established with average, sedentary people in mind — not athletes.

Other methods, based on nitrogen balance studies, are now being used to determine the protein requirements for athletes. Nitrogen balance means that the body is rebuilding at the same rate of breakdown. If tissue breakdown is faster than tissue build-up, you’re losing more nitrogen than you get from food. This state is called negative nitrogen balance, and it’s often induced by restrictive dieting. If less nitrogen is eliminated than is taken in, you’re in a positive nitrogen balance, indicating the growth of new muscle tissue. Nitrogen balance studies indicate that the protein requirement for athletes may be 23 to 178 percent greater than the average population.

Recent research indicates that weight-training athletes need greater amounts of protein. In one study, for example, 10 weight lifters trained intensely and consumed 0.9 grams of protein per pound of body weight a day. Four of these athletes were found to be in negative nitrogen balance.

In another study, weight lifters who increased their protein intake from 1.0 to 1.6 grams per pound of body weight a day were able to increase both strength and lean mass. Two other studies, both involving bodybuilders, found that eating 1.2 grams of protein per pound of body weight produced greater nitrogen retention than consuming 0.45 grams per pound of body weight a day.

Secret #4: Achieve muscular hardness by manipulating protein intake.

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Four Powerful Secrets to Physique Perfection

Clearly, bodybuilders and other athletes must include ample protein in their diets to promote muscular fitness. Individual protein needs vary and depend on a number of factors, including your training intensity and level of conditioning. I’ve seen many bodybuilders improve their physiques by increasing their protein intake up to 2.5 grams per pound of body weight a day — nearly seven times the RDA.

Without an adequate intake of protein, you won’t be able build or repair muscle. But if you consume too much, the excess could be stored as fat. Based on my experience, hard training bodybuilders can achieve excellent results — including muscular hardness — by consuming 1.25 to 1.5 grams of protein per pound of body weight a day. One gram per pound of body weight should come from lean protein sources such as white meat poultry, fish, and egg whites; the other .25 to .5 gram per pound of body weight, from all your other foods, particularly high-protein vegetables like beans, corn, and legumes.

Secret #4: Regulate development by controlling hormonal reactions naturally.

Along with nutrition, exercise is one of the best ways to control the fat-burning and muscle-building actions of certain hormones produced by the body, namely adrenaline, testosterone, and growth hormone (GH).

To illustrate how these hormones help you lose body fat, let’s start with adrenaline. When you work out, adrenaline is released, and it heads directly to fat cells. There, it sparks a chemical reaction, activating a special enzyme that breaks down stored fat into fatty acids. The fatty acids leave the fat cell, enter the bloodstream, and are carried to muscle cells to be used for energy.

Testosterone is a male hormone that seems to speed up the rate at which protein is used for muscle growth. Intense weight training triggers the production of testosterone. Concentrations in the blood start to climb, reaching peak levels 30 minutes into training. To take advantage of this increased testosterone level, you can perform highly intense training sessions using heavy, low-rep work for a duration of 30 to 60 minutes.

Growth hormone (GH) is the most powerful growth-producing substance in the human body. Part of the reason is that GH helps ferry certain essential amino acids into muscle cells. GH also has a “lipolytic” effect, which means it mobilizes body fat from storage sites and increases its use for energy. GH is probably the most important hormone for bodybuilding because of its dual involvement in building muscle and burning fat.

There are several things you can do to naturally increase your GH levels. First, follow a diet that contains adequate protein (1 to 1.5 grams of protein per pound of body weight). A high-protein meal increases GH release. Second, consider supplementing your diet with certain amino acids. The most effective oral combination for GH release is arginine pyroglutamate and lysine monohydrochloride, which is found in our GH Releasers. This is typically taken at bedtime and in the morning, always on an empty stomach.

Finally, train “smart.” High-repetition work with moderate poundages has been shown in research to stimulate GH release. Given that heavy low-rep work maximizes testosterone release and high-rep work triggers GH release, you can design a routine that takes advantage of these hormonal processes.

For example, incorporate heavy pyramid sets and exhaustion sets into the same training session. Start with one or two warm-up sets with about 15 reps each. Then select a poundage you can handle with proper form for 10 reps. Continue increasing the weight and do sets of eight, six, and four reps. Next, decrease the weight and perform an exhaustion set of 20 reps to failure. Exhaustion sets help pump blood into the muscle and stimulate GH release.

References


If your training, whether it is aerobic, strength, or both, is destined for super-intensity, then you’ve got to pay attention to your pre-exercise nutrition, particularly supplements. In case you don’t know it, there is an exact science to pre-exercise supplementation, and I’m going to cover it for you here and specify what you need to take and when you need to take. If you are going to get serious about your training, you must get serious about pre-exercise supplementation.

**Three to Four Hours Prior to Training**

A carbohydrate-rich meal eaten approximately four hours prior to exercise significantly pumps up muscle and liver glycogen content for better intensity for workouts, according to research. You can increase the carbohydrate content of your meal by including Parrillo ProCarb Formula, Parrillo Energy Bar, or one of our new Parrillo puddings as part of that meal.

Incidentally, any interval greater than four hours just won’t cut it. In a University of North Carolina study, women who ate a moderately high carbohydrate, low fat meal three hours prior to aerobic exercise performed with more energy and less fatigue than a group who ate their meal six hours prior to exercise. (1)

Exactly how much carbohydrate should you consume in this critical pre-exercise period? An Ohio State University study determined that eating 200 to 350 grams of carbohydrate improves performance substantially. (2)

**30 Minutes Prior to Training**

As I noted in the last issue of Parrillo Performance Nutrition Bulletin, supplements are the perfect way to help you get the carbo you need in this crucial window of time. You can use a high glycemic index carbohydrate drink, such as Parrillo ProCarb, or a form of food, such as a P-2-P Bar or -P-3-P Bar.

Alternatively, you can use a high glycemic index carbohydrate drink, such as Parrillo ProCarb, or a form of food, such as a P-2-P Bar or -P-3-P Bar.

In the last issue of Parrillo Performance Nutrition Bulletin, I detailed the use of high glycemic index carbohydrate drinks, such as Parrillo ProCarb, or a form of food, such as a P-2-P Bar or -P-3-P Bar.

With supplementation by taking Parrillo Max Endurance Formula 30 minutes to an hour before training, this supplement contains the following endurance-enhancing nutrients: inosine; a nutrient that improves oxygen utilization for better stamina, possibly by forcing additional production of energy-producing ATP; l-phenylalanine, an essential amino acid that acts as a potent mental stimulant for improved concentration during workouts; d-phenylalanine, an amino acid that promotes a higher pain threshold; and ferulic acid (FRAC), a nutrient stimulates the endocrine system to aid recovery and boost workout capacity.

This supplement also contains magnesium and potassium aspartates, which help filter waste products from the system, giving you extra stamina and extending endurance.

**Immediately Prior to Training**

Supplementing with a dose of creatine monohydrate right before your workout provides energy-giving benefits too. Among other effects, creatine increases the rate at which a high-energy compound called creatine phosphate, which also allows more rapid production of ATP. The more ATP that is available to muscle cells, the longer, harder, and more powerfully you can work out.

By supplementing with Parrillo Creatine Monohydrate right before your workout, you can load it into your muscles at just the right time to maximizing muscular reserves and restocking ATP.

To use creatine in your supplement program, there is a specific dosage program to follow. I recommend taking four 5-gram doses a day for five days. (Take one of these doses prior to your workout, as noted above.) This is known as the “loading phase.” From there, two to 5 grams once a day — about half a teaspoon — will keep your muscles saturated with enough extra creatine. This period is called the “maintenance phase.”

Another strategy is to combine CapTri®, our medium chain triglyceride oil (MCT oil), with a carbohydrate supplement such as ProCarb. For background, CapTri® provides twice the energy of protein and carbohydrate (8.3 calories per gram versus 4 calories per gram for carbohydrates and protein) and is absorbed into the bloodstream as rapidly as glucose or blood sugar, the cellular fuel made available from the breakdown of carbohydrates.

Second, CapTri®, is preferentially used as fuel for energy, instead of being stored by the body. Medium chain fatty acid fragments can diffuse into the cell very quickly, where they are burned immediately for energy — at the same time as glucose. The ability of MCTs to enter the cells in this manner has a glucose-sparing effect, meaning that glucose and its stored counterpart, muscle glycogen, last longer without being depleted. The longer glycogen reserves last, the more energy you have for activities and fat-burning exercise.

So to boost your endurance during ex-
exercise, take CapTri® with a carbohydrate-based beverage (again, ProCarb is a good choice). A similar combo has been tested scientifically. At the University of Cape Town Medical School in South Africa, researchers mixed 86 grams of MCT oil (nearly 3 tablespoons) with two liters of 10 percent glucose drink to see what effect it would have on the performance of six endurance-trained cyclists. The cyclists were fed a drink consisting of glucose alone, glucose plus MCT oil, or MCT oil alone. In the laboratory, they pedaled at moderate intensity for about two hours and then completed a higher-intensity time trial. They performed this cycling bout on three separate occasions so that each cyclist used each type of drink once. The cyclists sipped the drink every ten minutes. Performance improved the most when the cyclists supplemented with the MCT/glucose mixture. The researchers did some further biochemical tests on the cyclists and confirmed that the combination spared glycogen while making fat more accessible for fuel.

When you supplement with CapTri® by itself, start with 1/2 tablespoon at every meal. After a few days, increase to one tablespoon with each meal. During hard training, many athletes go as high as two to three tablespoons per meal - a level they have found to be beneficial.

References
MEP’s or MRP’s
by John Parrillo

They’re called meal-replacement products (MRPs) – shakes, bars, powders, and so forth – because, as the name suggests, you are supposed to eat or drink them in place of breakfast, lunch, or dinner. Therein lies the problem: If you do that, if you use them as true MRPs, you’re cheating yourself nutritionally – big time.

For one thing, you won’t be the beneficiary of all the natural vitamins, minerals, antioxidants, phytochemicals, fiber, and other synergistic foods factors found in real food.

For another, you’ll skimp on calories – by eating shakes or bars only at various meals - and thus cause your metabolism to downshift. Restrictive dieting practices such as replacing meals lower your metabolic rate, making it easier for your body to store fat. Instead of losing body fat, you lose a lot of hard-earned muscle in the process. And when denied food, your body will begin to feed on the protein in your muscles. Because muscle is your body’s most metabolically active tissue, depleting it interferes with your ability to burn calories.

I’m certainly not knocking MRPs – hey, we sell our own line of beverages, bars, and puddings here at Parrillo Performance – I’m questioning the whole meal replacement issue. What I’d rather see you do is use these products as meal enhancements (MEPs), or between-meal snacks, rather than as meal replacements. Here’s a close look at what I’m talking about. You will see that there are so many more uses for MEPs than you may be previously considered.

Increase Your Calories

Supplements such as ProCarb, 50/50 Plus, Optimized Whey Protein, Hi-Protein Powder, and any of our bars or pudding (great for dessert) are the perfect complement to meals in that they can help you increase your calories. This is a critical tenet of my Nutrition Program. On my nutrition program, you gradually increase calories to lose body fat and gain muscle. Depending on your sex, size, activity level, and present metabolic state, you eat between 2,000 calories a day and 10,000 a day, sometimes more. Add one of my MEP supplements to your meal, and bingo, you’ve easily upped your caloric intake for greater mass-building. MEPs can be used as snacks too – another way to push your calories up the nutrition ladder.

Boost Workout Energy

For even greater energy and endurance, sip a carbohydrate beverage such as ProCarb during your workouts. This provides a source of carbohydrate other than muscle glycogen. With glycogen spared, fatigue is delayed, and you can work out longer and harder. ProCarb contains the slow-release carb maltodextrin or rice dextrin and is free of simple sugars such as fructose and glucose.

Maximize Recovery

Your muscles are most receptive to synthesizing new glycogen within the first few hours after exercise. To initiate recovery and restore glycogen, an effective supplement to take is 50/50 Plus at this time. Scientific experiments demonstrate that this type of supplement (with the added protein) initiates the rapid uptake of carbs by your muscles – faster than carbs alone. (1)

In addition, a carbohydrate/protein supplement taken following a workout stimulates the release of two hormones (insulin and growth hormone), creating an environment favorable to muscle growth and recovery. (2)

Stay Well

No one likes to be sidelined from working out due to a cold, flu, or other infection. In addition to eating properly and supplementing with antioxidants, there are other measures you can take to bolster immunity so that you’re less like to get sick. One of these is using a whey-based supplement in your nutrition program. It also enhances recovery. We have two products containing whey: Optimized Whey Formula (100% whey protein isolate) and our 50-50 Plus Formula (formulated with whey protein isolate, calcium casein, milk protein isolates, and maltodextrin).

Whey is a component of milk that is separated from milk to make cheese and other dairy products. Research shows that whey protein diets increase the amount of glutathione in body tissues. Glutathione is involved in strengthening immunity. (3)

In addition, whey exerts a powerful mass-building effect too. This may be partially due to whey’s ability to stimulate protein synthesis and enhance recovery. In one study, whey boosted post-meal protein synthesis by 68 percent, whereas another milk protein stimulated synthesis by 31 percent. (4)

So you see: There is a lot more to these amazing supplements that is normally promoted. Their least-best use is as meal replacements. Their very best uses entail so much more – as calorie boosters, energy aids, recovery agents, and protector supplements. Use them strategically, you’ll be amazed at the muscle-building, energy-boosting results you’ll achieve.

References

Mighty Minerals
by John Parrillo

To any bodybuilder who trains all-out, high-intensity workouts mean paying closer attention to vital nutrients called minerals and electrolytes. Hard, intense training can deplete these needed nutrients from the body through perspiration and normal metabolic processes.

Found in fish, poultry, and vegetables, electrolytes are minerals that are responsible for maintaining the body’s fluid balance, both inside and outside cells. Fluids protect internal organs, supply nutrients and oxygen to cells and tissues for growth and repair, and transport carbohydrates and other waste products away from cells.

The main electrolytes in extra-cellular fluid are sodium, calcium, and chloride while in the intracellular fluid, they are potassium, magnesium, and phosphorus. These nutrients provide a life-sustaining environment for all body cells and must be kept in proper balance for optimal health.

In addition to their electrolytic functions, these minerals play other vital roles in the body. Calcium, for example, is required for the formation of body structures, particularly bones and teeth. It is the most abundant mineral in the body, with about 99 percent of this mineral deposited in bones. It’s important to mention that dietary calcium is not well absorbed. In fact, only about 20 to 30 percent of the calcium you get from foods is taken up by your body, making mineral-electrolyte supplementation a good idea. Calcium requirements vary by age, but women and men generally need between 1000 and 1200 milligrams daily.

The next most abundant mineral in the body is phosphorus. This mineral is essential for the formation of body structures, muscular contractions, nerve transmission, and kidney function. Phosphorus also plays a key role in energy production. Both women and men need about 700 milligrams daily for good health.

Magnesium is required for the metabolism of protein and carbohydrates. This mineral depends on the presence of calcium for its action. So when selecting a mineral-electrolyte supplement, make sure that the magnesium is equal to or at least 70 percent of the calcium. When taken in combination with the mineral zinc (30 milligrams) and vitamin B6 (10.5 milligrams), magnesium (450 milligrams) has been shown in research with college football players to boost strength levels.

The normal daily recommendation for magnesium is 320 milligrams for women and 420 milligrams for men; for zinc, 8 milligrams for women and 11 milligrams for men.

Another essential mineral is chloride. As an electrolyte, chloride helps maintain the pressure that causes fluids to pass in and out of cells until an equilibrium is reached on both sides of the cell membrane. There’s no daily recommendation for chloride, but it is advisable to obtain 500 milligrams daily.

Potassium is required for nerve transmission, muscular contraction, and glycogen storage. It is also involved in the synthesis of protein. Potassium works together with sodium to regulate fluid balance. Even though sodium has a bad reputation because of its link to high blood pressure and heart disease, some sodium is needed by the body for good health. There’s no recommended daily intake of potassium, although health experts suggest 3500 milligrams for active adults.

Right before competition, bodybuilders should be concerned about their sodium/potassium intake. Many competitors mistakenly believe that they must completely eliminate sodium from their diet. Actually, you need some sodium — between 500 milligrams and one gram a day — to look hard and full. This amount should be naturally present in the foods you eat during pre-contest dieting.

The trick is to keep your sodium/potassium ratio in balance. By eating natural carbohydrates, you take in high amounts of potassium. If there is too little sodium in your system, your body accelerates its production of aldosterone, a hormone that regulates the vital sodium/potassium balance. Inadequate concentrations of sodium can actually make you look smooth.

Drinking unfamiliar water can upset this ratio. That’s why you should be careful about the type of water you drink prior to your contest. Some city water supplies are high in sodium and calcium, which can both result in puffiness when taken in excess. For this reason, do not drink or cook with the water in the city where you are competing. Instead, take your own water with you to the contest — provided this water has not made you retain water in the past. If the water you drink does cause water retention problems, switch to distilled water for drinking and cooking. When drinking distilled water, however, be sure to take mineral-electrolyte supplements — because distilled water contains no minerals.

Other minerals of vital importance to
Mighty Minerals

athletes and bodybuilders include selenium, which bolsters the immune system, plus protects cardiovascular and muscular health; iron, which is involved in the production of energy; and copper, which helps protect ligaments and tendons. As for recommended intakes of these minerals: The recommended daily intake of selenium is 55 micrograms for men and women. Although hard-working athletes may require more iron, the daily requirement is 18 milligrams for women and 8 milligrams for men. You don't need more than 3 milligrams of copper daily.

Chromium, of course, is an important fat burner, shown in research to shift body composition toward a leaner, more muscular profile. Chromium’s primary function in the body is to help turn carbohydrates into glucose (blood sugar), the fuel burned by cells for energy. It also helps regulate and produce the hormone insulin. Manufactured by the pancreas, insulin helps control hunger, regulates fat storage and muscle-building, and assists the body in utilizing cholesterol properly. Chromium makes insulin work more efficiently in the body. Without chromium, insulin simply would not function. For fat loss and muscle-growth support, the recommended intake of chromium is around 200 to 400 micrograms.

As you can tell, there are many issues surrounding the intake of mineral-electrolytes, particularly for hard-training bodybuilders. You can obtain an excellent supply of these vital nutrients by supplementing with Parrillo Mineral-Electrolyte Formula. It supplies a balance of extracellular electrolytes and intracellular electrolytes. Other nutrients, such as zinc, magnesium, copper, selenium, and chromium, are present in readily assimilable forms. I suggest that you take one with each meal to ensure that you are getting ample amounts of these vital nutrients to help support essential body functions.
Food over Genetics
by John Parrillo

Where your physique is concerned, it’s estimated that 20 to 25 percent of your shape and body fat distribution are attributable to genetic factors. You might be born with the tendency toward abdominal or lower body fat, or less muscle, but that doesn’t mean you’re destined to live with these realities. You can change fat distribution patterns and build appreciable muscle even if you are a “hard gainer,” and there’s no better way to do that than with proper nutrition, complemented by specialized, intense training.

Genetic limitations can also be exceeded by increasing nutrient levels in the diet through food and supplementation. When properly nourished, the body starts growing and responding at rates never thought possible. Here is a look at how.

The Power Of Food

The most vital substance you need for growth is food. Yes, food! To get the results you want from nutrition, food will always work the most effectively, much better than “miracle” supplements. I call food the “perfect supplement” because it supplies the raw materials your body needs for growth and for the stimulation of chemical processes involved in the breakdown, absorption, and assimilation of nutrients.

In my work with the best bodybuilders and athletes in the world, I’ve identified which foods yield the best results in terms of physique and performance. Lean protein, for example, supplies nutrients called amino acids which are required for every metabolic process. Athletes have higher requirements for protein than the average person. Without enough protein, you cannot build muscle, repair its breakdown after training, or drive your metabolism. Starchy and fibrous carbohydrates supply energy and are stored as glycogen in the muscles and liver.

You need certain fats called Essential Fatty Acids (EFAs), which must be supplied by the diet. EFAs regulate many biological functions, including the manufacture of connective tissue, cellular walls, and hormones. A good supplemental source of EFAs is Parrillo Evening Primrose Oil. All the foods I recommend on the Parrillo Nutrition Program have a “high-nutrient density.” This describes the ratio of nutrients in a food to the energy it supplies. Natural starchy foods like potatoes, yams, brown rice, and whole grains are packed with carbohydrates, protein, vitamins, and minerals. Fibrous vegetables are rich in vitamins, minerals, water, fiber, and carbohydrate. And, lean proteins are high in protein, vitamin, and minerals. In short, high-density nutrient foods pack a lot of nutritional wallop, and that’s why you should eat them.

Try to stay away from low-nutrient density foods. These are typically “junk foods” such as processed foods, sweets, soft drinks, alcoholic beverages, and high fat foods. Low-nutrient density foods are easily converted to body fat or, as in the case of alcohol, can interfere with the body’s ability to metabolize fat.

Foods containing simple sugars are excluded from my nutrition program because they also convert easily to body fat. These foods include fruit and fruit juices, which contain the simple sugar fructose, and dairy products, which contain the simple sugar lactose.

You can increase the nutrient density of your nutrition by adding in supplements — but only after you’re eating properly. By taking supplements, you force your digestive system to process more nutrients. This allows the nutrient levels in your body to be increased at the cellular level — beyond what can achieved by food alone. This, along with a gradual increase of calories, helps your body grow. Supplements are quality nutrients that work in conjunction with food to help your body build its metabolism and recovery mechanisms.

The Ultimate Bodybuilding Diet

To a degree, you have a great deal of control over whether the food you eat is turned into body fat or muscle. The assignment of food to either fat stores or muscle stores is called “nutrient partitioning,” and it’s the secret behind getting lean and staying muscular.

To understand how nutrient partitioning works, it’s helpful to think of the body as being divided into a fat compartment and a lean compartment. Food goes to either of these compartments or is burned for energy.

One of the factors that has a significant effect on nutrient partitioning is your endocrine system. It’s involved in such processes as metabolism, energy production, and growth. The endocrine system consists of several organs in the body, including the pituitary gland, the thyroid gland, the parathyroid gland, the pancreas, the testes or ovaries, and the kidneys. This specialized system is like a chemical “messenger service” in the
Food over Genetics

body; it transmits messages in the form of hormones, carried by the blood to specific targets (organs, tissues, or cells) in the body. The messages sent are things like “build muscle proteins,” “store fat,” “burn fat,” or “store carbohydrates.”

Once these messages are received by the targets, the commands are carried out by enzymes, special proteins that control chemical reactions inside cells. Through these reactions, enzymes can make or break down proteins or fat.

Two of the most important hormones involved in muscle growth and fat loss are insulin and glucagon, both produced in the pancreas. They regulate carbohydrate metabolism and fat metabolism by exerting control over the enzymes that carry out these processes.

When blood sugar (glucose) levels rise — usually after carbohydrates are eaten — insulin is released. It transports glucose into cells where it is burned for energy or stored as glycogen. If carbohydrates are released into the bloodstream too fast, an overproduction of insulin occurs. Consequently, some of the carbohydrates are deposited as fat — instead of being stored as glycogen. Simple sugars and refined carbohydrates are rapid-release foods that trigger too much insulin. This channels calories to the fat compartment of the body — not the avenue of nutrient partitioning you want.

Interestingly, insulin is involved in muscular growth because it transports certain amino acids into muscle cells. To make this happen, you need carbohydrates. The key, however, is eating the right kinds of carbs, in the right amounts.

Glucagon opposes the effect of insulin. When blood sugar is low, glucagon is released, and this typically occurs several hours after a meal is eaten. Glucagon then activates the conversion of glycogen to glucose in the liver in response to low blood sugar levels. It also signals the body to start burning fat for energy, because the body is running low on carbohydrates, its preferred fuel source.

The ratio of insulin to glycogen in your body largely determines whether you will gain fat or lose it. You can control this ratio naturally by adjusting the protein and carbohydrate proportions in your diet and combining foods in the proper manner. Here’s how you can partition your food more effectively, so it can be used to burn fat and build muscle:

1. When trying to gain muscular weight, you want a higher ratio of insulin, so you would increase your carbohydrate intake, perhaps as high as 400 to 500 grams or more a day. A carbohydrate supplement such as Parrillo ProCarb Formula, which is formulated with the complex carbohydrate maltodextrin, is a good way to increase carbohydrate consumption. So are any of the Parrillo Energy Bars. At the same time, be sure to meet your lean protein requirement by eating between 1.25 and 1.5 grams of protein per pound of body weight. At least 1 gram should come from chicken, fish, turkey, or egg whites, with at least another .25 or .5 gram of additional protein per pound of body weight from vegetable sources, which contain some protein as well.

2. To lose body fat, decrease insulin and increase glucagon by eating slightly less carbohydrate and more protein. A good rule of thumb is to adjust your carbohydrate-to-protein ratio to between 1 to 1 or 1.5 to 1. One problem with reducing carbohydrate intake is the potential decline in energy levels. To compensate, try supplementing your diet with CapTri®, our medium-chain triglyceride oil. This is a special type of lipid that provides quality calories and, unlike conventional dietary fats, is not likely to be stored as body fat.

3. Don’t take nutrient partitioning to extremes by going on a “zero-carb” diet in an attempt to burn more body fat. Under extremely low-carb conditions, muscular growth is impossible. There’s not enough insulin available to transport amino acids into muscle cells. Furthermore, the body begins to break down its own proteins into amino acids for conversion into glucose, needed by the brain for fuel.

4. Rate of digestion is important. Your meals (five, six, or more a day) should include the proper combination of lean proteins, starchy carbohydrates, and fibrous carbohydrates. This combination of foods slows your digestion to keep carbohydrates from being released into the bloodstream too fast, thus preventing an overproduction of insulin.

Food is the cornerstone of nutrition. If you don’t eat the proper foods — lean proteins, starchy carbohydrates, and fibrous carbohydrates — nothing else matters. We were built to process food — proteins, carbohydrates, and fats. So if you want to make the best possible progress with your physique and buck your genetics, I suggest that you start with the basics. And that means food.
Muscle growth is one of your chief goals if you’re a bodybuilder, athlete, or exerciser, but you can’t achieve that goal without adequate protein. One of the best ways to power up is through supplementation with amino acids. In this two-part series, you’ll get the inside scoop on everything you need to know about these amazing nutrients.

What Are Amino Acids?
Amino acids are the building blocks of protein. Without amino acids, your body cannot manufacture protein, and protein is needed to make muscle. Amino acid supplementation is used to provide an additional source of protein — beyond food — that can be used by the muscles for growth and repair.

For good metabolic control, your body required 22 amino acids in a certain balance to synthesize protein for muscular growth. All but eight of the amino acids can be manufactured by your body. Those eight are called “essential amino acids,” and they are supplied by animal proteins such as chicken and fish. Essential amino acids include lysine; methionine; phenylalanine; threonine; tryptophan; and the branched-chain aminos, isoleucine, leucine, and valine. Foods that contain the eight essential amino acids are called “complete proteins.”

Of the 22 amino acids, seven are considered “conditionally essential,” which means that under certain conditions such as extreme stress the body cannot manufacture them. These amino acids include arginine, cysteine, glutamine, histidine, proline, taurine, and tyrosine. The remaining seven amino acids are termed “nonessential amino acids,” which the body makes on its own. These amino acids include alanine, asparagine, aspartic acid, citruline, glutamic acid, glycine, and serine.

Now let’s take a look at specific amino acid supplements used in sports nutrition.

All-Purpose Amino Acid Supplementation
Your starting point with amino acid supplementation should start with a base formula that supplies a profile of all free form aminos that are available supplemental. The designation “free form” is important; it means that the amino acids are more easily assimilated by your body and thus bypass the long digestive process that food goes through. In other words, these protein nutrients get into your system more rapidly so that they can do their regenerative work of repair and building.

The benefits of a base formula are as follows:

- Assurance that your body is receiving the protein it requires to support your training efforts.
- Muscular protection in the wake of intensified training.
- Support during stricter competition dieting in order to preserve lean muscle.

The supplement we recommend is our Ultimate Amino Formula™, which should be taken with each meal. It has been specially formulated to meet the needs of dedicated, hard-training athletes and exercisers. Most of the athletes we work with use it year round to help stay in peak condition.

Using the Ultimate Amino Formula™ as a base, you should build from there, adding in other amino acids in order to customize your program and meet your other training goals. What follows is a look at other formulations that should be included in your own program.

Branched-Chain Amino Acids
The so-called “branched chain amino acids” (leucine, isoleucine, and valine) are unique in that they can also be used directly as fuel by the muscles. That’s critical, particularly if you work out aerobically, in addition to your regular weight-training regimen. Unless you properly fuel yourself with quality calories, high-intensity aerobics can result in the loss of lean body mass. Endurance activities, for example, cause loss of lean tissue because as fat and carbohydrate fuels are exhaust- ed, the body draws on its own muscle tissue to use as fuel. Supplementing with BCAAs prevents this from happening.

These aminos are utilized by your body in the following way: After a high-protein meal, BCAAs are rapidly absorbed, processed by the liver, and released into the bloodstream. From there, they are taken up by the muscles to be metabolized — unlike other amino acids, which are metabolized in the liver.

BCAAs work together with insulin to transport other amino acids into the muscles to be used in growth and repair. BCAAs, therefore, should always be taken with meals and never on an empty stomach.

Leucine, in particular, affords numerous benefits. (1) This amino acid has a higher “oxidation rate” than that of
isoleucine or valine. This point deserves some elaboration. During high-intensity aerobic exercise lasting 60 to 90 minutes or longer, leucine is rapidly used up and depleted. The by-products of its breakdown are used to manufacture another amino acid called alanine, which the liver converts to glucose. Eventually, that glucose finds its way to the working muscles where it is used for energy.

The harder you work out, the more leucine your body will use up. Following aerobic exercise, plasma leucine levels drop 11 to 33 percent; following strength training exercise, 30 percent. In skeletal muscle, leucine levels can decrease by as much as 20 percent with very intense aerobic exercise.

Leucine also induces the loss of body fat. Supplementation with BCAAs in which 76 percent of the formulation is leucine has been shown in research to trigger significant and preferential losses of visceral body fat. Located in the deeper layers of the body under the subcutaneous fat, visceral fat is often the hardest fat to lose and doesn’t respond well to dieting, particularly in women. This finding is significant because it indicates that leucine may be an effective natural supplement for fat loss as long as you select the correct formulation. The Parrillo Muscle Amino Formula™ is contains 400 milligrams of l-leucine, 160 milligrams of l-isoleucine, and 160 milligrams of l-valine – the optimum balance for fat-loss needs.

What’s more, leucine works together with the other branched chain amino acids to rebuild vital muscle tissue. The more muscle you have, the more efficiently your body burns fat. Further, research indicates that consuming BCAAs before or during endurance training may decrease, even prevent, the rate of protein degradation in the muscle; improve both mental and physical performance; and may spare muscle glycogen stores so that you can train longer and harder, aerobically.

How to Supplement with Leucine and BCAAs

As noted above, leucine itself can be depleted by intense aerobic exercise. Thus, it is important to keep your system well-stocked with this amino acid, particularly during periods of hard training. In one study, during five weeks of speed and strength training, leucine supplementation of 50 milligrams per kilogram of bodyweight a day, along with a high daily protein intake, prevented a decrease in leucine in power-trained athletes.

On the Parrillo Nutrition Program, we advise taking two more more capsules of our Muscle Amino Formula with each meal. If you eat five meals a day and take two capsules, you would consume 4000 milligrams, or 4 grams, of leucine daily. Let’s suppose you weigh 200 pounds, or 91 kilograms, and follow the research-prescribed dosage indicated above. Four grams is roughly what you would need daily – exactly the amount you would get by taking our suggested usage. In all of our supplements, our suggested usages are based on scientific research.

Research also specifies that leucine supplementation should be in conjunction with a high-protein eating plan. The leucine content of protein foods is thought to vary between five and ten percent.

Each day, you should eat 1.25 to 1.5 grams of protein per pound of body weight. At least one gram of protein per pound of your body weight should come from complete protein sources such as lean white meat poultry, fish, egg whites, or protein powder. The remaining should come from starchy and fibrous carbohydrates, which also contain protein.

When you supplement with leucine, do so with a carbohydrate. We suggest taking our BCAA supplement with one of our carbohydrate drinks, such as ProCarb™ or 50/50 Plus™.

Next month, I will continue this two-part series with a detailed look into a number of amino acids that offer very unique health and muscle-building properties.

References

In continuing this two-part series on amino acids, I will focus on some specific nutrients that have recently won acclaim in the sports nutrition field for their ability to impact athletic progress in some monumental ways. Read on.

**Glutamine**

The most abundant amino acid in your body, glutamine is stored mostly in your muscles, although rather significant amounts are found in your brain, lungs, blood, and liver. This important amino acid serves as a building block for proteins, nucleotides (structural units of RNA and DNA), and other amino acids and is the principle fuel source for cells that make up your immune system. Glutamine is also one of the amino acids found in our Ultimate Amino Formula™, which I discussed in Part 1 of this series. Under certain conditions – including injury and intense exercise – the body’s tissues demand more glutamine than the normal amount supplied by diet (which is five to 10 grams a day) and more than can be synthesized normally by your body. (1)

During intense exercise, for instance, your muscles release glutamine into the bloodstream. This can deplete muscle glutamine reserves by as much as 34 percent. Such a shortfall can be problematic, since a deficiency of glutamine promotes the breakdown and wasting of muscle tissue. But if ample glutamine is available, muscle loss can be prevented. (2)

Glutamine is also the favored fuel of your immune cells. This means you need it when you’re ill, stressed, or recovering from surgery. During such times, the demand for glutamine exceeds its production and the body’s nitrogen stores become rapidly depleted — a sign that muscle protein is being broken down.

It is important to understand that glutamine is technically described as a “glucogenic,” meaning that it assists your body in manufacturing glycogen, the chief muscle fuel. In a study involving subjects who cycled for 90 minutes, intravenous glutamine, administered during a two-hour period following exercise, doubled the concentration of glycogen in the muscles. It’s not clear exactly how glutamine works in this regard, though. Scientists speculate either that glutamine itself can be converted into muscle glycogen or that it may inhibit the breakdown of glycogen. (3)

Also, supplemental glutamine has been shown to elevate growth hormone (GH) levels, theoretically influencing muscle growth. Physiologically, GH is the most important hormone in the body for exercisers and bodybuilders because it acts as a powerful stimulus for muscle growth and fat loss. Growth hormone is a substance that makes cells multiply faster. Among other functions, growth hormone helps mobilize fat from storage and makes more fat available for energy. It also promotes the transport of essential amino acids inside muscle cells to stimulate muscle growth. Many of the effects of exercise in increasing muscle mass and decreasing body fat are mediated by growth hormone.

One of the most exciting findings about glutamine is that it may help you fight fat. Some research hints that supplementing with glutamine can curb the desire for sugary foods — an excess of which leads to fat gain. For these reasons, glutamine may turn out to be an important amino acids dieters and exercisers who need to curb their desire for fat-forming sweets. Between 200 mg and one gram of glutamine can be taken with water 30 minutes before meals to lessen the desire for sugary foods. (4)

**How to Supplement With Glutamine**

Clearly, glutamine has numerous benefits for any athlete who wants to maximize performance, muscle repair, and immunity. Generally, a protein-rich training diet such as that recommended by the Parrillo Nutrition Program should prevent your glutamine levels from dipping too low. However, supplemental glutamine provides extra insurance, plus a windfall of other benefits. What’s more, if you’re the victim of frequent colds or infections, consider supplementing with this amino acid.

Each capsule in our Ultimate Amino Formula™ contains 103 milligrams of glutamine. We recommend that you take two or more capsules of this supplement with each meal. That should supply a gram or more daily — which is appropriate for athletes and active individuals. Both heat and acid destroy glutamine, so you should not take it with hot or acidic foods, such as vinegar.

**Phenylalanine**

Phenylalanine, an essential amino acid, is a building block for certain brain neurotransmitters. Neurotransmitters are chemical messengers that relay information between the brain and the rest of the nervous system. The L-form of phenylalanine can act as a potent mental stimulant for improved concentration during workouts.

This amino acid has sometimes been used to treat depression because it provides an amphetamine-like boost in mood. Since many people overeat when depressed, phenylalanine’s anti-depression properties are beneficial for maintaining a positive mental attitude while dieting. The amino acid is also believed to favorably affect memory and alertness. It also aids in the natural production of norepinephrine and dopamine, two neurotransmitters that promote and elevate mood.

Phenylalanine is another amino acid that may also play a role in fat loss, particularly when combined with other nutrients. A recent study found that a patented combination of chromium picolinate, inulin (an nondigestible plant fiber reported to quell sugar cravings), capsicum (cayenne pepper), and L-phenylalanine boosted fat loss and helped maintain muscle over a four-week period when subjects followed a liberal 1500-calorie diet and engaged in a brisk walking program 45 minutes, five times a week. (5)

Natural sources of phenylalanine include almonds, avocado, bananas, cheese, cottage cheese, non-fat dried milk, chocolate, pumpkin seeds, and sesame seeds. But
phenylalanine is another amino acid found in the Parrillo Ultimate Amino Formula. It is also included in our Max Endurance Formula, as both L-phenylalanine and D-phenylalanine. This formula contains other nutrients, known to enhance the body’s energy-producing systems. Specifically, D-phenylalanine (the mirror image of L-phenylalanine) inhibits the breakdown of endorphins (a protein-like substance with analgesic properties) for a higher pain threshold.

There are 200 milligrams of DL-phenylalanine in Max Endurance Formula™. This supplement should be taken 30 minutes prior to training.

Supplemental Growth Hormone (GH) Releasers

“GH releasers” are another popular amino acid formulation among bodybuilders, particularly because they are thought to burn fat and build muscle. There are many types of GH releasers, include the amino acids arginine, lysine, ornithine, tyrosine, and glycine. These nutrients appear to have a stimulatory effect on the production of growth hormone in the body.

Stored in the pituitary gland, growth hormone is involved in the growth of body tissues and has several important effects on the metabolism of protein, carbohydrates, and fats. In protein metabolism, for example, it helps transport amino acids across cellular membranes, increasing the concentration inside cells so that protein synthesis can proceed. Additionally, growth hormone prevents the breakdown of protein and its utilization for energy. Most likely, this occurs because growth hormone can mobilize fat for energy, thus sparing protein.

Growth hormone has a carbohydrate-sparing effect as well because it decreases cellular utilization of glucose. In the tissues, growth hormone also converts fatty acids to acetyl-Co-A, a molecule used in the production of energy.

Growth hormone is secreted throughout a person’s lifetime. The rate of secretion can be affected by a number of factors, including nutritional status, exercise (working out does increase the secretion rate somewhat), time of day, and stress.

When given intravenously, certain amino acids seem to trigger the release of growth hormone in the body. The combination of two amino acids — arginine pyroglutamate and lysine monohydrochloride — has been shown in research to be the only oral pair of amino acids to effectively elevate the body’s levels of growth hormone. This combination is available in supplement form in our Enhanced GH Formula™. The suggested usage is two or three capsules upon rising, before training and going to bed.

The arginine component of this supplement is worth further discussion, since it has its own unique set of benefits.

Arginine

Arginine is believed to be an immune booster, since it stimulates the activity of the thymus gland, which shrinks as we age. Located in the chest just behind the breastbone, this gland immune system cells that help fight off disease. Because of arginine’s immune-boosting power, doctors are beginning to use it supplementally in patients suffering from immune suppression. (6)

Research indicates that arginine – when taken with carbs - may help initiate recovery – the period of muscle repair and growth that takes place following a workout. In one study, exercisers took either a carbohydrate supplement or a carbohydrate-arginine supplement at one, two, and three hours following exercise. The supplements contained either one gram of carbohydrate per kilogram of body weight or one gram of carbohydrate, plus 0.08 grams of arginine per kilogram of body weight. During the four-hour recovery period, the increase in muscle glycogen was more rapid in those who had consumed the carbohydrate/arginine formula.

The researchers chalked this response up to arginine’s ability to increase the availability of glucose for muscle glycogen storage during recovery. (7)

There’s more. Arginine apparently helps prevent the body from breaking down protein in muscles and organs to repair itself when injured. In one study, surgical patients who were given 15 grams of arginine daily following their operations had a 60 percent reduction in protein loss compared to non-supplemented patients. Of course, more studies are needed in this area, and you shouldn’t self-medicate with arginine, or any other amino acid, after you’ve been injured unless you have your doctor’s permission. (8) Though it has been around for a long time, arginine is re-emerging as an important health supplement.

For more information on how you can get in on all the benefits afforded by amino acid supplementation, call our Orderline at 1-800-344-3404.

References


Mold More Muscularity
by John Parrillo

Muscularity describes the relative development of each muscle — its size, shape, separation, and the degree of body fat present. With most physiques, the lack of muscularity is immediately obvious, with flaws ranging from poor quadriceps separation to poor lower fat development. In many cases, muscularity is there, but it is obscured by body fat. But let’s not focus on the negatives; let’s focus on the positives: how to hone your physique so that there are no flaws in muscularity.

Although muscularity is a highly desired attribute among exercisers, bodybuilders, and other athletes, few really know how to attain it. Basically, it requires a multi-prong approach, something I call my six-step formula, mapped out for you in this column. If one of your physique goals is muscularity, I’d advise the following:

**Step One: Eat fewer starchy carbohydrates.**
Reducing your intake of starchy carbohydrates — potatoes, yams, whole grains, and brown rice, for example — is an amazing way to start stripping away fat. Metabolically, this dietary reduction helps shift your body into a fat-burning mode. Your body simply starts burning fat for energy, since there is a deficit of carbs in your body. How much of a reduction will work? A good rule of thumb is to adjust your carbohydrate-to-protein ratio to between 1 to 1 or 1.5 to 1.

Be aware that one problem with reducing carbohydrate intake is a potential decline in your energy levels. To compensate, try supplementing your diet with CapTri®, our medium-chain triglyceride oil (MCT oil). This is a special type of lipid that provides quality calories and, unlike conventional dietary fats, is not likely to be stored as body fat. Calorie for calorie, CapTri contributes less to body weight gain (fat gain) than carbohydrates or conventional dietary fat. Think of CapTri as an immediate energy source that will get burned before the body has time to store it. It is an excellent metabolic-support supplement.

Start with 1/2 tablespoon at every meal. After a few days, increase to one tablespoon with each meal. During hard training, many athletes go as high as two to three tablespoons per meal - a level they have found to be beneficial.

**Step Two: Increase your dietary protein.**
Protein is now recognized as a nutrient that helps stimulate the metabolism, and by that token, it is essential to consume ample protein in order to promote fat loss while maintaining muscle. You can meet your higher-protein requirement by eating between 1.25 and 1.5 grams of protein per pound of body weight. At least 1 gram should come from chicken, fish, turkey, or egg whites, with at least another .25 or .5 gram of additional protein per pound of body weight from vegetable sources, which contain some protein as well.

**Step Three: Gradually increase your caloric intake.**
To lose body fat, thereby unveiling muscularity, most people are under the mistaken impression that they must severely restrict their caloric intake. But when denied food, the body begins to feed on the protein in the muscles. Because muscle is the body’s most metabolically active tissue, depleting it interferes with your ability to burn calories. Plus, restrictive diets lower your metabolic rate, making it easier for your body to store fat. With this step, you should gradually increase your calories 200 to 400 calories for a few days to re-charge your metabolism for fat-burning. This will stimulate your metabolism for increased muscularity.

**Step Four: Place greater emphasis on heavy weight training.**
The development of muscularity is not all nutrition. Certain training techniques are required as well, but they do work best in concert with the nutritional guidelines I just covered. If you want to obtain muscularity fairly rapid, there is a special set sequence that I recommend following.

It is as follows: one warm-up set, three to five heavy pyramid sets (increasing the poundage each time and lowering the number of reps), and one to two high-rep sets (exhaustion sets). Put another way, you start off training a muscle slow and heavy like a powerlifter trains. You then finish training the muscle fast and intense like a bodybuilder does. This is the right training sequence for muscularity.

**Step Five: Increase the duration, intensity, and frequency of your aerobics.**
Doing more aerobic work improves the muscle fibers’ ability to oxidize fats for energy, and you get leaner, with more muscularity, as a result. Let me explain the optimal way to train aerobically so that you can achieve the best results.

For a long time now, exercisers have been urged to achieve their “target heart rate” during aerobic activity. This is the elevation of the pulse to approximately 60 to 80 percent of your maximum heart rate (220 minus your age). Reaching target heart rate and keeping it there for at least 20 minutes is supposed to boost general cardiovascular conditioning. Also, it’s always been assumed that if you exercise at your target heart rate long enough, you burn fat.

Optimal cardiovascular conditioning is not achieved by just raising your target heart rate, however. It’s achieved by increasing your “oxygen uptake” or VO₂ max. This represents your body’s maximum capability to deliver oxygen to the working muscles. So how do you boost your VO₂ max? By exercising so intensely that you’re breathing hard. The harder you breathe, the more energy you expend, and the more fat you burn because you’re doing more work.

Train consistently like this, and some important metabolic changes take place inside the body. First, the mitochondria (cellular furnaces where fat and other nutrients are burned) increase in size and total number inside muscle fibers. Second, muscle fibers build up more aerobic enzymes —
special chemicals involved in fat-burning. Third, aerobic exercise appears to increase levels of myoglobin, a muscle compound that accelerates the transfer of oxygen from the bloodstream into the muscle fibers.

Larger mitochondria and more of them, greater levels of aerobic enzymes, and increased blood flow — these factors all boost the fat-burning capability of muscle fibers. The more aerobically fit you become, the more your body learns to burn fat for energy. So you can see why aerobic exercise is so important for leaning out.

Endurance athletes have known these things all along. That’s why bodybuilders can learn a lot from the training regimens of endurance athletes. They train regularly and at long durations at near VO\textsubscript{2max} and as a result, their muscles are conditioned to rely more heavily on fat for energy and less on stored carbohydrate (glycogen). To approach the training level of an endurance athlete, perform aerobics several times a week, for 45 to 60 minutes each time. But don’t “coast.” Work out hard, so that you’re breathing hard. The harder you breathe, the more fat you burn.

**Step Six: Stretch for mass and muscula-rity.**

A special training technique I developed called “fascial stretching” can be incorporated into your training program to develop muscula-rity. This technique strengthens and stretches the “fascia,” a thick, fibrous sheet of tissue that envelops individual muscles and groups of muscles and, like a divider, separates their layers and group-ings. The fascia encloses other structures too, including tendons, joints, blood ves-sels, nerves, and organs. The fascia func-tions like a “shock absorber” for the tissues it surrounds, protecting them from blows of athletics or the stresses of training and competition. On the molecular level, fascia tissue is stronger than structural steel.

To perform fascial stretching, you stretch between sets of weight training exercises when the muscle is fully pumped (the pump has an additional stretch effect on the muscle). Special stretching exercises are used, and these are explained in detail in the Parrillo Training Manual. Done consistently during workouts, fascial stretching stimulates muscular development and improves strength. The reason for this response is simple: When you stretch the fascia, you give the muscle underneath more room to grow. The result is larger muscles and bet-ter separation between muscle groups. I’ve seen this happen in working with athletes who use fascial stretching. What’s more, I’ve observed that their strength levels can increase by as much as 20 percent.

I have just really scratched the surface of muscula-rity with this column. If you’d like to know more, call Parrillo Performance for information on the Parrillo Nutrition Program and the Parrillo Training Manual – and how you can make both of these books part of your training library.
Step 1: Move into a caloric-surplus state.

This eat-more-calories advice defies conventional wisdom, but it works. Increasing your calories will help recharge your metabolism. For a period of two to four weeks, gradually increase your calories – even to the point of gaining weight! Yes, you read that correctly: Gain some weight to ultimately lose more weight. Try to gain weight at the rate of one pound per week for every 100 pounds you weigh. But let me qualify this: I’m not talking about any type of body weight; I’m talking muscle. This is the time to tweak your weight training routine to concentrate on heavy pyramid sets for greater muscle weight. Increasing your muscle in this fashion will boost your metabolism so that you can burn fat at an accelerated pace.

If you’re still not convinced, look at it this way: if you gain a pound a week for four weeks and lose a pound a week for four weeks, you’ll gain more mass and be much leaner than if you tried to lose first and gain later. So try to put on weight for several weeks. You will be amazed by how much bigger and leaner you will get. Depending on your sex, size, activity level, and present metabolic state, you should eat enough calories a day to gain at the desired rate. For some people, this will be around 3000 calories a day; for others, as many as 8000 to 10,000 calories daily.

Step 2: Select plateau-busting foods.

Yes, there are such foods, and they are the same foods you use to burn fat and construct new muscle. These foods include those from all the Parrillo Food Groups: lean proteins (fish, white meat poultry, and egg whites), starchy carbohydrates (potatoes, yams, rice, legumes, and whole grain cereals), and fibrous carbohydrates (salad vegetables, broccoli, cauliflower, green beans, etc.).

After meeting your daily lean protein and carbohydrate requirements, be sure to include a certain amount of fat in your diet. Good sources are safflower oil, sunflower oil, linseed oil, and flaxseed oil. These dietary fats provide essential fatty acids and help the body absorb fat-soluble vitamins such as vitamin A, vitamin D, and vitamin E. I recommend that you eat up to one tablespoon a day of these fats.

You must increase your calories from these foods because they are the choices that will help create the desired benefit of a leaner body. The reason is, the same number of calories from different foods has different effects on the body. This is very easy to prove. Just try replacing 1000 calories of potatoes and brown rice with 1000 calories of candy and ice cream in your diet, and see what happens to your body fat levels. (Clue: You’ll get so big you’ll have to sit down in shifts.)

Step 3: Use metabolic-support supplements.

Supplements don’t burn fat per se, but they can support your body’s metabolism. That being so, make sure you are using our Advanced Lipotropic Formula™. It contains fat-mobilizing nutrients your body needs to efficiently metabolize fat. For example.

Choline. Present in all living cells, choline helps prevent fat from building up in the liver and works to shuttle fat into cells to be burned for energy. What’s more, choline levels can drop during hard exercise. This affects brain chemicals involved in the production of muscular energy. Theoretically, by supplementing with extra choline, you could work out harder and burn more fat as a result. (1)

Inositol. Working together with choline, inositol helps prevent build-ups of fat in the arteries and keeps the liver, heart, and kidneys healthy.

Biotin. This B-complex vitamin is required to activate specific enzymes involved in metabolism. Without it, your body can’t properly burn fats. Biotin also influences the body’s ability to properly metabolize blood sugar (to avoid low-energy periods).

Vitamin B₆. This nutrient helps keep the body’s water balance in check, plus helps regulate blood sugar so you don’t get swings in blood sugar and the cravings they cause. Restrictive diets can deplete the body’s supply of vitamin B₆, and supplementation is extra insurance against a deficiency.

Methionine. This amino acid has been linked to weight control. In combination with another amino acid – phenylalanine - methionine apparently assists in the breakdown of fat. (2) (Our Max Endurance Formula™ contains 200 mg of DL-phenylalanine.)

Carnitine. This nutrient shovels fat into
the cells’ mitochondria (cellular furnaces) to be burned for energy. It also cleanses the mitochondria by removing cellular waste products. Thus, carnitine is absolutely vital to metabolism. When combined with chromium picolinate, carnitine appears to boost fat loss — potentially up to two or more pounds a week.

Chromium Picolinate. Chromium may stimulate the growth of lean muscle if you lift weights. In one study, 10 college men attending a strength-training class twice a week took either chromium supplements (200 mcg a day), or a placebo. After 40 days, the chromium supplementers gained an average of 4.84 pounds of muscle, without gaining any fat. The placebo group did not fare as well. They gained barely a pound of muscle, on average, and their body fat increased by 1.1 percent. (5)

Enzymes. Advanced Lipotropic Formula™ contains two important enzymes: pancreatin and betaine HCL. Enzymes such as these help ensure that our bodies properly break down the foods we consume so that they can be properly utilized by the body for growth and repair.

I recommended that you take one capsule with each meal — which means four to six capsules daily, depending on how many meals you consume. That way, your body receives a continuing supply of important fat-mobilizing nutrients throughout the day.

Step 4: Perform pre-breakfast aerobics.

Do your aerobics every morning for 45 to 60 minutes — before breakfast. At that time, your glycogen stores are low because you’ve gone all night without eating. With glycogen in short supply, you begin burning fatty acids for energy. You become leaner as a result, while busting past that plateau. Later, the nutrients you eat, including natural, starchy carbohydrates, are efficiently re-supplied to muscles, without being turned into body fat. Plus, your metabolism is activated for the entire day.

There are many types of aerobic activities from which to choose: jogging, running, cycling, rowing, stair climbing, walking, swimming, jumping rope, to name just a few. Exercise so that you’re breathing hard but can still carry on a labored conversation. Always strive to increase the duration, intensity, and frequency of your aerobics. Doing more aerobic work improves the muscle fibers’ ability to oxidize fats for energy, and you get leaner as a result. The harder you work out aerobically, the better.

References


Your Guide to Supplement Bars

by John Parrillo

If you’re training for your next big marathon, bodybuilding competition, or just getting ready for bathing suit season, supplement bars are an effective complement to your nutrition. But as with all supplements, not just any bar will do; you should customize your choice of supplement bar to your fitness goals. That’s easy to do with the Parrillo Supplement Bars, which come in three different formulations: Sports Nutrition Bars, Energy Bars, and Protein Bars, each designed for specific athletic requirements. Here’s what you need to know about these supplements - and how to use them in your personal sports nutrition program.

If You’re a Bodybuilder or Strength-Trainer:

Use the Protein Bars mainly to aid in post-exercise recovery. With 20 grams of pure protein and 30 grams of slow-release carbs, the Protein Bar provides a 60-40 ratio of carbohydrates to protein, considered optimal for post-workout nutrient replenishment by nutrition experts.

To aid recovery, consume one of these bars right after your workout - the period in which your muscles are most receptive to producing new glycogen. That’s when blood flow to muscles is much greater, a condition that makes muscle cells thirsty for nutrients. Taken right after a workout and again an hour later, this amount (in the form of a carbohydrate/protein bar), will help reduce the breakdown of muscle protein if you train with weights. Consuming protein and carbs after a workout actually speeds up the body’s glycogen-making process, better than just carbs alone. Another benefit of this post-training snack is that it helps trigger the elevation of key hormones (insulin and growth hormone) involved in muscle growth, especially in the period right after exercise. Insulin is a powerful factor in building muscle, and growth hormone increases the rate of protein production by the body, spurring on muscle-building activity. It also promotes fat burning. (1,2)

For mass-building, have a bar with your meals to boost calories. It takes an additional 2500 calories a week to manufacture a pound of muscle. Increasing your calories by about 240 a day with one or two of these bars is an effective way to achieve that caloric surplus. Finally, if you’re a competitive bodybuilder, this bar great to use on the day of your contest to avoid looking or feeling too full.

If You’re An Endurance Athlete

Use the Energy Bars with meals or as a pre-exercise snack to boost calories for extra energy. With 35 grams of slow-release carbohydrates, 14 grams of high-quality protein, and 5.5 grams of energy-producing CapTri, the Energy Bar is a perfect pre-workout or pre-run energizer. You can also use this bar for carbohydrate-loading, in addition to other carb sources, to keep your glycogen reserves well-stocked for competition.

The Energy Bar is an excellent supplement if you’re an ultraendurance athlete who competes in events lasting several hours or more because of the extra carbohydrates it provides. What’s more, this bar offers advantages in certain sports, such as long-distance cycling because they’re easy to eat as you’re riding.

If You’re Getting in Shape with Aerobics and Weight Training

You need more calories to fuel your multiple modes of exercise, and the Sports Nutrition Bar can certainly fill the bill. With 240 calories, 11 grams of quality protein, 37 grams of slow-release carbohydrates, and five grams of CapTri, this bar is a tremendous source of fuel that won’t turn to body fat. It has no sucrose or fructose, and almost no sugar, so it can assist in fat loss. A few important footnote here regarding fructose (found in many bars on the market): Research shows that fructose actually impairs athletic performance. Besides its tendency to convert easily to body fat, fructose isn’t even converted to muscle glycogen fast enough for use by working muscles. (3)

As recommended for bodybuilders, strength trainers, and endurance athletes, it’s best to eat your Sports Nutrition Bar with meals as a source of additional calories; before exercise for extra energy; or after exercise for recovery. And the benefits of using the product this way are worth it: greater energy levels each time you exercise and better muscular development.

Using Supplement Bars Wisely

These products should be used only as a supplement to your diet, not as a substitute for meals. Use them primarily for increasing your caloric intake and feeding your muscles. The best way to fuel your body is always by eating a nutrient-dense diet of a variety of lean proteins, starchy carbohydrates, and fibrous carbohydrates.

References

The Latest Word on Fructose
by John Parrillo

More than twenty years ago, I came out against fructose in the diet, and people thought I had gone nuts. After all, fructose is a naturally occurring sugar in fruit, which is generally a healthy food — high in fiber, vitamins and minerals and low in fat.

Only recently, however, have nutritional scientists begun to recognize fructose for what it is: a sweetening agent that makes you fat. The reason for their nutritional “eureka” has to with the fact that our national consumption of fructose (as well as other simple sugars) over the decades parallels America’s rise in obesity. (1)

The form of fructose that is most prevalent in our diets now is a particularly troublesome sweetener known as high-fructose corn syrup. This sweetener is used mostly in soft drinks and refined foods, but you will also find it in the most unlikely of places: health foods such as the energy bars, sports drinks, and carbohydrate supplements you probably take every day. Further, many of the foods in your pantry are sweetened with this additive, and it might just be the baddest of the bad when it comes to simple sugars.

Made from cornstarch, high-fructose corn syrup is a liquid that is predominantly fructose but has some glucose in it. (Even the powdered fructose sold in stores is made from cornstarch and not from refining the sugar in fruit, as you might assume.) Food manufacturers love using high-fructose corn syrup because it tastes much sweeter than sugar; this means they can use less of it and save on their manufacturing costs. Consumption of high-fructose corn syrup has risen more than 21 percent since 1970, when it was introduced into the food supply. (2)

According to a U.S. Department of Agriculture analysis, from 1985 to 2000, Americans added roughly 330 calories to their daily intake, and twenty-five percent (about 83 calories) came from sweeteners, including high-fructose corn syrup. That amount of added sugar in your diet will produce a weight gain of nearly nine pounds a year. (3)

I will talk more about fructose and weight gain in a moment, but I want to alert you to something about fructose that is just now gaining attention. There is a medically recognized condition called “fructose intolerance” — a sensitivity to the fructose in fruit juices, sports drinks, or products containing high-fructose corn syrup has caused the gene to increasingly express itself in people who have an inherited disposition to fructose intolerance. (4) Thus, the prevalence of this sweetener in the food supply is quite problematic, triggering this genetic susceptibility at increasingly alarming rates.

Now back to fructose and weight gain. I originally learned that fruit makes you fat not by reviewing the biochemical pathways of metabolism, but by actually doing nutritional experiments with real bodybuilders. Rather than being some theory out of a book, this is an experimental fact. For a long time I didn’t understand it — I just knew from our work in the gym that certain foods made bodybuilders get in better shape and other foods made them get fat.

In my experiments, I would remove 300 calories worth of complex carbohydrates from the subject’s diet in the form of rice, and replace it with 300 calories worth from fruit. The subject’s total caloric intake remained the same, as did the percent of calories from protein, carbohydrate and fat. The training program remained exactly the same. The only change was in the form of carbohydrate supplying 300 of the calories: Rice was replaced by bananas.

You would expect the subject’s body weight and percent body fat to remain the same, right? But that is not what happened. The subject would begin to gain fat. I would let this go on for a couple of weeks and the subject continues to gain fat. Then I’d pull the bananas out of the diet and put the rice back in — i.e., go back to the original diet. Guess what? The subject would begin losing body fat.

From a metabolic standpoint, the problem with the fructose in fruit is that it bypasses the control point that decides if a dietary sugar is going to be stored as glycogen or fat. Complex carbohydrates, such as rice, oatmeal or potatoes, are preferentially stored as glycogen until
glycogen stores are full. Fructose, on the other hand, gets directly converted to fat in the liver, then gets whisked off in the bloodstream to be stored in fat cells (5).

So a large portion of the fructose simply gets turned directly into fat and released into the bloodstream. Bam. You get a dose of fat. But the damage doesn’t stop there. The rest of the fructose gets converted into liver glycogen. That sounds okay, until you stop to think about it. You see, once liver glycogen stores are full, the liver says, “I’ve got all the glycogen we can hold, so any more carbs coming in here I’ll just convert to fat.”

Fructose thus preferentially repletes liver glycogen instead of muscle glycogen and shifts the liver into fat-storing mode. This is exactly what you don’t want. You need some liver glycogen, to be sure, because this is what keeps blood sugar levels steady. But when liver glycogen stores are full, this is when dietary carbs start to “spill over” into fat stores – and not to muscle cells as muscle glycogen.

Clearly, one of the keys to effectively restoring glycogen is the type of carbohydrate you eat. Natural, starchy carbohydrates such as potatoes, yams, whole grains, corn, and legumes do a better job at this than simple sugars like fructose do. Research has shown that a diet high in starchy carbohydrates can restock more glycogen in the muscles 48 hours after exercise than simple sugars can. (6)

So if you eat simple sugars like fructose, you’re not going to be able to store as much glycogen had you consumed natural, starchy carbohydrates. What implications does this have for you as an exerciser and bodybuilder?

For one thing, you won’t be able to train as hard or as long during your next workout, because you haven’t stored as much glycogen. Nor will you be able to recover from your workouts as efficiently. By contrast, eating ample amounts of starchy carbohydrates will extend your endurance and effectively re-supply your muscles with glycogen for better recovery. You’ll stay leaner too, since starchy carbs are fully utilized for energy production and glycogen synthesis.

Clearly, fructose is the worst carb source for exercisers and bodybuilders you can imagine. If you wanted to design a supplement to ruin your physique, it would be a fructose-based energy bar. Unfortunately, the vast majority of the bars out there rely on fructose as their major carb source, because it’s cheap.

When we were designing the Parrillo supplement bars, we surveyed every available sports supplement bar we could find. We found that 25 out of the 26 bars had fructose in either the first or second ingredient. (If you use somebody else’s bar, go read the label.) Why? Because high-fructose corn syrup and fruit juice (good sources of fructose) are real cheap, and they’re also very sweet, as I noted above. We pioneered the use of a new carbohydrate source in the Parrillo Bar called rice dextrin. It’s a shortchain glucose polymer made from rice. This gives you the quick energy you want from a sports bar, but without the fructose.

In summary, a large portion of fructose is converted directly to fat by the liver, fructose preferentially fills liver glycogen stores so that even good carbs are more prone to spill over into fat, and it cannot be used by muscle to recover glycogen. Calorie for calorie, the only nutrient that will make you fatter than fructose is fat itself.

Try to think of fruit as nature’s candy, because that’s exactly what it is. If your goal is to build a lean and muscular physique, then you don’t want to eat candy. Sugar and fat are natural, but that doesn’t mean they’ll make you lean and muscular.

**References**

Boosting GH Naturally With Nutrition
by John Parrillo

Forget steroids. Forget androstenedione. Forget DHEA. Forget whatever “flavor of the month” mass-building drug comes on the scene.

I’m a big believer in getting back to basics, especially for building muscles. And one of the basics is a natural supplement you can use to accomplish a lot of what you want, along with proper nutrition and training. And that supplement is a good growth hormone (GH) releaser.

For background: Physiologically, growth hormone (GH) is the most important hormone in the body for bodybuilders and athletes because it acts as a powerful stimulus for muscle growth and fat loss. Many of the effects of exercise in increasing muscle mass and decreasing body fat are mediated by growth hormone. (1,2)

Growth hormone (GH) is the most anabolic substance in the human body (3,4). In a study of older men (whose growth hormone levels are diminished), it was found that GH administration promoted an increase in muscle mass and a decrease in body fat — even in the absence of exercise training (3,4). Growth hormone is anabolic, meaning that it promotes the incorporation of nutrients into new body tissues, including the protein synthesis required to make muscle.

Part of this effect is believed to occur because GH promotes the transport of certain essential amino acids inside muscle cells. Notably, insulin also acts to transport a different set of essential amino acids, so you need adequate amounts of GH and insulin present at the same time to stimulate muscle growth. GH also has a “lipolytic” effect, which means it mobilizes body fat from adipose depots and increases the use of fat for energy. This in turn spares carbohydrates so glycogen stores are preserved.

The most important role of growth hormone is in promoting growth during childhood. Without GH, normal adult stature will not be achieved. Growth hormone acts to promote growth of all tissues of the body except the nervous system. GH levels reach maximal levels in late teens and gradually decline with age. The high levels of GH and testosterone in young adult males explain why most bodybuilders make their best gains during their late teens and twenties. This again underscores the central role of hormones in bodybuilding.

Growth hormone (GH) has some major effects on mass and on the metabolism of carbohydrate, protein, and fat. First of all, GH increases lean body mass by stimulating protein synthesis and increasing nitrogen retention. Part of this effect is believed to be due to GH promoting transport certain essential amino acids inside muscle cells. GH-deficient individuals have a relatively high proportion of body fat. Treatment with GH causes a decrease in body fat, accompanied by an increase in body protein, mostly muscle.

Sometimes, particularly after a period of glucose deprivation, GH has an insulin-like effect in increasing glucose uptake and utilization. This effect disappears quickly, and its physiological significance is a mystery. After about two hours, glucose metabolism is inhibited in muscle and adipose tissue. There is a decrease in glucose uptake and muscle glycogen stores are preserved.

In adipose tissue, GH promotes the breakdown of stored triglyceride (body fat), increasing plasma levels of free fatty acids (FFA). Since glucose uptake is suppressed by GH, fat synthesis is also suppressed. These effects combined result in a net loss of body fat.

The thing to remember is that GH decreases glucose uptake and utilization and spares glycogen, it increases use of fat for energy by mobilizing fat stores, and it increases protein synthesis. The net effect is to make the body leaner and more muscular. Many of the effects of exercise in making the body leaner and more muscular are mediated by an exercise-induced increase in growth hormone (1,2).

GH secretion is stimulated by sleep, stress, low blood glucose, an increase in certain amino acids (especially arginine, leucine, valine, and ornithine), and exercise. Normally, GH is secreted in an episodic fashion with maximal secretion occurring during deep sleep. GH is...
synthesized and stored in the anterior pituitary, and its plasma level is controlled via its rate of secretion. Its rate of secretion is controlled by two hormones from the hypothalamus: GHRH (growth hormone releasing hormone) and somatostatin (which inhibits GH release). GH secretion is thus under minute-by-minute control by the nervous system.

There are several things you can do as a bodybuilder to naturally increase your GH levels (3). First, eat an adequate diet containing at least one gram of protein per pound of body weight. A high-protein meal increases GH release. Second, supplement your diet with GH releasers — those containing arginine pyroglutamate and lysine monohydrochloride, the most effective oral combination of amino acids for GH release ever developed (4). Third, make sure you get enough sleep. Maximal GH release occurs during deep sleep.

Finally, train smart. Heavy, low-rep work is effective in increasing strength. This is probably due to an increase in testosterone levels and a training effect on the nervous system. High-rep work with moderate weights is more effective in stimulating GH release (1,2,3), so it’s a huge mistake to leave out the high-rep part of your training. The GH release resulting from high-volume training also serves as a potent stimulus for fat loss. Of course, you need both high-rep and low-rep work to make continuing progress.

So get back to basics. Get back to GH. At Parrillo Performance, our version of the GH releaser supplement is called our Enhanced GH Formula™. It contains the combo I mentioned above – arginine pyroglutamate and lysine monohydrochloride, shown to release growth hormone is test patients. With this particular amino acid grouping, I suggest that you take it on an empty stomach immediately upon waking, before training, and just before bedtime. Taken before bed is great, because the capsules dissolve while you’re in dreamland, providing your body with GH-triggering amino acids at a time when GH release is the highest anyway. Theoretically, you can grow while you sleep!

References
One thing I have found during my years of experimentation with nutrition and dieting was that different body types respond somewhat differently to different nutritional structures. For background, there are three very general body types, classified by general shape and appearance: ectomorphs, mesomorphs, and endomorphs. Ectomorphs are naturally skinny people, mesomorphs are naturally lean and muscular, and endomorphs are naturally fat. (You know which you are.) If you’re an ectomorph or an endomorph you can still develop and build a great physique, but it will be harder because you’re working against your natural genetic tendency to be either skinny or fat.

**Dieting If You’re An Ectomorph**

Ectomorphs get lean easily but have a hard time putting on muscle. They can eat a lot and don’t gain much weight. I found that these individuals do better on a high-carb diet with moderate to high protein, maybe somewhere around 25 to 30 percent protein, 65 percent carbs, and 5 to10 percent fat. (The actual percentages aren’t important, but they usually work out close to those above. These are given just as an example.) Basically, they need to get one to 1.5 grams or more of protein per pound of body weight per day, and then keep increasing carbs until they gain weight.

Some nutritionists advise that ectomorphs eat a high fat diet to gain body fat. The problem with using conventional fats (like many diets are now advocating) for weight gain is that when your body is in a calorie surplus (gaining weight), virtually all excess fat calories you consume from food will simply be stored as body fat (1-13). Ectomorphs will find that adding some fat to their diets will help them gain weight, but they’ll gain more fat along with the muscle than if they had followed a low fat diet. It is extensively documented in the medical literature that excess feeding of carbohydrates results in less body fat gain than excess feeding of dietary fat (1-7).

**Dieting If You’re An Endomorph**

Endomorphs gain muscle more easily, but tend to be naturally fat and have a hard time getting and staying lean. They seem to be very sensitive to the carbohydrate content of the diet. Again, for weight gain the body must be in an energy surplus (excess calories) and the bulk of these excess calories should come from carbohydrates, because this results in less body fat accumulation than if the excess dietary energy is supplied as fat (1-7). However, during weight loss I found that these people do better if they reduce their carbohydrate intake. While ectomorphs need to maintain a high carb diet even while losing weight to help prevent muscle loss, endomorphs just can’t seem to lose all their fat without reducing carbs. They seem to be very sensitive to insulin, and high insulin levels block the burning of stored body fat for energy. (To be more precise, they usually have mild insulin resistance, which results in increased insulin levels and a hard time burning fat.)

Just as an example, some representative numbers for an endomorph might look like this: For weight gain, 30-40 percent protein, 50-60 percent carbs, 5-10% fat. For weight loss, 50-60 percent protein, 30-40 percent carbs, 5-10 percent fat. Again, it’s not the actual percentages that are important, I’m just trying to illustrate the idea that you can shift around the structure of your diet to achieve different metabolic effects.

**Dieting If You’re A Mesomorph**

Obviously, mesomorphs have the easiest time becoming bodybuilders. These are the people we all envy. They were lean and muscular before they ever started training. They gain muscle easily. They can eat like crap and still look good. All they have to do is cut the junk out of their diet a month before the show and they’re in contest shape. But if you’re a mesomorph who wants to be really successful, stick to the general nutrition advice that follows.

**General Nutrition Guidelines**

On the Parrillo Nutrition Program, you start by calculating your daily protein requirement. One to 1.5 grams or more of complete protein per pound of body weight each day is a good general guideline for hard training athletes, especially during weight gain. As you decrease calories to lose fat, it helps to increase this to as much as 1.5-2 grams or more per pound per day. The higher dietary protein intake helps prevent catabolism of muscle protein during energy restricted diets.

Next you allot 5-10 percent of daily calories to come from fat. The remainder of your calories come from complex carbohydrates, which I divide into starches (potatoes, rice, beans, etc.) and fibrous carbs (vegetables and salad greens). You adjust carbohydrate intake appropriately so that you’re either gaining muscular weight or losing body fat, as desired. So when you structure your diet this way the percentages take care of themselves. The times when I cite various nutrient percentages as examples are merely to illustrate how the balance of your diet can change as you’re working to achieve different goals.

**If You Need To Lose Body Fat**

I do believe in the low-carb strategy for burning fat, whether you are an endomorph or a mesomorph, or somewhere in between. The problem with low-carb dieting, however, is that it saps your energy and skimps on a lot of important nutrients.

So how do you do the low-carb diet...
at Parrillo? I’ve developed a very special energy supplement called CapTri® which allows you to utilize the power of the low carb diet without resorting to using regular fat as a food source. CapTri® is a specially engineered fat with a unique molecular structure which causes it to follow a different metabolic route than regular fats (8,9). It behaves more like a carbohydrate in the body, except that it doesn’t increase insulin levels. This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. CapTri® has virtually no tendency to be stored as body fat, which is in marked contrast to regular fats (8,9). Regular fat is metabolized very slowly and is very easily stored as body fat. CapTri® is burned (converted to usable metabolic energy) very rapidly in fact, as rapidly as glucose. This energy is used to fuel the body, which spares protein and glycogen. Since CapTri® is rapidly and completely used as fuel, this means it won’t be stored as body fat. (Of course, CapTri® does not defy the laws of thermodynamics, and if you eat too many calories too fast you will gain fat, even if you’re using CapTri®. The point is that CapTri® results in much less fat gain than conventional foods, because relatively more of the calories in CapTri® are immediately converted to energy and lost as body heat.)

Help for Ectomorphs Too!

If you need to increase your calories to build more muscle mass, you can use CapTri® for this purpose too. Furthermore, fats like CapTri® have been shown to increase growth hormone levels, which will also stimulate fat loss and muscle gain (10).

Nutrition works best if you tailor it to your own needs and goals. Stick to basic natural foods such as lean proteins (white meat poultry, fish, egg whites, and protein supplements); starchy carbohydrates; and lean carbohydrates. When you have your nutrition “right,” supplement as appropriate to match your energy and training needs. Consider your body type, make the right nutritional adjustments, and you’ll experience a higher level of performance and peak achievement.

References
High Fat Dieting Taken to the Next Level
by John Parrillo

There’s a weird “urban nutrition myth” circulating on the Internet: Coconut oil (a super-saturated fat) is loaded with medium-chain triglycerides (MCTs) and that by eating this tropical oil, you get the same benefit you’d get from supplementing with medium-chain triglyceride oil. Further, the web promotions state that coconut oil is a great choice if you’re dieting in the high-fat, low-carb mode.

NOT TRUE! But before I blast this myth out of the water, let me say that most myths are grounded in a little – and I mean a very little – reality. That reality is that MCT oil is refined from coconut oil through a special extraction process, but to say that these oils are the same, or can be used in the same manner, is an outright falsehood. Unfortunately, this falsehood has taken on a life of its own in cyberspace. But allow me to list the myths and facts in black and white for you:

• MYTH: Coconut oil is high in MCTs.
• FACT: Coconut oil has only 6 percent MCTs in it!

• MYTH: Coconut oil is great choice if you’re following a high-fat, low-carb diet.
• FACT: Coconut oil is one of the worst choices on any diet!

• MYTH: Coconut oil can help you lose weight.
• FACT: Coconut oil is a bad fat for weight loss. As a long-chain fat, coconut is VERY prone to be stored as body fat. By contrast, MCT oil (our product is CapTri®) has a shorter molecular structure that causes it to be metabolized in an entirely different manner than conventional fats are metabolized. CapTri® is more rapidly oxidized, and as a result, it has very little tendency to be stored as body fat.

Bottom line: Coconut oil is a bad fat. MCT oil is a good fat. Now let’s talk about how you can take your fat-loss program to the next level by doing high-fat dieting the right way and high-tech way.

Do High-Fat Diets Work?
It’s true that all the rage right now is the high-fat diet. This approach to dieting has a fairly high protein intake, around 25 to 30 percent of calories. Another common feature is that it advocates reducing carbohydrate content in favor of increasing dietary fat consumption. Some of these plans call for limiting carbs to 30 to 50 grams per day, or even less, and providing around 70 percent of calories from fat.

The fundamental idea behind these approaches is to reduce carbohydrate intake in order to reduce insulin levels. Insulin prevents lipolysis, or fat breakdown. By reducing insulin levels, you accelerate fat metabolism and encourage the use of stored body fat for energy. This works; there’s no question about that.

Although I’m known for advocating, in general, a diet high in protein, high in complex carbohydrates, and very low in fat, I also advocate individualizing a diet that’s right for each person. In many cases, people do need a high-fat, low-carb diet to lose fat because they’re “carbohydrate sensitive,” meaning that carbs just seem to naturally be metabolized into body fat.

So I’m all for low-carb dieting, as long as it’s done correctly and in the healthiest manner possible. There is a way to do that, and I’ll get to it in a second.

Potential Side Effects of High-Fat Dieting
My particular beef with the high-fat diet is not about reducing carbs - that works. My problem is with supplying so many calories as dietary fat. Not only does dietary fat contribute more to fat stores than protein or carbohydrate, but dietary fat (especially saturated fat) increases your risk of life-shortening and debilitating illnesses.

Over time, too much saturated fat – including coconut oil - in your diet can harm the health of your cardiovascular system. Essentially, excess saturated fat disrupts your liver’s ability to break down excess cholesterol, a fat that is a building block for cells and hormones. Further, saturated fat causes your liver to churn out cholesterol to form an artery-clogging type of cholesterol known as low-density lipoprotein (LDL) cholesterol, dubbed the “bad” cholesterol. All of this sets the stage for heart disease. (1)

Diet overloaded with saturated fats have also been implicated in the development of prostate cancer and colon cancer. With regard to prostate cancer, saturated fat is thought to alter levels of sex hormones, thereby promoting cancer. (2)

Where colon cancer is concerned, saturated fats increase the production of bile acids, which in excess are toxic to the lining of the colon. Chronic toxicity can result in changes in colon cells, eventually leading to cancer. (1)

Saturated fats also promote the production of arachidonic acid, the fatty acid that gives rise to inflammatory agents in the body, namely bad prostaglandins and pro-inflammatory substances called leukotrienes. These agents can harm your joints, leading to arthritis. Not only that, they can trigger abnormal blood clotting and thus promote clogged arteries. (1)

There’s not much good I can say about saturated fats.

Parrillo-izing the Atkins Diet?
The very best way to do the high-fat diet, but without the possible side effects is to incorporate CapTri® into your plan. This supplement lets you to utilize the power of the low-carb diet without resorting to using regular fat as a food source.

CapTri® behaves more like a carbo-
High Fat Dieting Taken to the Next Level

hydrate in the body, except that it doesn’t spike insulin levels (insulin is also involved in fat formation in the body). This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. This is very similar to the strategy of the high-fat diets, except that you don’t have to rely on long chain saturated fats as the energy source.

CapTri® has virtually no tendency to be stored as body fat, which is in marked contrast to regular fats. Regular fat is metabolized very slowly and is very easily stored as body fat. CapTri® is burned (converted to usable metabolic energy) very rapidly - in fact, as rapidly as glucose. This energy is used to fuel the body, which spares protein and glycogen. Since CapTri® is rapidly and completely used as fuel, this means it won’t be stored as body fat. (Of course, CapTri® does not defy the laws of thermodynamics, and if you eat too many calories too fast you will gain fat, even if you’re using CapTri®. (3)

The point is that CapTri® results in much less fat gain than conventional foods, because relatively more of the calories in CapTri® are immediately converted to energy and lost as body heat.) Furthermore, fats like CapTri® have been shown to increase growth hormone levels, which will also stimulate fat loss and muscle gain (4).

So follow a high-fat diet also, but use CapTri® instead of conventional fats because the heat generated by CapTri® has a much greater effect of increasing metabolic rate and much less tendency to be stored as body fat (5,6). It’s the low-carb diet taken to the next level.

Additionally, despite being a coconut oil derivative, CapTri® does not have any of the adverse qualities associated with highly saturated tropical oils.

How to Take CapTri®

As important as understanding how this supplement works is knowing how to take it correctly. Even though the supplement is a natural product, CapTri® must be gradually introduced into the diet as tolerated and should always be taken with meals. Improper introduction into the diet can cause diarrhea and stomach cramping as a result of the supplement’s rapid uptake by the body.

Begin by taking one-half tablespoon with each meal for three days. Then increase that amount to one tablespoon for three more days. Subsequent increases should be made in one-half tablespoon increments per meal for three days. Higher usage levels depend on your caloric intake and tolerance for CapTri®. At 114 calories per tablespoon, CapTri® is providing 570 calories to your diet. If you experience cramping or diarrhea, simply decrease your dosage temporarily until your tolerance improves.

Because CapTri® contains no essential fatty acids, be sure to take an EFA source such as Evening Primrose Oil 1000™. CapTri® can also be mixed with any “good fat” such as olive oil.

And, individuals with diabetes, acidosis, or ketosis should consult their physician before using any type of medium-chain fatty acid oil.

By combining CapTri® with the proper diet and exercise program, you’ll maximize your results. This amazing lipid, which the medical world has known about for years, is just what you need for energy, endurance, and a leaner, more muscular body.

References

Calories: Why I Insist You Need Lots Of Them
by John Parrillo

Easily the most controversial topic I’ve ever presented was my assertion that a serious bodybuilder can and should eat lots and lots of calories. In order to be all that you can be, you need to consume a ton of calories: a very specific type of calorie. The big eating I recommend is always accompanied by a high volume of high-intensity exercise. Every critic under the sun has asked, ‘how can a person ingest the thousands upon thousands of calories you recommend and not end up fatter than a hog that’s been force-fed just prior to slaughter?’ I cannot begin to tell you the sheer volume of negative reactions I’ve received over the years from armchair critics who want to pick apart my high calorie approach. Any bodybuilder who uses my procedures correctly – all of the procedures – can eat 6,000 to 10,000 calories per day, add tons of muscle and not become fat in the process. This is not some off the wall supposition but a fact proven by legions of bodybuilders who’ve successfully used this procedure! From the firestorm I created, you’d have thought I was insisting the earth was flat or the moon was made of green cheese. Despite the protestations of the nay Sayers, this revolutionary approach works and though it flies in the face of conventional bodybuilding orthodoxy, the procedures produce irrefutable results. The proof is apparent: just look at the hundreds of bodybuilders who’ve totally revamped their physiques as a direct result of this unique methodology.

Critics purposefully confuse my methods and criticize without looking at the whole picture. My high calorie nutritional program starts from a basic premise that to build lean mass you first need to provide the body with the building blocks necessary to construct muscle tissue. The same number of calories derived from different foods will have different effects. 1,000 calories derived from pie and ice cream will have a different effect than 1,000 calories derived from grilled chicken breasts and steamed broccoli. This phenomena is called ‘nutrient partitioning’ and simply put, certain foods such as natural carbohydrates and protein, are far more likely to end up partitioned into the production of muscle than say stored body fat. Food selection and intense training are critically important when using my high calorie approach. By confining food selections to those foods deemed appropriate for bodybuilding and eschewing any and all foods that are easily partitioned to fat storage, we are able to consume far more calories. Intense cardiovascular training, done on a regular basis, not only burns calories but boosts the metabolism. Hours after an intense aerobic session is over the body continues to oxidize calories at an accelerated rate. Hard cardio builds the bodies ability to process and assimilate nutrients derived from food.

Metabolism Building: How and Why:

Muscle, unlike body fat, is a metabolically active tissue and requires calories to exist. Adding 10-pounds of lean mass will require 300 to 350-additional calories per day to build the new muscle. More muscle means you can eat more without getting fat. The cornerstone of my nutritional philosophy revolves around increasing the basal metabolic rate. Think of the metabolism as the body’s thermostat; if the thermostat is set low the caloric expenditure at rest is minimal. If the thermostat is set high, even when the body is inactive calories are consumed at a much higher rate. Ever wonder why really obese people can eat next to nothing and still not lose weight? Their metabolic thermostat is set too low. On the other hand, I have discovered that by implementing specific eating and exercise procedures you can elevate the metabolism. This is called ‘building the metabolism.’ By setting the body’s metabolic thermostat higher, much higher, a bodybuilder can eat tons of calories – thereby providing the requisite fuel for muscle growth and recovery. By building the metabolism you teach the body to utilize massive amounts of calories efficiently. The procedures used to turn up the metabolic thermostat are specific and interrelated. Hard exercise, disciplined eating and expert nutritional supplementation all must done consistently, precisely and all must be balanced and skillfully interwoven.

Select only metabolism-building foods:

Food selection is critical; certain foods promote the elevation of the metabolism and other foods slow the process. Lean Protein produces a ‘dynamic action’ effect. The metabolism actually increases in order to break protein down once consumed. Studies have shown that after consuming protein the metabolic rate increases by as much as 30%. The trick is to derive protein from sources devoid of saturated fat. While ‘clean’ protein is the least likely nutrient to be partitioned as body fat, saturated fat is the nutrient most likely to end up compartmentalized as body fat. Carbohydrates are a mixed bag: some carbs are appropriate and desired while other carbohydrate sources are bad news and to be avoided. I divide useful carbohydrates into two broad categories: starchy carbs and fibrous carbs. Starchy carbs supply a slow and steady supply of glucose. Simple sugars produce an undesirably sharp rise in blood sugar. Recommended starchy carbs include oatmeal, oat bran, unrefined cereal, brown rice, potatoes, sweet potatoes, yams, corn, beans and legumes. Recommended fibrous carbohydrates include salads, broccoli, spinach, green beans, carrots and cauliflower. Dietary fat intake should be kept as low as possible; no more than 5% of daily calories should be derived from saturated fat.

Eat five to six meals a day:

To maximize nutrient uptake, minimize the digestive burden and improve food assimilation, the best strategy is to spread the daily caloric allotment out by consuming multiple meals of roughly equal amounts. Try spreading calories out over five or six daily feedings. Each meal should include a portion of lean protein, one or two starchy carbs and one or two fibrous carbs. Protein
and fiber slow down starchy carbohydrate digestion and retard the release of glucose. This particular combination of foods provides continual energy throughout the day and supplies muscles the nutrients needed to grow on a continual basis. Multiple meals naturally elevate insulin, a hormone with powerful anabolic properties. Insulin release is triggered when carbohydrate is converted into glucose by the liver. When glucose is introduced into the bloodstream the pancreas releases insulin in response. Glucose is introduced into the bloodstream with powerful anabolic properties. Insulin is a good thing while too much promotes body fat. I advise avoiding fruit and fruit juice for precisely this reason. Composed largely of a simple sugar, the fructose in fruit has a unique molecular structure that converts into a long-chain triglyceride once in the liver. Fruit consumption produces fructose and ultimately can end up as body fat. Dairy products are to be avoided. Milk contains lactose, another simple sugar that readily converts into body fat. Saturated fat is bad news and is always to be avoided. Be careful when selecting protein sources, particularly beef. Pick cuts of meat low in saturated fat. Are you aware that a prime rib or a hamburger derives as much as 50% or more of total calories from saturated fat? Pork is extremely high in fat and really doesn’t have a place in a serious bodybuilding diet. Refined carbohydrates, manmade products such as pasta, pastry, candies, cakes, pies and the like, are to be avoided. Alcohol will stop progress in its tracks and should be dropped altogether.

Avoid Fat-Producing Foods:
Certain foods are easily converted into body fat and are to be avoided. Simple sugars stimulate fat-producing enzymes and cause an overproduction of insulin. Some insulin is a good thing while too much promotes body fat. I advise avoiding fruit and fruit juice for precisely this reason. Composed largely of a simple sugar, the fructose in fruit has a unique molecular structure that converts into a long-chain triglyceride once in the liver. Fruit consumption produces fructose and ultimately can end up as body fat. Dairy products are to be avoided. Milk contains lactose, another simple sugar that readily converts into body fat. Saturated fat is bad news and is always to be avoided. Be careful when selecting protein sources, particularly beef. Pick cuts of meat low in saturated fat. Are you aware that a prime rib or a hamburger derives as much as 50% or more of total calories from saturated fat? Pork is extremely high in fat and really doesn’t have a place in a serious bodybuilding diet. Refined carbohydrates, manmade products such as pasta, pastry, candies, cakes, pies and the like, are to be avoided. Alcohol will stop progress in its tracks and should be dropped altogether.

Nutritional Supplementation:
I’ve devised an entire line of nutritional supplements designed to complement a sound basic eating program. In my seminars I always take a minute to note that supplements are designed to supplement a solid eating program – not replace wholesome foods. Many bodybuilders make the mistake of depending too much on nutritional supplements and this is counterproductive. Optimally a bodybuilder eats whole food meals every 2-3 hours and then uses nutritional supplements to ‘fills in the cracks and crevices.’ Supplements used in conjunction with proper foods eaten at the proper times melt off body fat, support muscle growth, extend endurance, promote recovery from brutally hard workouts and repair muscle tissue.

*Hi-Protein™ and Optimized Whey™ protein helps meet daily protein requirements

*Pro Carb™ provides slow release energy and glycogen replacement

*CapTri® provides clean calories without the detrimental effects of saturated fat

*Essential Vitamin™ and Mineral Electrolyte Formula™ supplies trace elements destroyed by hard training

*Parrillo Creatine Monohydrate™ accelerates muscle growth and speeds muscle recovery

*Muscle Amino™ and Liver Amino™ formulas supply the body with muscle tissue building blocks

*Protein bars provide portable nutrition

*Energy bars provide a jolt of protein and carbs for energy.

*Parrillo Hi-Protein Low Carb Pudding™ allows you to indulge a sweet tooth without compromising health

*Joint Formula™ helps keep the bones and connective tissue healthy

*50-50 Plus™ is the perfect post-workout supplement

Putting it all together:
To succeed you need to train hard and heavy each and every week: combine hardcore weight training with high-inten-

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Secret #1: There actually is one perfect supplement.

Beware of the latest nutrition fad hyping a “miracle” supplement — any product promising to magically transform your body so that it’s leaner and more muscular. There’s no such thing. But there is a substance you need for growth and repair — food. To get the results you want from nutrition, food will always work the most effectively, much better than “miracle” supplements or meal replacement diets. I call food the “perfect supplement.”

Food provides something that supplements or meal replacement diets do not: the raw materials your body needs for growth and for the stimulation of chemical processes involved in the breakdown, absorption, and assimilation of nutrients. The digestive process, for example, requires “real” food — complete with its balance of nutrients and fiber — to do the job for which it was designed. The presence of food, acids, and digestive enzymes in the duodenum (the first section of the small intestine) and the jejunum (the second section of the small intestine) stimulates the production of hormones required for the absorption of nutrients. Without food, these processes are interrupted, and the proper assimilation of nutrients is impaired. Your body’s cells don’t get everything they need.

In my work with the best bodybuilders and athletes in the world, I’ve identified which foods yield the best results in terms of physique and performance. Lean protein, for example, supplies nutrients called amino acids which are required for every metabolic process. Athletes have higher requirements for protein than the average person. Without enough protein, you cannot build muscle, repair its breakdown after training, or drive your metabolism. Starchy and fibrous carbohydrates supply energy and are stored as glycogen in the muscles and liver.

You need certain fats called Essential Fatty Acids (EFAs), which must be supplied by the diet. EFAs regulate many biological functions, including the manufacture of connective tissue, cellular walls, and hormones. You can get EFAs from safflower oil, flaxseed oil, linseed oil, sunflower seed oil and Parrillo Evening Primrose Oil 1000™, among others.

All the foods I recommend have a “high-nutrient density.” This describes the ratio of nutrients in a food to the energy it supplies. Natural starchy foods like potatoes, yams, brown rice, and whole grains are packed with carbohydrates, protein, vitamins, and minerals. Fibrous vegetables are rich in vitamins, minerals, water, fiber, and carbohydrate. And, lean proteins are high in protein, vitamins, and minerals. In short, high-density nutrient foods pack a lot of nutritional wallop, and that’s why you should eat them.

Try to stay away from low-nutrient density foods. These are typically “junk foods” such as processed foods, sweets, soft drinks, alcoholic beverages, and high fat foods. Low-nutrient density foods are easily converted to body fat or, in the case of alcohol, can interfere with the body’s ability to metabolize fat.

Foods containing simple sugars are excluded from my nutrition program because they also convert easily to body fat. These foods include fruit and fruit juices, which contain the simple sugar fructose, and dairy products, which contain the simple sugar lactose.

You can increase the nutrient density of your nutrition by adding in supplements — but only after you’re eating properly. By taking supplements, you force your digestive system to process more nutrients. This allows the nutrient levels in your body to be increased at the cellular level — beyond what can be achieved by food alone. This, along with a gradual increase of calories, helps your body repair and grow. Supplements are quality nutrients that work in conjunction with food to help your body build its metabolism and recovery mechanisms.

Food is the cornerstone of nutrition. If you don’t eat the proper foods — lean proteins, starchy carbohydrates, and fibrous carbohydrates — nothing else matters. No supplement can ever provide all the benefits that food supplies. We were built to process food — proteins, carbohydrates, and fats.

If you want to make the best possible progress with your physique, I suggest that you start with the basics. And that means food.

Secret #2: You can lose body fat by increasing your calories.

On my nutrition program, women can eat between 2,000 and 6,000 calories a day; and men, between 4,000 and 10,000 calories a day or more — and still lose body fat! To begin such a program, you need a caloric base from which you can build, adding more calories. This base varies from person to person and depends on how many calories you now average and somewhat on what you weigh. Some women, for example, may be eating only 1,500 or 1,800 calories a day, and so beginning the program at 3000 calories would be difficult. A starting point of 2000 calories would be more sensible. In other words, you should not jump in at the upper caloric levels because you could have a difficult time consuming such a large quantity of food.

Here are step-by-step guidelines on how to plan your daily menus to allow for a caloric increase and a body fat decrease:

1. Decide on how many calories you require per meal. Select your caloric base, and divide that number by the number of daily meals you’ll eat, either five, six, or more. This gives you the approximate number of calories to eat at each meal.

   For example, if your caloric base is 4,000 calories and you plan to eat six meals a day, each meal should provide approximately 667 calories.

2. Choose protein sources. Next, determine how much protein you need to meet your daily protein requirements. Each
day, you should eat 1.25 to 1.5 grams or more of protein per pound of body weight. At least one gram of protein per pound of your body weight should come from complete protein sources such as lean white meat poultry, fish, egg whites, or protein powder. The remaining should come from starchy and fibrous carbohydrates, which also contain protein. To determine the exact amount of protein to consume, use the following equation:

Your body weight X 1.5 (or 1.25) = Required grams of protein per day. (Someone who weighs 175 pounds, for example, would need 262.5 grams of protein a day.)

Divide your daily protein intake by the number of daily meals to calculate how many grams of protein you need at each of those meals.

3. Choose Carbohydrates. Decide which fibrous carbohydrates you’ll eat and how many grams of each. Figure in one or two per meal. At this point, sub-total your calories to see how much you have left to “spend” on starchy carbohydrates. Figure in one or two starchy carbohydrates a meal.

4. Add in calories from supplements. To increase your daily caloric intake, use supplements. The supplements I recommend are a carbohydrate supplement such as ProCarb™, a protein powder, such as Hi-Protein Formula™, or a Parrillo Protein Bar™, and CapTri®, also known as MCT oil.

**Secret #3. A lot of food supplements contain fat-forming fructose.**

Read the labels of nutrition beverages and bars you buy. You might be surprised to see fructose, or high fructose corn syrup, as one of the first few ingredients.

Fructose came into favor years ago because of its effect on blood sugar. Unlike other simple sugars, it triggers neither a surge of insulin nor a corresponding drop in blood sugar an hour or so after eating it. That’s the good news. But there’s more to the fructose story.

After you work out, your body moves from an energy-using mode (catabolism) to an energy storage and rebuilding mode (anabolism). During the transition, dietary carbohydrate is broken down into glucose and fructose to be used for “glycogenesis,” the manufacture of glycogen to restock the muscles and liver.

Fructose is used primarily to restore liver glycogen; it’s really not a good re-supplier of muscle glycogen. Glucose, on the other hand, bypasses the liver and is carried by the bloodstream straight to the muscles you just worked, where the glycogen-making process begins. Any muscle emptied of glycogen due to exercise is first on the list to get its quota of glucose.

Clearly, one of the keys to effectively restoring glycogen is the type of carbohydrate you eat. Natural, starchy carbohydrates such as potatoes, yams, whole grains, corn, and legumes do a better job at this than simple sugars do. Research has shown that a diet high in starchy carbohydrates can restock more glycogen in the muscles 48 hours after exercise than simple sugars can.

If you eat simple sugars like fructose, you’re not going to be able to store as much glycogen had you consumed natural, starchy carbohydrates. What implications does this have for you as an athlete or bodybuilder?

First, you won’t be able to train as hard or as long during your next workout, because you haven’t stored as much glycogen. Nor will you be able to recover from your workouts as efficiently. Plus, the simple sugars are likely to spill over into fat stores, with just a fraction converted to glycogen. By contrast, eating ample amounts of starchy carbohydrates will extend your endurance and effectively re-supply your muscles with glycogen for better recovery. You’ll stay leaner too, since starchy carbs are fully utilized for energy production and glycogen synthesis.

Second, you’ll notice less of a “pump” while working out, also due to low glycogen stores in the muscle. The “pump” describes an exercised muscle heavily energized with blood. If you can’t get a good pump, it’s difficult to get the full benefits of “fascial stretching.” This is my system of stretching between exercise sets. It stretches the fascia tissue surrounding the muscle so that it has more room to grow. The best time to stretch is when the muscle is fully pumped, because the pump helps stretch the fascia too. With low glycogen levels in the muscle, you can’t stretch to the maximum. This limits your growth potential. (For more information on fascial stretching, consult the Parrillo Training Manual.)

Third – and this is the biggie - fructose is easily converted to body fat. Because of fructose’s molecular structure, the liver readily converts it into a long-chain triglyceride (a fat). Therefore, a majority of the fruit you eat can ultimately end up as body fat on your physique. You’ll notice an incredible difference when you eliminate fruits and juices from your diet.

These three basic understandings are the cornerstone to successfully achieving you nutritional goals. Even though they are the most important, they are often the least known among many in the fitness community. If you remember these three “secrets” they can seriously help you achieve your goals.
The Whey and Creatine Blast!
by John Parrillo

Two “heavy hitter” supplements proven scientifically to enhance lean muscle when combined with an intense weight training program are whey protein and creatine monohydrate. You may be taking one or the other, or you may be using both. If you are using both, then you are harnessing the supplement synergy of this combination – and that means a potentially greater increase in muscle mass, according to recent research published in the International Journal of Sports Nutrition and Exercise Metabolism.

In this six-week study of 36 weight-training men, those who took whey protein and creatine daily (in the amount of 1 gram of each per 2.2 pounds of body weight) increased their muscle mass significantly, plus increased their bench pressing strength. Control groups who took whey alone had some increase in mass but not as much as when creatine was added to the mix. Those who took a pure carbohydrate placebo showed very little gain. This study suggests that part of your supplement program for gaining leaning mass and building strength should involve taking whey and creatine. Both have individual benefits, but appear to be synergistic when taken in combo. (1)

How Whey Works

For background, whey is a component of milk that is separated from milk to make cheese and other dairy products. It is a chief ingredient of some protein powders and drinks formulated specifically for athletes and exercisers. At Parrillo Performance, we have an entire line of products formulated with whey, including our Optimized Whey™ Formula (100% whey protein isolate), our Hi Protein™ Powder which is whey protein isolate and calcium caseinate and our 50-50 Plus™ Formula (formulated with whey protein isolate, calcium caseinate, milk protein isolates, and maltodextrin), to be used in conjunction with our Nutrition Program.

Whey protein is significantly high in the branch chain amino acid, leucine, and this is significant. Leucine plays an important role in protein metabolism and has a signaling function in the body – which basically means that it stimulates protein synthesis in skeletal muscle, although this function is not yet well understood. Leucine has been shown in research to trigger significant and preferential losses of visceral body fat. Located in the deeper layers of the body under the subcutaneous fat, visceral fat is often the hardest fat to lose and doesn’t respond well to dieting, particularly in women. This high leucine component may possibly be responsible for the potential fat-burning effect observed with whey protein. (2)

Our whey protein supplements are also high in the mineral calcium. Known best for its role as a bone-builder, calcium also controls fat-burning mechanisms in the body by turning on switches that activate fat metabolism. (3)

Whey protein is also a proven recovery nutrient. In one study of athletes, supplementing with a whey protein drink immediately after exercise and then one and two hours later accelerated the rate of glycogen resynthesis. (4) This means, essentially, that you rebuild your muscle energy supplies much more efficiently so that you can continue to work out more intensely – which leads to greater gains. So the bottom line is that whey protein, with its certain constituent parts, naturally enhances anabolic processes in the body.

How Creatine Monohydrate Works

Named after the Greek word for flesh (kreas), creatine was first discovered in meat in 1832. Creatine is produced naturally in the liver, kidneys, and pancreas — at a rate of about 2 grams a day — from the amino acids arginine, glycine, and methionine. Most of your body’s creatine is delivered to the muscles, heart, and other body cells. Inside muscle cells, creatine helps produce and circulate adenosine triphosphate (ATP), the molecular fuel that powers muscular contractions. Supplementing with creatine provides numerous benefits. (5,6,7)

Creatine increases levels of a high-energy compound called creatine phosphate, which also allows more rapid production of ATP. The more ATP that is available to muscle cells, the longer, harder, and more powerfully you can work out. Thus, creatine can indirectly help you lose body fat, since longer, more intense workouts help incinerate fat and build lean muscle. The more muscle you have, the more efficient your body is at using energy and burning fat.

Creatine helps your body manufacture contractile proteins within muscle fibers. When you build muscle through exercise, diet, and assistance from creatine, you’re essentially increasing the amount of contractile proteins in your muscle fibers. This makes the muscle fibers expand in diameter, get stronger, and generate more force when they contract.

Creatine promotes muscular gains in body mass, averaging up to 6 pounds or more, usually within several weeks of use. Some of the weight gain experienced by creatine users is due partly to water. Cre-
The Whey Creatine Blast!

The Whey Creatine Blast

Here’s how to take these two supplements. To use creatine in your supplement program I recommend taking four 5-gram doses a day for five to 10 days. This is known as the “loading phase.” From there, two to 5 gram doses once a day — about half a teaspoon — will keep your muscles saturated with enough extra creatine. This period is called the “maintenance phase.”

Then I recommend that you take creatine with one of our whey protein powders. Try this for several weeks, but be sure to monitor and record your gains using our BodyStat measuring system.

Diet is critical too. To support muscle growth, creatine works best if you follow the Parrillo Nutrition Program, which supplies ample calories from the proper categories of proteins and carbohydrates.

References


Creatine improves the force and power with which you train. This has been proven repeatedly in studies of athletes who perform short-burst movements in their sports. At the Kingston University in the United Kingdom, researchers tested the effects of creatine on exercise performance in elite athletes. Athletes took 20 grams of creatine a day in divided doses for five days; another group took a placebo. The athletes engaged in three maximal kayak ergometer tests. (The tests simulated the sport of kayaking, which is very demanding, particularly on upper body strength.) Those taking the creatine were able to perform significantly more work than those taking the placebo. The results of this study indicate that creatine can help you sustain more powerful contractions when working out. (8)

In another recent study, women exercisers took 20 grams a day of creatine for four days, then followed a maintenance dose of 5 grams a day for a total of 10 weeks. Another group took a placebo. Those women taking the creatine were able to complete more repetitions with significantly higher poundages than those taking the placebo. (9)
New converts to Parrillo methods almost invariably have a common complaint, “I don’t have the time to eat all the regularly scheduled meals that you insist are critical for bodybuilding success.” In this day and age, that’s no excuse. First off, the serious Parrillo-style trainee cooks the food they require for the coming week the previous weekend. It’s a fairly easy thing to take some time and bake or grill chicken breast, fish, shellfish or lean beef. Do it ahead of time. It’s also a fairly easy thing to bake potatoes, steam rice and prepare veggies in quantities sufficient for the entire coming week. Salad fixings are available at the grocery store in pre-made packages. Pack the cooked food away in the refrigerator and each day before work or school (or the night before) construct those highly structured bodybuilding meals using proper amounts of pre-made food. I recommend a portion of protein, a portion of starchy carbohydrate and a portion of fibrous carbs at each meal. Once the meals are assembled, place the portions into individual sized Tupperware containers for transportation to the workplace, office or school. When it’s time to eat a meal bring them to life by zapping them in the microwave or eat them at room temperature in a pinch.

Finding time for meal consumption is a consideration. Even if your boss is Ebenezer Scrooge how long does it take to consume a mid-morning or mid-afternoon meal? Five minutes? You can eat a meal in less time than it takes to smoke a cigarette or use the bathroom; the point being that even with the constraints of work and school you can make the bodybuilding meal plan work if you want to. On the other hand if you’re looking for a convenient excuse not to cook ahead of time and looking to find a way not to eat a mid-morning and mid-afternoon meal, than perhaps you’d be better suited for golf, bowling or tennis instead of bodybuilding because frankly, if you don’t come to grips with food preparation and food consumption your chances of success are slim to none. For those rare instances when it is impossible to eat a real food meal at an appointed time, don’t fret; you can still have a great bodybuilding meal using Parrillo supplements. A single Parrillo Energy Bar contains 240 calories with 14 grams of high BV whey protein, 35 grams of slow release carbohydrate and 6 grams of CapTri®, my patented medium chain tryglyceride fat. My Protein Bar has a slightly different nutritional profile: 20 grams of protein combined with 30 grams of carbs. The great thing about my sport nutrition bars are their portability: you can stash them in your gym bag or the glove compartment of your auto, you can leave a few in the office desk drawer, satchel, purse, locker or file cabinet and this way you are never, ever without a delicious, muscle-building snack – how long does it take to consume a bar? Three minutes?

There really is no excuse to miss a meal or deny your self the quality calories needed to ward off catabolism. I would strongly suggest that you consider keeping a container of Parrillo Hi-Protein or Optimized Whey protein powder stashed at work. The simplicity of protein shake preparation is mind-boggling: keep a small Tupperware shaker handy and at the appropriate time place two scoops of dry protein powder into the shaker, walk to the water fountain, add six ounces of cold water and give the concoction a vigorous shake or two. Presto! 150 calories, 33 grams of high BV whey protein, no fat or sugar and 4 grams of carbohydrate. Look at the amazing meal you can have by consuming an Energy Bar and an Optimized Whey™ shake...

It would be pretty darned hard to top the nutritional profile of these two products individually and combined they provide a 400-calories mini-meal that is virtually unbeatable. This one-two Parrillo supplement punch rivals the classical chicken/broccoli/rice bodybuilding meal in terms of nutritional wallop: the all-supplement meal contains a 47% - 40% - 13% ratio of protein/carbohydrate/fat. The fat contained in my products is not the standard long-chain saturated variety but a special MCT that is processed by the body like a carbohydrate. This technical distinction is huge and cannot be overemphasized; the problem with fat is not the caloric content but the fact that saturated fat is easily compartmentalized as body fat. MCT oil accounts for all the fat calories in my nutritional products and while boosting the calories (a good thing) is virtually impossible to end up as body fat. Substituting the Energy bar for the Protein bar makes the split between protein and carbohydrate roughly equal at 44/44/12. Best of all, this 400-calorie meal doesn’t have to be cooked and can be eaten anywhere. Is it any wonder that elite bodybuilders will consume a “Parrillo Meal” after an intense workout?

Science has shown repeatedly that nutrients are absorbed at a far faster and more efficient rate immediately after a high intensity weight workout. There exists a window of opportunity that opens after a workout ends and snaps shut roughly one hour later. During this period if quality nutrients are ingested in a timely fashion and in the right amount, all kinds of miraculous results occur: catabolism is thwarted, anabolism is established and (assuming the nutrients are of sufficient quality and quantity) muscle tissue is healed, repaired and growth occurs. Conversely about the worse thing you can do to a muscle after beating the hell out of it in a fierce workout is to starve the mus-
Is it any wonder that elite bodybuilders are often seen sitting on an exercise bench after an exhausting workout drinking a Parrillo protein shake while they munch on a Parrillo bar? You should do the same. I am a great believer that supplements should be used to supplement not replace regular food. Often bodybuilders take a good thing to extremes and virtually live on nutritional supplements. Their logic is understandable but flawed; if supplements are good, more supplements are better. The problem with consuming supplements most of the time is that repeated use doesn’t take advantage of the effect real food has on digestion.

A perfectly balanced ‘real food’ meal, one that contains a fat-free protein portion, a starchy carb and a fiber carb portion, provides sustained nutrition over a protracted period of time. It takes the human body time to digest food and break food down into usable subcomponents. This is a good thing as the digestion process ensures a sustained release of quality nutrients. Bodybuilders who use nutritional supplements on a near exclusive basis don’t get the same results as those who receive the bulk of their calories from real food meals. The optimal method is to consume most of your daily calories in the form of whole foods and supplement sound eating with high quality nutritional supplements. Every single meal does not have to be a food meal; as long as the majority of your daily calories are derived from ‘real’ food, a daily feeding (or two) derived strictly from quality supplements is okay. Then you have the best of both worlds. The ease and quickness of a post-workout ‘smart bomb’ is genius-on-a-stick. The quick digestive properties of a Parrillo Bar and a Parrillo protein shake can work to our post-workout advantage. We don’t have to wait for the body’s enzymes to break down whole food in order to get nutrients to blasted muscles before the post-workout window of opportunity snaps shut. Post-workout, smart-bombing using nutritional supplements are totally appropriate.

Sometimes circumstance prevent us from eating that perfectly balanced bodybuilding meal at its appointed time. Rather than miss a critical feeding and go catabolic – or instead of stuffing your face with junk food – retrieve that Parrillo bar (or two) and drink a protein shake. Inside two minutes you’ll have consumed a delicious, nutritionally balanced meal. Persuaded? You should be – pick up the phone right now and call our toll-free number and order a canister of Parrillo Optimized Whey™ and a box of our bars. When situations and circumstance contrive to keep you from consuming that perfectly constructed bodybuilding meal, you’ll be ready. After that high intensity, Parrillo-style weight workout there is no smarter, faster or more efficient way to revive, repair and restore muscle tissue than eating a bar and drinking a protein shake. Don’t forget our patented 50-50 Plus™ supplement which blends near equal parts of Optimized Whey™ and Pro-Carb™. I designed this powerful supplement to provide the hard working bodybuilder an easy to use anti-catabolic drink.
At Parrillo Performance we use science and experience to our advantage. One particular area of scientific interest for all serious bodybuilders should be hormones and how to regulate them. Combine serious training with regulation and manipulation of hormones and take your bodybuilding up to the next level. Were you aware that hormones control the amount of body fat we carry? When calories are consumed three things can happen: the calories can be used immediately to power movement and run bodily functions, the calories can be placed in storage as glycogen for use in the near future or the newly-consumed calories can be stored as body fat. Hormones instruct the body how to compartmentalize calories and my nutritional approach teaches you how to manipulate hormones to do the right thing at the right time. By combining precision eating with intense physical exercise two key hormones, insulin and glucagon can be regulated to our benefit. Insulin can have a powerful anabolic effect, particularly if secreted right after a heavy workout. Precise use of insulin causes nutrients to be rushed to battered muscles at just the right time. Manipulation of glucagon causes the body to burn stored body fat. Glucagon is released into the system when blood sugar is low. Glucagon causes body fat to be summoned from fat storage sites. Insulin and glucagon are both produced by the pancreas but each has an exactly opposite effect. By controlling blood-sugar levels you determine how the body uses incoming calories. I call this nutrient partitioning and the concept is easy to understand but requires precision eating to realize the immense benefits.

Carbohydrates are converted to blood glucose after they are consumed. Nutrients are transported to the liver via the portal vein and digested and absorbed by the small intestine. Carbs are converted to glucose and released into the bloodstream and a rapid rise in blood sugar triggers the release of insulin in order to facilitate glucose diffusion and move glucose into the cells. With the help of insulin, glucose is transported to the individual cells and either burned for energy or stored as glycogen. If too many of the wrong kind of carbohydrates are consumed too quickly and released into the bloodstream too rapidly, insulin spikes. If too much insulin is dumped into the bloodstream too quickly (all a direct result of consuming too many of the wrong kind of carbs) carbohydrates are eventually converted into body fat. Optimally we want to burn carbs for energy. As a next resort we want excess carbs to go into carb limbo and end up stored as glycogen for use in the near future. The very last thing we want is for excessive carbohydrates to become converted into body fat. The classical Parrillo bodybuilding diet insists you stay away from certain foods, foods that inevitably end up compartmentalized as body fat. Simple or refined sugars top the avoid list: sweets, dairy products containing lactose, refined carbs like pasta and bread are foods that need to be avoided altogether. Calories derived from simple sugars are usually channeled directly to body fat storage compartments pointing out why food selection is critical.

Are you aware that a gland, the hypothalamus, determines how much body fat a person should carry? It is possible to reset the hypothalamus ‘set point’ by making intelligent food choices. Resetting the set-point is accomplished by combining intense exercise with specific foods taken at specific times in specific amounts. I have arrived at a very effective method for structuring meals that combines certain foods in order to make optimal use of insulin and glucagon. If done correctly we can actually reset the hypothalamus in the process. Optimally a bodybuilder eats multiple meals spaced at equidistant intervals throughout the day. Elite bodybuilders using a Parrillo nutrition plan will eat 5 to 8 meals per day and each meal will contain a portion of three key food groups:

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Example</th>
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<tbody>
<tr>
<td>Protein</td>
<td>Chicken</td>
</tr>
<tr>
<td>Starchy Carbs</td>
<td>Pasta</td>
</tr>
<tr>
<td>Fatty Carbs</td>
<td>Butter</td>
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Protein is critical for anyone who trains intensely. Protein is composed of amino acids essential for rebuilding and regenerating muscle tissue torn down by intense progressive resistance training. Every time you consume a meal, be sure to include a protein portion. Protein keeps muscle tissue supplied with building blocks needed to fuel growth.

Fibrous carbohydrates have a dampening effect on insulin and therefore, along with protein, are considered the backbone of the Parrillo nutritional approach. Every time you consume a meal, include a fibrous carb to help dampen insulin spikes.

Starchy carbohydrates are a mixed bag; I include them in my nutritional program but always combine their consumption with a fibrous carb and a protein portion. During mass building phases starchy carbs are eaten in ample amounts. During lean-out phases, starchy carbohydrate consumption is systematically reduced.

Insulin and glucagon are two sides of the same coin and work together to keep blood sugar levels on an even keel. By avoiding certain foods and making sure to take other foods in combination with one another we favorably manipulate powerful hormones that aid in our quest to build additional muscle and strip off excess body fat. The optimal insulin-to-glucagon ratio is determined by the ratio of carbohydrates-to-proteins in your diet. In a nutshell, my recommendation to people interested in trying a Parrillo-style bodybuilding diet is to start by consuming 1 to 1.5 grams or more of protein per pound of body weight per day. A 200-pound man would consume 200-250 grams of protein per day. That sounds like a lot of protein but if you are hitting the weights and the cardio as hard and often and as intensely as you’re supposed to, you will need this much protein to heal and repair muscle tissue and still have enough amino acids left to fuel new growth. At Parrillo, long chain saturated fat is allotted no more than 5% of daily calories. A man eating 3000 calories per day would be allowed to consume only 150-calories worth of saturated fat per day; a
Nutrient Partitioning: How To Control the Insulin/Glucagon Axis!

Starchy carbohydrates are the wild card in the Parrillo nutritional philosophy. As I mentioned earlier, during a concentrated muscle-mass building phase, starchy consumption is purposefully increased. During a mass-building phase I recommend adding 1-pound of body weight per 100-pounds of bodyweight per week. Our hypothetical 200-pound athlete would seek to add 2-pounds of bodyweight per week for the length of the mass-building phase. Since protein and fibrous carb consumption is kept high regardless if the bodybuilder is seeking to build size or get ripped, and since long chain saturated fat is always held to 5% or less, adding starchy carbs during a mass building phase is the ideal way to obtain additional calories needed to push the body weight ever upward. On the other hand, if the athlete has sufficient muscle mass and seeks to strip off body fat, I recommend reducing body weight by – you guessed it – 1-pound per 100-pounds of body weight. By being methodical and precise during the weight loss phase and by not dropping body weight too quickly, the bodybuilder retains hard-earned muscle mass while systematically stripping away body fat. The idea is to tip the insulin/glucagon ratio one way or the other, depending on the goal. Insulin and glucagon activate or inhibit regulatory enzymes. The introduction of insulin into the system increases the number of enzymes involved in the conversion of glucose into energy. Simultaneously these enzymes inhibit glycogen synthesis and breakdown, and decrease gluconeogenesis, the synthesis of glucose from amino acids. Glucagon inhibits two key enzymes that promote fat storage. Glucagon mobilizes fatty acids from fat stores and transports them to muscle mitochondria. Want to build muscle mass? Precision use of insulin is the ticket – want to get shredded and ripped? Avoid insulin spikes and through strict eating stimulate the release of body fat-mobilizing glucagon.

To be successful at building an outstanding body you have to combine commonsense with science and factor in experience. At Parrillo Performance we have taken bodybuilding nutrition to a whole new level. While our head may be in the clouds searching out new and better modes and methods our feet are planted on the firm ground of real World experience. We know what works and what doesn’t. Experience gained over the past 30-years in preparing National and International level bodybuilders for competition has proven what works and what doesn’t. The good news is we can control hormones by regulating what we eat, when we eat and how much we eat. The human body can only build muscle mass so fast but it has a virtually unlimited ability and capacity to store body fat. The Parrillo method has four components: weight training, cardio training, food and nutritional supplementation. Through the controlled use of Parrillo-style eating, training and supplementation we have developed a method to manage the insulin/glucagon ratio. Clean up your diet, eat only recommended foods and avoid other foods altogether, engage in hard and heavy weight training and practice intense cardio on a regular basis. Finally, use nutritional supplementation to fill in any gaps.

Seeking to add some serious muscle mass? Tip the insulin/glucagon ratio in favor of insulin by adding more calories derived from starch. Make sure you have plenty of Parrillo Pro Carb™, Hi-Protein powder™, creatine monohydrate and boxes of Parrillo Energy Bars™ on hand. Looking to get shredded for summer or compete in an upcoming bodybuilding competition? Start now! Tip the I/G ratio in favor of glucagon; hit early morning cardio, cut down on starchy carbs while maintaining a good intake of insulin-dampening protein and fibrous carbs. Add back lost calories by using CapTri®, the world famous Parrillo product used by legions of competitive bodybuilders. CapTri® is a calorically dense lipid that is used as a cooking agent or a food accent and adds back calories critical for maintaining muscle mass without spiking insulin. Strip off body fat by using Optimized Whey protein™, Advanced Lipotropic Formula™ and 50-50 Plus™ powder for post-workout regeneration. Whichever way you decide to jump you need an eating plan that tips the insulin/glucagon ratio purposefully one direction or the other. Call us today at 1-800-344-3404 and ask to speak to one of our nutritional experts about what specific supplements you’ll need to aid you in your quest to be the best.
Clearing Up The Confusion Over Carbs
by John Parrillo

The “low-carb revolution” we’re living in would have you believe that all carbs are bad. Not so — especially for bodybuilders, athletes, and anyone who exercises regularly, with even a fair degree of intensity. I think we’ve lost sight of the importance of carbs for building muscle and maintaining high energy for high-performance training. That’s why I’d like to set the record straight on carbs — and which ones are best for bodybuilding and strength training in general.

A Carb Primer

For perspective, carbohydrates are grouped into two general classes: complex carbohydrates and simple sugars. Found in whole grains, vegetables, and fruits, complex carbohydrates are nothing more than simple sugars linked together into long chains. Your body digests the complex carbs into simple sugars and releases them into the bloodstream as glucose. In the end, then, all carbohydrates are converted into glucose before they are used. Based on this, you might think it would not make any difference whether you get your carbs from starch or simple sugars — but it does.

Available from candy, soft drinks, and other processed sugary foods, simple sugars are released into the bloodstream immediately, causing a rapid increase in blood sugar level and an insulin surge. Because simple sugars are released faster than the body can burn them for energy or store them as glycogen, insulin causes the excess to be converted to fat. Complex carbs, on the other hand, must be digested, a process that slows down their rate of release into the bloodstream, resulting in a more moderate insulin release and a more uniform energy level. Also, since they don’t cause as big an insulin release, complex carbs are not as prone to be converted to fat. One hundred grams of sugar will have a different effect on your body than one hundred grams of starch, even though both supply 100 grams of carbohydrate.

Starchy Carbs and Fibrous Carbs

The Parrillo Nutrition Program further subdivides complex carbs into two classes: starchy carbs and fibrous carbs. Good sources of starchy carbohydrates are potatoes, rice, beans, oatmeal, and whole grains, and good sources of fibrous carbs include broccoli, lettuce, spinach, green beans, asparagus, and other fresh vegetables. On my nutrition plan, you eat at least one to two servings of starchy carbs and one to two servings of fibrous carbs at each meal, along with a lean protein source.

High fiber foods such as fibrous carbs contain cellulose, a plant carbohydrate that humans cannot digest. Cellulose, provides bulk, which helps with elimination and is good for your intestines. Also, fiber and protein slow the digestion of starchy carbs, resulting in a more gradual release of glucose into the bloodstream and more sustained energy levels. This way, insulin release is more moderate, rather than the sharp spike of insulin released in response to simple sugars.

Be sure to avoid simple sugars. These include not only processed sugar but also foods like honey, milk, and fruit. Milk contains lactose, or milk sugar. Fruit contains a simple sugar known as fructose, which is easily converted to fat in the liver. Although fresh fruit and low fat dairy products are healthy, nutritious foods, they contain a lot of natural sugars which are easily converted into body fat. So if you’re striving for ultimate leaness and a high energy level, avoid the consumption of sugary foods, including fruit and dairy products.

The Body’s Optimum Energy Source

Many experiments indicate that carbohydrate is the body’s preferred fuel during exercise. More than 99 percent of the carbohydrate is used in the body to form adenosine triphosphate, or ATP, the fuel source used directly by the muscles to power contractions. ATP is not stored by the body so it must be constantly produced from the aerobic metabolism of carbohydrates, fatty acids, and amino acids (aerobic means “with oxygen”). Carbohydrate is unique in that it can also be metabolized anaerobically (without oxygen). The anaerobic production of ATP from carbohydrate is called glycolysis. Glycolysis makes a big contribution to the energy expended during very intense exercise of short duration, such as weight lifting. Lifting weights requires so much energy so fast that aerobic metabolism can’t keep up with the demand. By the time oxygen can get from the lungs to the muscles and inside the cells, your set is already over. Although glycolysis is relatively inefficient, it offers the advantage of generating energy instantly upon demand.

One disadvantage of anaerobic metabolism is that it produces lactic acid as a waste product. Lactic acid accumulates in the muscles and the blood and is responsible for the burning sensation at the end of the set. The accumulation of lactic acid shuts down energy production and forces you to stop and rest. Most of the lactic acid makes its way from the muscles into the bloodstream. The liver is able to convert the lactic acid back into glucose so it can be used as fuel again. The conversion of lactic acid back into glucose requires oxygen, and this is why you continue to breathe hard for a few minutes while you’re recovering after a set. This pay-back from anaerobic metabolism is called “oxygen debt.”

How Your Body Stores and Uses Carbs

Your body can store only about 600 grams of glycogen (the body’s storage form of carbohydrate), although this probably varies according to your training state, diet, and amount of muscle mass. Glycogen is stored mostly in the muscles where it will be used, and also to a small extent in the liver. Muscle glycogen is not released into the bloodstream and is only used by the muscle in which it’s stored. After muscle glycogen stores become depleted, liver glycogen is broken into glucose units and released into the bloodstream for use by
Clearing Up The Confusion Over Carbs

working muscles throughout the body and by the central nervous system.

Your muscle glycogen reserves become progressively lower during exercise. During long bouts of exercise, glycogen reserves may drop to critically low levels - to the point of glycogen depletion. You then feel exhausted and must stop exercising or dramatically reduce the intensity. The point of muscular fatigue coincides with glycogen depletion. This is separate from momentary muscular failure at the end of a set which is due to lactic acid accumulation. Glycogen reserves can also be depleted gradually over a period of days if carbohydrate intake does not match that utilized during exercise. This feeling of fatigue from failure to adequately replenish glycogen reserves is often interpreted as overtraining. In some cases, overtraining may be alleviated by increased carbohydrate consumption. Not getting a good pump in the gym is a clue that you’re probably glycogen deficient.

Carbs and Training Intensity

The amount of carbohydrates you take in affects your training intensity. In one study, a group of athletes consuming 300 to 350 grams of carbohydrate per day was seen to become progressively more glycogen deplete during successive days of training (1). After several days, these athletes were unable to continue with heavy training. In contrast, a diet providing 500 to 600 grams carbohydrate per day was found to elicit a complete repletion of glycogen reserves, and athletes on this diet were able to maintain a heavy training schedule.

Of course, these numbers are not prescriptive. An individual athlete’s carbohydrate requirement depends on his energy needs, which in turn depend on the type, intensity, duration, and frequency of exercise. Endurance athletes require the most energy and the most carbohydrates. The longer and harder you train, the more carbohydrate calories you need.

Some athletes train so heavily that they have trouble consuming enough high carbohydrate foods to fuel their activities and replenish glycogen stores. Also, consuming a huge volume of food can cause gastrointestinal distress, bloating, or discomfort, and is not conducive to optimal exercise performance.

Carbohydrate drinks such as Parrillo ProCarb™ are very useful in this situation, as well as for athletes trying to further increase caloric intake. ProCarb™ is also useful during training and athletic competitions to help maintain energy. This supplement contains slow-release starches (dextrins), rather than simple sugars such as glucose, sucrose, or fructose.

Generally speaking, the more carbs you eat, the more carbs your body will burn for energy, and the more fat you eat, the more fat you’ll store. This is why athletes—and especially bodybuilders—should eat a diet high in complex carbohydrates and low in fat. In fact, anyone interested in having a lean, high-energy body should consume a high-carbohydrate, low-fat diet.

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all works.

have control over them by carefully regulating what you eat. Insulin and glucagon are both produced by the pancreas, but have exactly opposite effects. Their chief concern is the regulation of blood sugar (glucose) levels. Your brain requires a constant supply of glucose for fuel, so the blood glucose level is tightly regulated to make sure the brain never runs out of gas.

When you eat carbohydrates, they are digested and absorbed by the small intestine and transported directly to the liver via the portal vein. Essentially, all of the carbohydrate you eat is converted to glucose by the liver before being released into the bloodstream. After a meal your blood glucose level rises as carbohydrates are released. This rise in blood sugar triggers a release of insulin from the pancreas. Insulin is required to help move glucose into cells. Once inside cells, the glucose is burned for energy or stored as glycogen. Everything is fine so far. The problem arises when carbohydrates are released into the bloodstream too fast. This causes too much insulin to be released. When insulin levels get too high, some of the carbohydrate is converted to fat instead of being stored as glycogen. Also, if insulin levels get too high this actually causes too much sugar to be moved into cells. This results in “hypoglycemia,” which means low blood sugar. If your blood sugar is too low, you feel very tired. Simple sugars cause your blood sugar level to spike, then paradoxically to decrease to a lower level than before (because of insulin over-release).

This is why the rate of digestion of your meals is important. Stay away from foods containing simple sugars (sweets, fruit, dairy products) and refined carbohydrates (bread and pasta) because these are released into the bloodstream too fast, causing too much insulin to be released. This channels calories to fat stores.

Combining protein and fibrous carbs with your starches, and avoiding simple and refined carbohydrates, slows the release of glucose into the bloodstream resulting in a lower, but longer, insulin release. This gives you a uniform energy level and channels calories toward muscle and away from fat. Glucagon has the opposite effect of insulin. An increase in blood sugar triggers a release of insulin but inhibits glucagon release. Glucagon is released several hours after a meal when blood sugar levels drop. Glucagon reduces glucose for energy and stimulates breakdown of body fat and the use of fat for energy. Glucagon also stimulates glycogen breakdown. The net result of glucagon is to raise the glucose levels back to normal and to signal the body to begin using fat for energy since it is running low on carbs.

Your body’s ratio of insulin to glucagon is determined solely by the ratio of protein to carbohydrate in your diet. For weight loss, you generally want to limit your carb:protein ratio to 1.0:1.5 and use CapTri® to make up for the carb energy you’ve reduced (CapTri® is a specially engineered fat that is burned like a carb in the body). For muscle gain, you will want to increase the carb:protein ratio as well as increasing total calories. Generally, you want to consume about 1.5 times as many calories from carbohydrate as protein. When you’re trying to gain weight, you want a little more insulin so you eat a little more carbohydrate.

One last thing about insulin. In addition to it enhancing transport of glucose inside cells, it is also required for transport of certain amino acids into cells. These include the branched chain amino acids, and this is why it is important to take your Muscle-Amino Formula™ with meals and not on an empty stomach. It has been found that neither insulin nor growth hormone alone is sufficient to stimulate growth; you have to have both of them together at the same time. This is at least partly due to the fact that these two hormones act to transport different sets of amino acids inside cells, and you need all of the amino acids present at the same time in order for growth to occur (1).

Exercise Manipulation of Hormones

While insulin and glucagon are controlled entirely by diet, the most effective way to control growth hormone (GH) is by exercise (2,3). This is why exercise is required to gain muscle and lose fat. If you try to lose weight by cutting calories, about half of the weight you lose will be muscle. Conversely, if you gain weight simply by increasing calories (without exercising) you’ll just get fat. Exercise is required to set up the proper hormonal milieu allowing selective fat loss and muscle gain. The favorable effects of exercise in increasing muscle mass while decreasing fat stores are mediated largely through growth hormone, testosterone and epi-
nephrine. Therefore, to sculpt the ultimate physique, we have to talk about effective training strategies to optimize growth hormone. Growth hormone is the most important hormone responsible for normal growth during childhood. Without growth hormone, a person will never attain adult stature. Growth hormone has profound effects on the growth of the skeleton as well as the muscles. Testosterone and estrogen produced during puberty cause the skeleton to mature and stop growing, but growth hormone still promotes muscle growth and fat loss in adults.

There are several things you can do to naturally increase your GH levels. One is to get a good night’s sleep. Growth hormone is released maximally during sleep, normally about three hours after you fall asleep. Trying to build muscle without getting enough rest is nearly impossible. Second, GH release is increased during and just after intense exercise (2,3). The most effective training style for increasing GH release is high volume training (2,3,4). I recommend a mixture of low rep, medium rep and high rep work to maximally stimulate all the muscle fibers as well as train the nervous system. This results in optimal increases in size and strength.

Third, eat a high-protein diet consisting of egg whites, white meat poultry, fish, and protein supplements such as Parrillo Hi-Protein™ Powder. Protein not only stimulates GH release, but also provides the building blocks you need to build new muscle tissue. Fourth, certain combinations of amino acids have been shown to increase GH release and result in increased lean body mass (4). Enhanced GH Formula™ contains the most effective combination ever developed. Take it on an empty stomach just before training and before bed.

Of course, merely having a detailed intellectual understanding of how nutrition and exercise come together in your body to build muscle and burn fat does nothing to achieve those results. It’s up to you to put this information to use in the gym and at the dinner table.

References


Creatine
by John Parrillo

Creatine does it all: increases muscle mass, builds strength, and enhances endurance, according to a growing body of scientific research. (1-6). We’ve been doing our own trials here as well and have seen impressive results.

What is creatine, and how does it work? For background, the immediate source of energy for all cellular activity, including muscle contraction, is a molecule called ATP. This stands for adenosine triphosphate. ATP is formed from the chemical energy contained in food. Food is oxidized, or burned, in the body to release energy. This energy is used to form ATP, which then goes on to power cellular activity. The body’s stores of ATP are very limited. In fact, each muscle cell contains only enough ATP to power contractions for a few seconds. Therefore, ATP must be continuously regenerated.

That’s where creatine fits in. When ATP is broken down to as part of the energy-producing process, creatine (in the form of creatine phosphate, or CP) steps in and chemically regenerates ATP (1). This allows high energy muscle contractions to continue. After about 45 seconds to 2 minutes (depending on the intensity of effort) the creatine phosphate is also used up, and power production by the muscle rapidly declines. This is what happens when you fail at the end of a set – you’ve used up all your ATP and CP, which means you’re out of fuel. This is also why high intensity weight lifting sets usually last about a minute before you fail. After the CP is used up, ATP cannot be regenerated fast enough to maintain a high level of intensity. Lower intensity exercise (aerobic exercise like bike riding) can be continued almost indefinitely because you can generate CP and ATP fast enough to keep up with the energy demands of the activity.

You’ll notice supplemental creatine comes in the form of creatine monohydrate. Why isn’t creatine phosphate or ATP itself used as a supplement instead? Simply put, because it doesn’t work. Molecules such as CP and ATP are not absorbed through the intestine.

Creatine monohydrate, on the other hand, is readily absorbed and does in fact reach the muscle cell when administered orally (2). This is why it can be used as an effective supplement. Once inside the muscle cell it is converted to creatine phosphate. What about the sublingual route? This is bogus, since the molecule still has to cross cell membranes to reach the circulation. What about liquid creatine? Doubly bogus, since creatine tends to break down when stored as a solution.

So how exactly does creatine increase muscle size and strength? It increases strength by increasing the intracellular levels of creatine and creatine phosphate, which allows more rapid ATP production. This means more energy is available to the cell, allowing it to work harder. This same mechanism explains why creatine increases endurance performance too. If you increase the creatine pool inside the muscle this increases the cell’s energy reserve, allowing longer, as well as more powerful, contractions. Creatine is very popular among endurance athletes, and is widely used in track and field.

Creatine increases muscle size because it attracts water. Creatine is absorbed into the muscle cell and pulls a lot of water along with it, causing the muscle to swell. This results in larger, firmer muscles and a better pump. Please realize that creatine itself does not directly increase muscle protein. As with all supplements, it is vital that you use creatine in conjunction with a solid bodybuilding diet. You need protein to build muscle tissue and carbohydrates to provide energy. Creatine itself is not burned to produce energy, rather it acts as an energy buffer to transfer the energy derived from carbohydrate and fat oxidation to ATP. Creatine is not incorporated into protein. It will, however, indirectly increase the protein mass of muscles over time by allowing you to perform higher intensity workouts. That is, of course, if you are eating enough lean protein and quality calories to support muscle gains.

What can you expect from creatine? Typically in hard-training bodybuilders, we observe an increase of 4-14 pounds of lean mass during the first month of using creatine. This is remarkable. This does not mean you have to consume 4-14 pounds of creatine. Remember, most of the weight gain and size increase comes from water. Creatine is stored in muscle cells, where it attracts water. The more muscle mass you have to start with, the more creatine you can assimilate and the more weight you will gain from using creatine. Small bodybuilders usually gain 4-6 pounds and the really big guys gain 10-14 pounds. We have verified that this weight gain shows up as an increase in lean body mass when you do body composition testing. Remember that lean mass is a measure of everything in your body that’s not fat, including the skeleton and muscle, including water. It’s hard to imagine anybody happier than a bodybuilder who gains 10 pounds of lean mass in one month.

Regarding performance, we’ve seen athletes experience a 5-15% increase in strength on their maximum lifts, and an increase of about 2 reps per set with their working weight. This increase in training intensity allows you to put a greater load on the muscle, which will indeed increase your gains in muscle protein mass over time. The amount of strength gain each individual can make may differ considerably, because the strength of your tendons also determines how much weight the muscle can lift. While it seems clear that creatine will allow faster and greater gains in size and strength over the long-term, firm numbers cannot be attached at the onset. A lot depends on whether you are eating enough protein and calories to support gains. If you don’t eat enough to support muscle gain, you won’t see any, it’s that simple. But with a solid, high-calorie, high-protein diet and intense training, your muscle gains can be incredible. Regarding endurance exercise,
we’ve seen athletes experience a 5-10% increase in speed and a 10-20% increase in time to fatigue.

As with nearly all supplements, actual usage will vary from person to person and will likely change as your body and training changes. To start out, I recommend for the first one to two weeks you use 20-30 grams a day divided into even servings taken with each meal, or with a Hi-Protein/Pro-Carb drink. This is the loading phase. One scoop or heaping teaspoon is five grams, so one of these with each meal is about right. Use the lower end of these ranges if you’re 150-200 pounds, and the upper end if you’re over 200 pounds. We recommend one to two weeks, but the loading phase may take as many as four weeks. When you find that you’re really getting a good pump, the loading phase has filled the creatine stores in your muscle. After that, 5-10 grams a day is enough to maintain your creatine stores. Cycling creatine is of no advantage. If you stop taking creatine, you simply deplete your existing store, which takes 4-8 weeks.

Creatine can be mixed in plain water too. Don’t be concerned that creatine doesn’t dissolve fully; just drink the suspension. It gets absorbed very well. Don’t mix creatine in water too far in advance of when you take it, however, since it begins to break down. A great way to pack creatine is to take a shaker bottle with a scoop of Hi-Protein or Pro-Carb, plus a scoop of creatine and put it in your gym bag or cooler. Then just add water, shake, and drink. Another convenient way to use creatine is to mix it into oatmeal. Creatine has no flavor, but it is a little grainy.

Are there any medical concerns with taking creatine? If you have any blood work done you might find that creatine elevates your creatinine level. Doctors use the creatinine level in the blood as an index of kidney function. If your doctor notices an increase in your creatinine level and expresses some concern about your kidneys, tell him or her that you’re using creatine. Creatine does not damage the kidneys in any way, but is contraindicated if you have pre-existing severe kidney disease (for example, renal dialysis or kidney transplant patients). People with severe kidney disease have trouble eliminating creatinine, and creatine supplementation would increase creatinine levels further.

References
One of the greatest peaking ironies – and challenges – is that you must be in a calorie deficit to stimulate fat loss, yet in order to drive muscle growth you must supply all the nutrients and energy muscles require for growth. Can you do both at the same time? Absolutely.

Of course, the easiest way to lose fat is to just starve yourself. Starving people are not fat. But the problem with this approach is that during severe caloric restriction, you lose about half muscle and half fat. Your body tries to hang on to the fat as long as it can so it won’t run out of energy. At the other end of the spectrum, it is pretty easy to gain weight if you just eat like a pig. There are very few people who can’t gain a lot of weight if they just eat enough calories. This is what the hoard of “weight gainer” powders out there are for. If you add 1,000 calories a day to your diet, you will gain weight. The problem, of coarse, is that if you just indiscriminately add calories to your diet most of them (probably about 75% by most estimates) will end up as fat.

What’s the answer? How can you attain a really spectacular physique? How do you do it?

The answer is nutrient partitioning, a method of directing food toward your lean compartment and not to fat stores. The idea is to have your food energy go to build muscle while drawing on your fat stores to fuel activity. Achieving this requires two things. First is a very specific eating program which supplies energy in a way that supplies nutrients to build muscle but does not supply calories that are stored as fat. There are certain foods you should eat and specific foods you should avoid. Each meal must be structured according to fairly narrow parameters. The nuts and bolts of how to do this is described in the Parrillo Performance Nutrition Manual, which is the cornerstone of the program.

The second requirement for nutrient partitioning is a training program. Training provides the stimulus to build muscle as well as activating the body’s fat-burning pathways. How does it work? What happens is the nutrition program and the training program merge to have certain effects on your body’s hormones. And these hormones control muscle metabolism and fat metabolism. If you follow the program faithfully, you can actually modify the hormonal environment inside your body in such a way as to signal your muscles to grow and simultaneously signal fat loss. And by supplying nutrient energy in a specific pattern you can direct this energy to the lean compartment while at the same time burning body fat.

Now, where do you start? You start with the Nutrition Manual and a solid training program which includes lifting weights and aerobics. It is virtually impossible to achieve the results of my program without the Nutrition Manual. Many advanced level bodybuilders in the world are on this program, and that’s no exaggeration. You have to start there. I’ve spent over thirty years researching this area and experimenting with advanced level competitive bodybuilders. My approach has been to assemble all of the scientific information on muscle and fat metabolism, and then try different strategies in real athletes to find out what really works. The Nutrition and Training Manuals give you the benefit of twenty years of research and work right at your fingertips.

Are there any supplements that can help? Yes, definitely. One in particular that fits into this program is called Muscle Amino. Muscle Amino is a pharmaceutical grade, ultra-pure, crystalline, free-form amino acid mixture of leucine, isoleucine, and valine. These are the so-called “branched chain” amino acids, because their side chain contains a branched carbon structure. The branched chain amino acids (BCAAs) are among the essential amino acids. Of the twenty amino acids common in human proteins, twelve of them can be made by the body and are called “nonessential” amino acids. The other eight cannot be made by the body and are called “essential” amino acids because it is essential they be obtained from the diet. Obviously, bodybuilders need to be attentive that their diet supplies all of the essential amino acids they need, because they are required for muscle maintenance and growth.

There are two special things about the BCAAs: they are among the most abundant amino acids in muscle proteins (1) and they are heavily catabolized (broken down) during exercise, especially intense aerobic exercise (2). These two reasons plus the fact the body cannot make its own BCAAs increase the need for BCAAs by athletes, especially athletes concerned about achieving maximum muscle mass. BCAAs seem to be preferentially taken up by muscle tissue and stored there, providing an anabolic effect as well as a nitrogen-sparing (anti-catabolic) effect (3).

Muscle Amino is selectively taken up by muscle, so it will add to muscle mass and not fat mass. It provides essential building blocks which are used to build muscle protein, having a anabolic effect. And it blocks the breakdown of existing muscle tissue during intense exercise. This is a perfect example of positive nutrient partitioning. Muscle Amino provides nutrient energy that is specifically targeted to building up muscle stores while not contributing to fat stores.

Exercise induces changes in the body’s pattern of energy metabolism, and these changes are driven by energy needs, substrate availability, and hormonal regulation (2). This change in the pattern of energy flow in the body is what brings about the change in body composition we seek. Energy to fuel body is derived from oxidation (burning) of the carbon chains in carbohydrates, fats, and proteins. The ratio of the fuel mixture that is oxidized depends on the nutrient ratio consumed as well as exercise type and intensity (2). In other words, whether you burn fat or carbs or protein for energy depends on what you eat and how you exercise.

During normal conditions, 80 - 100%
BCAA’s: Activating Muscular Growth

of the body’s energy requirements are supplied by fats and carbohydrates (2). This means that amino acids can provide up to 20% of energy needs on a daily basis, and more during intense exercise. In one study, protein breakdown and use of amino acids for fuel were measured in men following a 10 mile run. It was found that 57 grams of protein were consumed as fuel during the run, accounting for 18% of the energy cost of the run (2). This means that as much as the entire USRDA for protein can be burned during a single intense aerobic exercise bout.

If you want to build a firm, hard body, you require ample protein. One reason is that if you’re very active with an intense weight training program and an equally intense endurance/aerobics program, you are actually burning protein for fuel. If you don’t supply enough protein in your diet to make up for this increased demand then the body will actually break down muscle tissue to supply the amino acids to use as fuel. This is your worst nightmare. Since the biggest demand for amino acid fuel is during aerobic exercise, it turns out that endurance athletes actually have even higher protein requirements than bodybuilders (2). Very few people realize this, including very few endurance athletes. This is why endurance athletes usually have a very thin (sometimes referred to as “stringy”) look - they burn more protein than they take in, so their muscles get catabolized as fuel.

Muscle mass is determined by the balance of protein synthesis and protein degradation (2). When synthesis exceeds degradation, protein mass accumulates and the body is said to be in positive protein balance (or positive nitrogen balance). When degradation exceeds synthesis, the body is in a negative protein balance and muscle mass is lost. The proteins in your muscles are not exceptionally stable over time, but rather are in a constant state of “turnover.” This means that every day some of your body proteins are broken down and destroyed to be replaced with new proteins. Proteins are the mechanical workhorse of the cell, being responsible for doing the physical work of life. For example, during muscle contraction what happens is protein filaments called actin and myosin slide past each other in opposite directions, thus making the muscle shorter. Like any mechanical parts that move and rub against each other, they get worn out. After a while the old proteins are broken down and replaced with new ones.

This coupled with the fact that the BCAAs are among the most abundant amino acids in muscle protein make it obvious why athletes have increased need for the branched chains. They use more for energy, plus they need more for protein synthesis. Virtually every book and article about supplementation for athletes suggest the BCAAs as one of the core supplements. Of all the supplements out there, Muscle Amino is certainly one of the most high-tech, because it specifically targets the metabolic problem at hand. By supplying more BCAAs to the body less muscle tissue is catabolized during exercise, helping to maintain positive protein balance and net gain of muscle tissue. This is a prime example of a low calorie nutrient which specifically targets metabolic pathways to have a positive partitioning effect. Muscle Amino is selectively taken up by muscle where it acts to promote protein synthesis and prevent protein breakdown. Since it is taken up by muscle and not by fat, this is a way to supply nutrient energy which will be partitioned to the lean compartment. It should be emphasized that endurance athletes will benefit from this supplement at least as much as bodybuilders, if not even more.

To see a real noticeable effect from Muscle Amino you need to take a fair amount of it. At least ten grams a day, and twenty would not be too much. I suggest two to three capsules with each of six meals per day. Smaller amounts will have a smaller effect, but this is a supplement where the effects accumulate over time. It is best to take Muscle Amino with meals to increase absorption.

References


Of the many sweeteners now available, Parrillo Performance has made the move to use erythritol in one of its products. Erythritol is technically a “sugar alcohol,” made from the fermentation of corn. A sugar alcohol is neither a sugar nor an alcohol, but is labeled such because of the fermentation process used to produce it. Sugar alcohols are “polysols,” a carbohydrate that has very little effect on blood glucose levels.

Sugar alcohols, in general, are low in carbohydrates and contain roughly half the carbs found in an equal amount of sugar. Their advantage as additives in food is that they affect blood sugar and insulin levels less dramatically than regular sugar or other simple sugars – which means that they are appropriate for weight control and for the management of diabetes.

There are a number of sugar alcohols used in food products. Among them: mannitol, sorbitol, xylitol, isomalt, and maltitol. But erythritol outperforms them all in a number of ways. Erythritol:

• **Is very low in calories**

  Per teaspoon, erythritol has 0 calories, and therefore is an excellent choice for reducing fat-forming sugar in your diet. Erythritol also looks, cooks, and tastes like sugar. It is about 70 percent as sweet as aspartame and sugar and has no aftertaste.

• **Has a high digestive tolerance**

  Most sugar alcohols can cause digestive disturbances such as diarrhea, gas, and upset stomach. Erythritol, however, does not generate these unpleasant side effects – a quality that distinguishes it from other sugar alcohols. The reason is that erythritol is rapidly absorbed in the small intestine due to its small molecular size and structure. Several clinical studies have proved its high digestive tolerance. This unique metabolic profile is a real plus, especially for people who have been avoiding sugar alcohols that produce gas and have laxative effects.

  • **Gives foods a “melt in the mouth” quality**

    Sugar alcohols like sorbitol have long been used in sugar-free hard candies because they produce a candy that doesn’t crystallize and stays hard and dry. Erythritol has different properties; it provides smooth bulk, ideal for our supplement bars, to give them a creamy, melt in your mouth quality.

    Like other sugar alcohols, erythritol does not cause tooth decay. It is resistant to oral bacteria that breaks down sugar and starches to produce acids that may corrode tooth enamel. The American Dental Association recognizes the value of sugar alcohols, including erythritol, as alternatives to sugar and as part of a comprehensive program to fight tooth decay.

    Human studies have found erythritol to be well tolerated and safe, and animal studies show it to be harmless. Further, it has been used in foods around the world since 1990, and so it already has a long history of safe use. Commercially, you’ll find it in sugar substitutes, hard and soft candies, reduced and low-calorie beverages, in dietetic cookies and wafers, and in chewing gum – in addition to our new High Protein Low Net Carb Bar. It has the ability to mask the off-flavor bitterness often associated with other sugar substitutes.

    Erythritol is naturally present in foods such as pears, melons, grapes, mushrooms, and corn. It is a near-perfect sweetener if you’re trying to control your weight, reduce your carbohydrate intake for greater fat-burning, or need to regulate your blood sugar.

    We strive for the best supplement formulations at Parrillo Performance, and we believe that our decision to use erythritol has resulted in a better taste and metabolic profile for our customers.
Captri®: Exploring The High Fat Diet
by John Parrillo

Over the last two or three years several “new” dietary strategies have been advanced that are specifically designed to help bodybuilders get extremely lean for contests. These diets have in common a fairly high protein intake, around 25 to 30 percent of calories. Another common feature is that they advocate reducing carbohydrate content in favor of increasing dietary fat consumption. Some of these plans call for limiting carbs to 30 to 50 grams per day, or even less, and providing around 70 percent of calories from fat. This regimen is carried out over a five day (or so) course to deliberately induce ketosis and a fat-burning metabolism, to promote the use of stored body fat as energy. This is followed by two or three days of carbing up to provide an anabolic growth spurt.

Another program is more moderate, suggesting a diet of 30 percent protein, 40 percent carbs, and 30 percent fat, without cycling. There is a lot of science and theory behind these diets, although the high-fat recommendation is quite controversial. Without getting too bogged down in the biochemical details, the fundamental idea behind these approaches is to reduce carbohydrate intake in order to reduce insulin levels. Insulin is a potent inhibitor of lipolysis, or fat breakdown. By reducing insulin levels, you can take the brakes off fat metabolism and encourage the use of stored body fat for energy.

In my work with bodybuilders, I have found that reducing carbs does indeed help to promote fat loss, especially in people who have a hard time getting lean. I don’t have a problem with carb reduction – as long as it’s done right (I’ll get to that in a moment). But what I have a problem with is that with high fat diets, the dietary fat is VERY prone to be stored as body fat. Several studies have demonstrated that body fat percentage is more highly determined by dietary fat intake than by caloric intake (1,2,3,4,6,8,9,10). Not only does dietary fat contribute more to fat stores than protein or carbohydrate (1-13), but dietary fat (especially long chain saturated fat) increases your cholesterol level and your risk for heart disease.

Back to carbs for a moment: A problem with the very low carb approach is that energy levels fall dramatically. Anaerobic exercise, such as weight lifting, is fueled almost exclusively by carbs. Fat cannot be used as an anaerobic energy source; it can only be oxidized aerobically. Therefore, strength and energy levels fall dramatically without carbs. This results in more muscle catabolism (breakdown and loss), as the muscles turn to branched chain amino acids as fuel. In addition, low carbohydrate diets have been found to reduce thyroid hormone level, which is one of the chief controllers of metabolic rate.

If you’re familiar with my work at all, you know that I advocate, in general, a diet high in protein, high in complex carbohydrates, and very low in fat. I agree that hard-training athletes need more protein than sedentary people, at least one gram to 1.5 grams or more per pound of body weight per day. This is a good general guideline, especially during weight gain. As you decrease calories to lose fat, it helps to increase this amount to as much as 1.5 to 2 grams or more per pound of body weight per day. The higher dietary protein intake helps prevent catabolism of muscle protein during energy-restricted diets.

Next, you should allot 5 to 10 percent of your daily calories to come from fat. The remainder of your calories come from complex carbohydrates, which I divide into starches (potatoes, rice, beans, and so forth) and fibrous carbs (vegetables and salad greens). By combining protein and fibrous vegetables with your starch at each meal you can greatly slow the rate of release of glucose into the bloodstream. This in turn decreases insulin levels, taking the brakes off fat metabolism. You will find that by proper food combining you can stimulate a powerful fat burning effect without eliminating too many carbs from your diet.

But because carbohydrate reduction is such a powerful tool for fat loss, I’ve developed an approach to low-carb dieting that allows you to utilize the power of the low carb diet without resorting to using regular fat as a food source. Instead of regular fat, you use CapTri®, a specially engineered fat with a unique molecular structure which causes it to follow a different metabolic route than regular fats (14,15). It behaves more like a carbohydrate in the body, except that it doesn’t increase insulin levels. This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. This is very similar to the strategy of the high fat diets except without relying on conventional fat as an energy source. In short, CapTri® lets you reap the benefits of the high fat approach without the problems that go along with conventional dietary fat.

To use CapTri® for fat loss, continue to keep your protein intake high at about 1.5 to 2 grams or more per pound of body weight per day, then reduce starchy carbohydrate intake and provide an equivalent number of calories from CapTri® while making sure you still eat plenty of fibrous carbs. For example, if you normally consume 300 grams of carbs per day (1200 calories worth), reduce that to 150 grams per day and add 5 tablespoons of CapTri® per day (providing 570 calories). By reducing carbs and always combining your starches with protein, vegetables, and CapTri® at each meal, you will dramatically reduce insulin levels and maximize fat loss.

One more point: Unlike conventional fats, CapTri® also works well during weight gain because it doesn’t contribute to fat stores (14,15).

References


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The Winning Fat Loss Formula

by John Parrillo

A successful approach to losing body fat involves alternating one month on a weight gain cycle and one month on a fat loss cycle. The first month you would gain a pound each week (four pounds) and 75% of it is muscle. In the second month you lose a pound a week (four pounds total) and 75% of that loss in fat. At the end of the two-month cycle you will have gained two pounds of muscle and lost two pounds of fat. Extend that to a year and you’re looking at 12 pounds of muscle gained and 12 pounds of fat lost. You’re constantly making progress and your metabolism never gets the chance to slow down.

I believe these goals are quite realistic and very easily attainable for anyone, and particularly easy for bodybuilders who are giving 100% effort to the training and nutrition program. The beauty of this idea is that you’re constantly making progress; you’re always either gaining muscle or losing fat; and the constant change prevents your metabolism from adapting so you can make continual progress without wasting time being stuck on a plateau and trying to figure out what to do.

In principle, you could keep this up for year after year. If you’re 20% body fat or more, you may want to devote a few months to getting in shape first, or if you’re really skinny, you may want to spend a few months just putting on size. But if you’re somewhere in the middle, maybe around 10% to 15% body fat, you might consider giving this program a try. To gain a pound a week increase your calories to 300-500 above your MER, do 20-30 minutes of aerobics a day, and train like a powerlifter with heavy sets in the 5-8 rep range. To lose a pound a week, decrease calories to your MER, do 60 minutes of aerobics a day, and train like a bodybuilder with increased volume and moderate weight in the 8-20 rep range.

There are other ways you can maximize this fat-burning mode. For example:

Continue to eat five, six or more meals a day to keep your metabolism in a constant state of acceleration. This has several beneficial effects. Every time you eat your metabolic rate increases a little due to the thermic effect of feeding (also known as diet-induced thermogenesis). Eating frequently keeps the furnace stoked and keeps your metabolism speeding along. If you go too long without eating your metabolism begins to slow down.

Eliminate as much fat as possible from your diet, since fat has a slowing effect on metabolism. Dietary protein and complex carbohydrates have negligible tendency to be converted to fat, whereas dietary fat is very prone to be stored as body fat (1,2,3,4). This is a hot topic in the scientific literature these days and is a matter of debate in the bodybuilding magazines. (It is less a matter of debate in the scientific journals, where actual research is reported.) Very little of your body fat comes from complex carbohydrates or protein being converted into fat; almost all of it comes from fat and sugars you eat. How much fat your body stores seems to be more closely related to how much fat you eat rather than how many calories you eat. Decrease your carbohydrate intake, thereby lowering insulin levels and activating fat-burning mechanisms in the body.

Decrease your carbs. How do you cut down on carbs without decreasing calories? Well, you have to eat more of something else. Fat is not an option, so your only other choices are protein or CapTri®. Either one will work, but a combination of both probably works best. Let’s be brutally honest about this. If you’re used to getting most of your calories from carbs, cutting back significantly on carbs makes you feel bad, at least for a while. People who cut their carbs dramatically have low energy levels, are irritable and grouchy, and get headaches. CapTri® is more effective at relieving some of these symptoms than protein because it’s more readily used as an energy source. Protein is not a very efficient energy source. It’s role is to serve as building blocks for repair and maintenance of tissues, not to provide metabolizable fuel. Using protein for energy is kind of like trying to burn a wet log. Carbs, on the other hand, are a great energy source. So if you want to reduce carbs in your diet to manipulate hormone levels and promote fat metabolism it makes sense to replace those calories with another fuel source, namely CapTri®. CapTri® is a good choice because it is readily burned as fuel and won’t be stored as body fat, (5, 6).

I suggest you ease into this slowly. Start by eliminating starchy carbs from your last meals of the day. Replace those lost calories from carbs with an equivalent number of calories from CapTri®. CapTri® actually has a higher thermogenic effect than carbohydrates, meaning that more of this dietary energy will be lost as body heat with less energy available for storage. This further promotes additional fat loss. Continue in this way until you reduce your daily carbohydrate grams to about half of what you normally consume. At this point you’ll be eating mostly protein, vegetables, and CapTri®.

Do your aerobics when you are relatively carb-depleted. This will cause your body to burn more fat for energy during your workout because fewer carbs are available. The best time is first thing in the morning before breakfast. Your glycogen stores are low, so you’ll rely more heavily on stored fat. Take two scoops of Hi-Protein Powder™ to prevent muscle loss, then do your aerobics. Another good time is right after weight training, because then you’re relatively glycogen depleted too. You should do moderate to fairly high intensity aerobics, so that you’re breathing hard and sweating. While it’s true you burn a higher percentage of calories from fat during low intensity aerobics, you will burn more grams of body fat if you perform high intensity aerobics, because you’ll burn so many more total calories. Also, if you do reasonably intense aerobics you will get the added benefits of increased vascular density and enhanced fat burning.
capacity. Increase the volume of aerobics progressively as you get leaner. If your fat loss plateaus the first thing to try is to increase the intensity of your aerobics and also increase your calories. If that doesn’t work you should probably back off for a couple weeks, increase your calories, put on some muscle, and get your metabolism going again.

How do you know if you’re losing fat and not muscle? By using the Body Stat Kit once a week. You can determine your pounds of lean mass and pounds of fat every week and make adjustments in your training and diet accordingly to make sure you stay on track. The Body Stat Kit Manual contains detailed instructions on exactly how to change your training and diet to make sure your body composition keeps moving in the right direction. I think one of the reasons the Parrillo Program has been so successful for so many people is that everything is scientifically controlled. How many calories, how much protein, carbs, and fat, how many meals, which foods, how to combine the foods, macronutrient ratios, Diet Trac Sheets, the Training Log, Body Stat Sheets—it’s all in the manuals. Every parameter of your bodybuilding program is covered and nothing is left to chance. If you weigh your food and keep track of your diet and body composition like you’re supposed to, and something’s not working right, we can pinpoint exactly what the problem is and make detailed adjustments to fix it. Otherwise, if you’re just going on what “feels right” or seems to make sense, and you don’t make good progress, you’re not sure what to change. If you want more details than I have been able to squeeze into this article, check out the Parrillo Performance Nutrition Manual and the Body Stat Kit. I go into great detail about which foods to eat, which foods to avoid, and how to structure your meals. The Nutrition Manual contains a three step protocol for reducing body fat levels to contest condition, as well as describing how to manipulate carbs and water at the end. The Body Stat Kit contains instructions on exactly how to modify your training and nutrition program based on your weekly changes in body composition. The Nutrition Manual comes with its own food scale and Diet Trac Sheets to record your calories and grams of protein, carbs, and fat. It even includes a food composition guide that lists the nutrient breakdown of all the bodybuilding foods. The Body Stat Kit includes high quality calipers and everything you need to chart your body composition. Remove the guesswork from your bodybuilding program. Don’t leave anything to chance.

References


Regular food can create a powerful anabolic environment for the conscientious bodybuilder. Regular food is food purchased at the supermarket and when combined with a proper weight training and cardiovascular regimen, amazing physical results occur rapidly. For thirty years I have refined a system that combines precision eating with high intensity exercise and when properly balanced and used consistently, this approach triggers dramatic gains in muscle mass and equally dramatic reductions in body fat. Many young bodybuilders are on an eternal search for a ‘miracle’ nutritional supplement that will allow them to eat in an undisciplined way and train in a haphazard fashion - no such product exists or has ever existed. I’ve said this before and I’ll say it again, proper amounts of regular food eaten at the proper time will get you 80% of the way there, assuming you train hard, heavy and often. It takes lots of high intensity weight training and aerobic exercise to trigger gains and it takes a lot of calories to support serious training. Supplements can add 20% to your efforts – and that’s huge! Unscrupulous supplement manufacturers make outrageous claims about phony products in an effort to get you to buy their goods. They want you to believe that by using their miracle product you can effortlessly build your physique without hard training or disciplined eating. People desperately want to believe this myth and there are plenty of supplement makers that will tell you with a straight face that they have designed just such a product. As a result there is always a market for crazy new nutritional supplements that make unbelievable claims.

Reality is a lot different from make-believe. In the real world results start with the expert use of regular food; this is the foundation on which every sound and sane nutritional program is constructed. What is the best way to construct a nutritional program that delivers real results? Start by establishing a multiple-meal daily eating schedule. Once the eating schedule is squared away, turn your attention to food selection: discipline yourself to eat only foods that are beneficial, not detrimental.

After you have squared away the eating schedule and regimened yourself to eat only foods that help, not hinder. The final step is to utilize a broad array of nutritional supplements. At Parrillo Performance we have developed a line of potent supplements that are designed to do just that: supplement a sound eating program structured around the intelligent use of regular foods. Bodybuilding foods are available at the local supermarket and when combined with our supplements (designed to supplement not supplant or replace regular food) the supplements act as a force multiplier. To reap maximum benefits from your nutrition, train hard and ingest plenty of quality calories to heal muscle tissue shock-blasted from intense training. Eating too few calories is as bad as eating too many of the wrong calories; in order to make progress, hard training must be supported by big eating. The trick is to derive calories from foods devoid of saturated fat, sugar and refined carbohydrates. The human body has an easy time converting fat and sugar into body fat and for that reason we avoid them. On the other hand it is virtually impossible for the body to convert pure protein and fibrous carbohydrates into body fat and for that reason we build our nutritional foundation upon these foods.

Multiple meals are critical: The logic is irrefutable; better to consume the daily caloric allotment in smaller chunks. If you are consuming 2,000 calories per day, better to consume five 400-calorie mini-meals than in one or two high calorie maxi-meals. Small meals lessen the digestive burden and multiple meals ‘teach’ the body how to digest and assimilate food in a more efficient fashion. Multiple meals ‘build the metabolism,’ and this is the cornerstone of the Parrillo nutritional philosophy. Optimal meal or ‘feeding’ need occur every two to three hours. This ensures the athlete maintains ‘positive nitrogen balance,’ the ultimate metabolic state for building muscle tissue.

Eat only recommended foods: Once a multiple meal eating schedule is established, turn your attention to food selection. As mentioned earlier, protein devoid of saturated fat and fibrous carbohydrates are the foundational foods in the Parrillo nutritional program. Starchy carbohydrates are the ‘wild card.’ Every Parrillo-style meal should include a protein portion, a fibrous carb portion and a starchy carbohydrate portion. Protein and fiber are eaten in large amounts and starch is eaten in a precise fashion: if the athlete is building mass lots of starch is consumed. If the bodybuilding is in a pre-competition ‘ripped and shredded’ phase, starch is eaten in smaller amounts.

Eliminate foods that are detrimental: Powerlifters build huge amounts of muscle by eating lots of calories and training hard and heavy using basic exercises with bar-bending poundage. Because they are not choosy about caloric sources their impressive muscle mass is usually accompanied with equally massive amounts of body fat. The Parrillo-style bodybuilder rips a page or two from the powerlifter by ingesting lots of calories and by training hard and heavy – but in order to minimize body fat the bodybuilder is super selective in food choices and performs aerobic exercise. By confining foods to those difficult for the body to compartmentalize as body fat and by performing high intensity aerobics, muscle mass is acquired and body fat acquisition is minimal.

Exercise often and exercise intensely: At Parrillo Performance we have developed a integrated system of weight training, aerobics and nutrition that results in a radical alteration of the physique in short order – assuming all the elements are in place and practiced with due diligence. Training is done with great intensity
whether it is weight training or cardiovascular training. For maximum results weight training sessions are done often. I recommend a wide variety of exercises for every body part: use low reps to build size and power and high reps to build muscle density and separation. Aerobic sessions should be performed often and done with great intensity. Hard cardio actually increases mitochondria density and the more of these tiny muscle blast furnaces exist within a muscle the more efficient the body becomes at oxidizing calories.

Supplements are critical: Nutritional supplementation can make or break a bodybuilder. Assuming you are training with the requisite frequency and intensity, unless you are ingesting sufficient calories – clean calories devoid of fat and sugar – no progress is possible. A common mistake for hard working bodybuilders to ‘under eat’ in the mistaken belief that restricting calories is proper and appropriate. Nothing could be further from the truth: training hard and not eating enough result in muscle catabolism and the human body will actually eat its own muscle tissue to cover calorie shortfall. More often than not the bodybuilder cannot eat every single required calorie from regular food sources and this is where supplements come to the rescue. A serious bodybuilder will require 1.5 grams or more of protein per pound of body weight per day and by supplementing with protein powder the athlete is easier able to hit the protein target – and without having to cook every single bite. Parrillo carbohydrate powder, sport nutrition bars, CapTri, amino acid supplements and various vitamin and mineral supplements round out the eating regimen effortlessly.

Regular food forms the bedrock foundation: As I mentioned earlier, the expert use of regular food, the kind available at the grocery store, allows you to construct a nutritional game plan that will get you 80% of the way towards the goal: maximizing your ultimate genetic potential. The precise use of nutritional supplements will provide the remaining 20%. Assuming you are training frequently and intensely, physical transformation is not a matter of ‘if’ but ‘when.’ Use a multiple meal schedule based on the consumption of regular recommended foods and supplement with potent Parrillo supplements. Train hard, eat correctly, supplement precisely and the results will shock and amaze you: muscle mass increases, body fat melts and inside of sixty days you will undergo a total physical makeover.
Natural Regulation Of Cortisol To Maximize Lean Mass
by John Parrillo

One hormone that has been in the fitness spotlight lately is cortisol, a steroid hormone manufactured by the adrenal glands. Although its overall function is to help the body deal with stress, cortisol has a wide variety of actions, all of which help to regulate overall metabolism. For example:

Cortisol has a direct effect in regulating carbohydrate, fat, and protein metabolism (1). Cortisol mobilizes the body’s energy reserves during times of stress. Cortisol acts to increase blood glucose concentration in two ways: first, through a decrease in insulin sensitivity (thus reducing storage of glucose inside cells) and second, by stimulating gluconeogenesis.

Gluconeogenesis is the production of new glucose from amino acids. Unfortunately, these particular amino acids are derived from the breakdown (catabolism) of body proteins - including muscle tissue. Cortisol stimulates muscle catabolism to free up the amino acids so they are available to be converted into glucose to use for energy. This is why excess cortisol causes muscle wasting. Cortisol’s effect on body fat varies somewhat according to the specific body region. Fat depots exist in different parts of the body and these different regions have different hormone receptors. Cortisol tends to cause depletion of peripheral fat in the arms and legs, but increased accumulation of fat in the abdomen, back and face. Patients with excessive cortisol levels (or those on high dosages of prednisone) develop thin arms and legs due to both muscle and fat loss (through catabolism). Typically, they also develop obese abdomens.

Cortisol is not anabolic like testosterone; to the contrary, cortisol is primarily catabolic. Too much of it and you will risk obesity, and not enough can lead to medical problems.

Fortunately, as long as your adrenal glands are functioning properly, you’ll never have to worry about cortisol deprivation or excess. Your adrenal glands, in concert with other glands (and nature), automatically regulate cortisol and keep it in the appropriate range.

So why am I bothering to write about this subject? It turns out that exercise increases cortisol levels – and this has important implications that needs to be taken into account by anyone who practices high intensity weight training. Exercise stimulates muscle growth and paradoxically also triggers the release of cortisol. When cortisol is suddenly dumped into the bloodstream, it creates a potentially catabolic situation. So we need to understand how cortisol works and how it is regulated so we can design a training and nutrition strategy which will allow for optimal growth - while minimizing cortisol’s catabolic effects.

For bodybuilding purposes we want to minimize cortisol because it promotes muscle loss, fat accumulation and water retention. Cortisol is secreted in response to stress of almost any kind. It should then come as no surprise that the first thing we should do to control cortisol is minimize body stress and maximize recovery time. For starters, get plenty of rest. Sleep deprivation has been shown to increase cortisol levels and the reintroduction of proper sleep habits reduces cortisol levels back to normal. Everyone knows either by intuition or experience that muscle growth is much harder if you don’t get enough rest. And don’t neglect the connection between cortisol and stress. Anger and stress are often interrelated: are you a “type A” personality? If so, attempt to remain as relaxed and calm as possible. Easier said than done. Remember this: every time you have an emotional outburst, lose your temper or fly into a rage, you are most likely dumping huge amounts of muscle-eating cortisol into your bloodstream. Hopefully, that thought will give you pause if you are serious about bodybuilding but emotional by nature.

Another cortisol-related factor is training. Over-training, literally doing too much training, while being under nourished and not getting enough rest results in decreased testosterone production and increased cortisol levels. This tips the balance rapidly from anabolism to catabolism. People who are chronically over-trained are continually tired, fatigued, weak and often depressed. They lose muscle, strength plummet and performance declines. If you look around the gym, the people who are not making progress are usually under-training - not over-training. Furthermore, if you compare the stagnant trainers to the one making the gains, you will observe the ones making gains are invariably training harder and longer. Before you conclude that you are over-training and reduce your exercise level, try getting some additional rest, eat more clean calories and add in some basic supplements such as our Vitamin Formula™ and Mineral Electrolyte Formula™ to increase your nutrient levels. Generally these changes will promote growth without having to reduce exercise activity. In many cases, failure to grow is simply the result of inadequate caloric and nutrient intake in relation to the exercise level of the bodybuilder. Over-training is a result of doing too much exercise (volume) while being under nourished. Do not confuse volume with intensity. Successful bodybuilding is about intensity, not volume. Endurance exercise is about volume, not intensity. You should train intensely and workout for 60 to 90 minutes. Remember, the longer and harder you train the higher your calorie and nutrient levels must be.

There are certain nutrition and supplementation strategies you can use to minimize the catabolic effects of cortisol. The single most important and effective of the cortisol-suppressing nutritional techniques is a low-tech solution. Probably the most effective thing you can do to minimize cortisol release is to simply eat something every two to three hours, as the Parrillo...
Nutrition Program recommends. Caloric deprivation has been shown to cause a significant increase in cortisol levels (3). A small meal every two to three hours (or so) is a great way to keep cortisol excretions to a minimum. The ideal cortisol suppressing meal would contain a complex carbohydrate and some protein. Carbohydrate ingestion in particular seems to reduce cortisol levels. It is also important to eat some protein at each meal as protein slows the release of carbohydrates and provides a constant supply of amino acids to facilitate muscle growth. Most people find it difficult to eat six complete meals a day and rely on nutritional supplements for two or three of these many meals. If you are looking for a supplemental meal replacement try our 50-50 Plus™. This product supplies 17 grams of quality carbohydrates and 20 grams of high BV protein. Another excellent meal alternative is the Parrillo Bar™, Parrillo Protein Bar™ or the Parrillo Energy Bar™. These tasty bars are extremely convenient and will provide you with a balanced meal that you can carry in your pocket and eat in minutes. Some of our athletes like to combine Optimized Whey Protein™ or Hi-Protein Powder™ with Pro-Carb™. This novel approach allows you to customize and adjust your ratio of protein-to-carbohydrates to suit your personal goals.

In addition, vitamin supplementation may be helpful. In particular, the antioxidant vitamins E and C seem to reduce the oxidative stress of exercise and therefore reduce catabolism. Most bodybuilders who follow our nutritional guidelines don’t eat fruit (since fruit sugar is preferentially converted into fat) and therefore vitamin supplementation becomes an even better idea. Glutamine and the branched chain amino acids - leucine, isoleucine, and valine - may not affect cortisol levels directly, but are very effective at shifting the anabolism-catabolism balance more towards the anabolic side. These amino acids seem to have a powerful effect in stimulating protein synthesis. Glutamine has been shown to increase glycogen storage as well as increase growth hormone levels (3,4). Our protein products (Optimized Whey™, Hi-Protein™, 50-50 Plus™) all have high amounts of amino acids mixed into a well-balanced protein base.

In summary: to help minimize the catabolic effects of cortisol you should get plenty of rest, minimize stress in your life and make sure your caloric and nutrient levels match your training load. You should eat small, frequent meals, containing both carbohydrates and protein. Your protein choices should contain high levels of glutamine and the BCAAs. Try to eat every three hours if possible. Three conventional meals per day, combined with three servings of 50-50 Plus™ or your own Pro Carb™/Hi-Protein™ or Optimized Whey™ concoction will assure that you are obtaining adequate protein intake and obtaining high levels of glutamine and BCAAs. By applying and following a few common sense diet and exercise guidelines, we can minimize the catabolic effects of cortisol. Just remember to stay cool calm and collected the next time the boss or your kids do something that makes you angry. By subduing stress, getting plenty of rest, adequate nutrients and exercising hard and intensely, cortisol-related muscle wasting can be a non-event in your bodybuilding career.

References


Herbs, Food, and Performance  
by John Parrillo

I am often asked about whether herbal supplements can help improve performance, particularly since there are so many of these supplements on the market. The bottom line is that healthy nutrition, proper training, and genetic endowment are the major factors that contribute to physique and athletic success. Increasing your nutrient density with supplements to amplify success is also important, as long as you eat properly and train consistently and intensely.

Herbal supplements, in my opinion, are iffy, however. Yes, athletes and exercisers often use herbal substances to try to gain a competitive edge. But by and large, most herbs have proved to be of doubtful value in enhancing performance. And many may be downright harmful.

Case in point: Sixty-five cases of herbal supplement-related seizures reported to MedWatch from 1993 to 1999 were obtained through the Freedom of Information Act and independently evaluated by three reviewers. They concluded that of these cases, 20 were probably related to herbs. Of these, 19 involved ephedra, and 14 involved herbal caffeine. Thirteen of the 65 cases were possibly associated with herbal supplements. Of these, ephedra was also associated with 7 cases, and caffeine was contained in 5 of these supplement products. Other herbs implicated in possibly related seizure events were St. John’s wort and gingko biloba. These findings underscore that significant health risks are associated with use of certain herbal products. (1)

Of the supplements in the Parrillo Performance line, Evening Primrose Oil™ is about as close as we get to a herbal formulation. The evening primrose is a small flowering plant that grows in England. Evening Primrose Oil™ (EPO) is an excellent source of essential fatty acids. The main function of EFAs in the body is to provide building blocks for a class of hormones called eicosanoids. The broad category of eicosanoids is further subdivided into prostaglandins, prostacyclins, leukotrienes, and thromboxanes. The eicosanoids are a complex group of hormones (over 100 different prostaglandins have been identified so far) which are involved in controlling many metabolic processes such as blood pressure, inflammation, fat metabolism, and blood clotting, to name a few. Eicosanoids are made by all cells of the body and their central function is to communicate messages to nearby cells to help coordinate and regulate the body’s metabolic activity. EFAs are also important structural components of cell membranes and thus are important for healthy skin. As for how to take EPO, I advise from two to six capsules a day with meals.

Another important point is to always eat breakfast - this gets your metabolism going first thing. This is why breakfast is probably your most important meal.

Are there any toxic effects from taking too much EPO? No, EPO is completely nontoxic. There are some potential side effects, which include headaches and (paradoxically) your skin breaking out (pimples). These are a result of the effects of the class 2 prostaglandins which are made from arachidonic acid, a metabolite. These effects are completely blocked by aspirin, which stops the conversion of arachidonic acid into prostaglandins. If you should notice these problems, simply take two aspirin and decrease the number of capsules you take.

Parrillo EPO™ is a high-tech EFA supplement designed to provide EFAs without excess non-essential fats. It provides a way for bodybuilders and other athletes to optimize their EFA metabolism while still maintaining a low fat diet. Parrillo EPO™ is simply another tool to help you optimize your nutrition.

That’s about all the practical “how to” information you need to incorporate EFAs into your diet. The Parrillo EPO™ supplement was developed specifically to provide a concentrated source of EFAs so you don’t have to eat a tablespoon of oil every day.

More important than supplements (which have their rightful place), sticking to a multiple-meals nutrition program is essential. That means eating five, six, or more meals a day. This pattern of eating is metabolically beneficial in three ways. To begin with, multiple meals that include starchy carbohydrates help keep insulin constantly present in the body. This powerful, growth-producing hormone helps make amino acids available to muscle tissue for growth and recovery. Insulin’s release is triggered by the conversion of carbohydrate into glucose by the liver. Frequent meals also increase “thermogenesis,” the production of body heat from the burning of food for energy. Following a meal, your metabolic rate is elevated as a result of thermogenesis. So the more meals you eat, the higher your metabolism stays throughout the day for fat burning and muscle building. Finally, with a constant nutrient supply, you are never forced into a starvation mode. With meals coming at regular intervals, your body learns to process food more efficiently, and your metabolism is accelerated as a result.

Another important point is to always eat breakfast - this gets your metabolism going first thing. This is why breakfast is probably your most important meal. You have the whole day to burn off any excess calories you consume at breakfast - any excess
calories you consume right before bed are likely to be stored as fat.

Additionally, don’t forget to combine your foods properly, so as to slow the release of glucose into the bloodstream. Carbohydrates are digested down into glucose, which is the form of sugar released into the blood. If too many carbs are consumed, or if they are released into the blood too rapidly, the insulin response causes the excess to be taken up by fat cells and converted into fat in a process known as lipogenesis. By eating unrefined, complex carbohydrates - and not simple sugars - you slow the release of glucose into the blood. This is also the reason you should combine fibrous carbs and protein together with your starches at each meal - it slows the rate of digestion and release of glucose.

So basically, my philosophy is that the role of supplements is to increase cellular nutrient levels beyond what can be obtained from a healthy diet of regular foods. Food will always be the cornerstone of sound nutrition – don’t lose sight of the importance of your diet. I do not know of any herbal supplements that can really affect your body composition beyond what can be obtained from regular foods and certain non-herbal supplements (such as creatine, CapTri®, amino acids, and protein supplements).

References

Creatine for Maximum Results
by John Parrillo

If you are interested in maximizing muscle size, creatine helps in two ways. A more long-term effect is that creatine supplementation allows you to lift more weight for more reps, so you get more muscle fiber hypertrophy. A more immediate effect is that as muscle cells take up creatine, it takes water along with it. So it makes the muscle fibers swell, getting bigger and harder. After a month of creatine supplementation, you might ingest only 250 grams of creatine, but gain six to fourteen pounds of muscle mass. That weight is mostly water, being drawn inside muscles cells by the extra creatine. It’s kind of like having a constant pump.

Your body makes some creatine naturally. Your kidneys make about one gram per day. Creatine is also contained in meat, and the average diet of meat eaters supplies about another gram per day. So, without creatine supplementation, you get about two grams per day, unless you’re a vegetarian, in which case you get about one gram per day. Creatine supplementation allows you to propel this to a much higher level. This increases the amount of creatine inside muscle cells, making them bigger and harder and stronger.

The way to use creatine is to start with a loading phase, which usually is 20 grams a day for five to seven days. To do this, take five grams (one teaspoon) four times a day, for five to seven days. This is followed by the maintenance phase, which is five to ten grams a day. After only one month, you will see a noticeable increase in size and strength. I feel that Parrillo Creatine Monohydrate™ is the highest purity creatine supplement available. And a word of caution: don’t be fooled into buying creatine phosphate supplements. It sounds like a good idea, until you realize creatine phosphate is not absorbed from the intestine. You need to use creatine monohydrate, which is absorbed from the intestines. Once transported inside muscle cells, it is converted into creatine phosphate.

Also beware of liquid creatine supplements, as creatine will break down after a few weeks of being dissolved in water. To boost your gains through the roof, there’s an excellent supplement to use in combination with creatine: 50-50 Plus™. 50-50 Plus™ is a drink mix made from about 50% protein and 50% carbohydrate. The protein portion is very much like Parrillo Hi-Protein Powder™, and the carbohydrate part is derived from Pro-Carb™. Studies have shown that a combination of protein and carbohydrate like this works better at promoting muscular growth than either one alone. Combining creatine with 50-50 Plus™ is, quite frankly, the most potent nutritional supplement available for supporting muscle growth. The amino acid profile of the protein is ideal for supporting muscular growth, and the carbohydrate replenishes glycogen, further enhancing energy levels and strength. The best time to use this combination is after training. At that time your muscles are depleted and are begging for nutrients. The protein acts to repair muscle damage from training as well as to supply the building blocks to generate new muscle tissue. The carbohydrate replenishes glycogen, as well as increasing uptake of the amino acids and creatine by muscle cells. If you’re on a budget and want to keep things simple, try 50-50 Plus™ along with creatine. After just one month, used in combination with proper diet, you will see and feel a difference.
Recovery Nutrition
by John Parrillo

No “get up and go” in the gym? Plateaued muscular development? Frequent colds and infections? If so, you could be suffering from poor recovery. “Recovery” is the process of regeneration that takes place after you exercise. It involves replenishing glycogen stores, repairing muscle, restoring energy-producing compounds in cells, and building up your antioxidant reserves, as well as fluid and electrolytes.

To boost your recovery, follow these steps:

Refuel with good carbs (starchy carbs, fibrous carbs, or a supplement such as Parrillo ProCarb™, as recommended on the Parrillo Nutrition Program™). Of all the nutrients necessary for optimal recovery, dietary carbohydrate takes precedence for two reasons. First, carbohydrate restocks your body with muscle and liver glycogen, which can be depleted during exercise. Replenishing these stores allows you to train harder on successive workouts for greater gains. Carbohydrate also triggers the release of the hormone insulin, which promotes muscle growth as well.

Time your carbs. Your muscles are most receptive to producing new glycogen within the first few hours after your workout. That’s when blood flow to the muscles is much greater, which increases glucose transport to the muscle cells. They are also more sensitive to the effects of insulin during this time, promoting glycogen synthesis. (1)

Consume protein with your carbs. Various research studies have proved that a carbohydrate/protein supplement triggers the greatest elevations in insulin and growth-hormone levels in exercising study subjects. Clearly, protein works hand in hand with post-exercise carbs to create a hormonal environment that promotes the greatest increase in muscle growth. Parrillo 50/50™ is a great way to get this benefit. (2)

Supplement with BCAAs. These nutrients help to optimize muscle repair in the wake of exercise. Take a BCAA capsule that supplies approximately 4 gm of leucine daily, as does Parrillo Muscle Amino Formula™. In order to move into your muscles, BCAAs need insulin, which is triggered by the digestion of carbohydrates. Therefore, take your BCAAs with meals or with a carbohydrate/protein supplement after training. (3)

Supplement with antioxidants. A significant amount of research has found that antioxidants, such as vitamins C and E and the mineral selenium, can shore up your body’s defenses. Most studies have demonstrated a protective effect with a daily intake of 400 IUs of vitamin E, 200 to 1,000 mg of vitamin C and approximately 150 mcg of selenium. Taking Parrillo Essential Vitamin Formula™ can help you get the antioxidants you need. (4)

Exercising diligently is essential. Follow these guidelines, and you’ll keep poor recovery from interfering with your progress.

References


The Scoop on How to Recuperate
by John Parrillo

With the weather changing, colds and flu bugs are in the air. It’s hard to believe but exercisers and athletes, despite their healthy regimens, can be very susceptible to infections, since training can deplete the body’s antioxidant defenses. So in this month’s column, I want to amplify what Dr. Sheats has to say in his column on recovery nutrition, particularly on the supplements we recommend to shore up immunity.

In certain circumstances, exercise can suppress your immune system, which is your defense against infections and illness, by altering hormonal and biochemical functions in the body. Not to worry, though: In most situations, exercise does the opposite. It enhances your immune system.

But what of those cases where exercise impairs immune defenses?

According to scientific research, these can occur under the following circumstances (1):

1. You’re under mental stress.

2. You’re undernourished. (Research indicates athletes consume about 25 percent fewer calories than they need, leading to deficiencies of many essential nutrients.) (2)

3. You exercise in a carbohydrate-depleted state (this increases the circulation of stress hormones in your body, plus harms immune-protective substances in the body).

4. You’ve attempted quick weight loss through caloric deprivation.

5. You’ve practiced improper hygiene.

The good news is that you can protect yourself from infections with improved nutrition and life-style practices. Here’s a look at how:

1. **Supplement with extra carbs**

Supplementation with carbohydrate beverages – before, during, and after exercise – has been shown to strengthen immune responses. For example, it reduces levels of the hormone cortisol in blood. That’s good, since cortisol suppresses immune response. Carbohydrate supplementation also appears to protect various types of immune cells from weakening. (3) If you’re on the Parrillo Nutrition Program™ a good supplement choice is our ProCarb™ Formula, which can be used before, during, and after a workout.

2. **Consume whey protein supplements**

Research shows that whey protein diets increase the amount of glutathione in body tissues. Glutathione is a peptide (an amino acid derivative) that is involved in strengthening immunity. The elevation of glutathione has been shown to inhibit the development of several types of tumors, according to numerous studies. (4)

Whey protein is found in the following products: Optimized Whey Protein™, Hi-Protein Powder™, 50/50 Plus Powder™, All-Protein™ Powder, Parrillo Sports Nutrition Bars™, Parrillo Protein Bars™, and Parrillo Energy Bars™.

3. **Beware of the “overtraining myth”**

“Overtraining” refers to poor performance in training and competition, and its symptoms include fatigue, frequent illness, disturbed sleep, and moodiness. (5)

Overtraining, however, is simply “underrecovery” or “undereating” – not taking in enough nutrients to fully recover from your workouts. If ample nutrients are not provided, intense workouts won’t do much good. But once you get in the habit of making your nutrition as intense as your training, your workouts will be much more productive, and you’ll see results much quicker.

Make sure you remain in a calorie surplus – that is, eating ample calories and taking in supplemental nutrients to support your energy needs throughout the day. Follow a high-calorie nutrition program, and you should have enough energy stamina to blast through any workout, regardless of how long or intense it is. You’ll also have enough recuperative power to sustain you from workout to workout, without any compromise of energy or immune function.

4. **Take Antioxidants**

Antioxidants are nutrients found in foods and supplements that protect the body from the onslaught of disease-causing free radicals. Free radical damage has been implicated in diseases such as cancer and heart disease.

Fortunately, free radicals aren’t allowed to do their bad deeds without being policed. They’re apprehended by the antioxidant nutrients, which include vitamins A, C, E, beta-carotene, and certain minerals and enzymes. These nutrients simply donate an electron to a free radical but without changing into a radical itself. This action “neutralizes,” or stops the dangerous multiplication of still more free radicals.

Supplementing with antioxidant nutrients has been found in research to help protect the body against age-related diseases. You get vitamins A and E by eating a diet rich in vegetables and whole grains. Vitamin A, in particular, is found in yellow and orange foods, such as yams - a bodybuilding staple. Nutritionists feel that our diets don’t supply all the vitamin E needed for good health. Thus, supplementation...
of Parrillo Natural E™ is recommended.

By following the Parrillo Nutrition Program™ and supplementing with the Parrillo Essential Vitamin Formula™ and the Parrillo Mineral-Electrolyte Formula™ you supply your body with the antioxidant vitamins and minerals it needs for good health.

5. Try arginine

Arginine is considered a non-essential amino acid, meaning the body can synthesize it from proteins and other nutrients. Despite the fact that arginine is labeled non-essential, it has a number of important functions in the body, including the fortification of the immune system. In studies with animals and humans, arginine has been found to improve wound healing and bolster immune responses, plus reduce the incidence of infection following surgery. (6,7)

Arginine has other duties, as well. It is required to manufacture creatine, an important chemical in the muscles that provides the energy for contractions. In addition, Arginine apparently helps prevent the body from breaking down protein in muscles and organs to repair itself when injured. Meat, poultry, and fish are good sources of arginine, as are numerous supplements, including our Enhanced GH Formula™ and our Ultimate Amino Formula™.

6. Get in the zinc sync

Zinc has far-reaching roles in the body. For example, it helps absorb vitamins; break down carbohydrates; and regulate the growth and development of reproductive organs. Zinc is also an important immune-boosting mineral, involved in making superoxide dismutase (SOD), an antioxidant enzyme that inactivates certain free radicals. Zinc, however, can be depleted by prolonged, high-intensity exercise if you’re poorly nourished. Because zinc is required for the activity of several enzymes involved in energy metabolism, reductions in zinc concentrations in muscle may lead to muscle fatigue. (8)

The best sources of zinc are lean proteins, whole grains, and mineral supplements. Zinc is one of the minerals found in our Mineral-Electrolyte Formula™.

7. Manage athletic stress

Hard-training bodybuilders and athletes can succumb to the immune-weakening effects of stress just like anyone else. Here are some ways to prevent this (9):

- Vary your training routine to avoid monotony.
- Space your competitions appropriately so as to not place undue burden on your recovery and immune responses.
- Practice stress reduction strategies such as relaxation if you’re continually stressed out over competition.
- Get adequate rest and recovery.
- Reduce environmental stress by limiting the time you train in heat, cold, humidity, or polluted air.
- Practice good hygiene to limit the transmission of contagious illnesses.
- Get regular medical check-ups if you have recurrent infections.

References


Stay Fit & Lean This Holiday Season
by John Parrillo

With the holiday season, can you still eat, drink, be merry and still stay fit?

**Answer:** Absolutely—and here are some easy-to-follow guidelines to help you. If you stick to these, you’ll start 2007 in super shape—with no need to make New Year’s resolutions...

**Avoid or limit alcohol consumption.** When there’s alcohol in your system, the liver has to work overtime to process it, so it doesn’t have adequate time to process fat. Sip on seltzers, club soda or sparkling mineral water on the rocks with a citrus twist.

**Stay active.** Sticking to your regular weight-training and aerobic exercise routines is one of the best ways to fight fat gain during the holidays. So regardless of what comes between you and your workout, try not to eliminate it all together. If you’re like most people, you’ll need to let off some steam during the often-stressful holiday season, and exercise is the perfect stress reliever. Plus, it helps to burn off the extra calories that you’ve eaten at those parties and holiday get-togethers.

**Push it aerobically.** If you have the luxury of vacation time during the holidays, why not engage in a little additional aerobics to burn off those extra calories? Do a bit more of your usual aerobic activity or try some new types just for fun. If you are not that adventurous, try to slightly increase the duration and/or frequency of your usual aerobic exercise routine.

**Check out the Parrillo Cap-Tri® Cookbook.** Most people don’t realize it, but the traditional holiday dinner with appetizers can weigh in with thousands of fat and sugar-filled calories. Look at John’s cookbook for some recipes that make great holiday fare! There are new, healthier, and delicious ways to cook with turkey, sweet potatoes, and more.

**Plan ahead.** It’s easier to stick to a healthy course of action if you decide to do so ahead of time, before the situation presents itself. Decide ahead of time what you will eat, and how much. Planning ahead of time works much better than merely throwing caution to the wind.

**Try “pre-dieting.”** It works like this: Start trimming off a few pounds of fat before the holidays get in full swing by following the Parrillo Nutrition Program. Pre-dieting has been shown in clinical trials to offset holiday weight gain. Obesity researchers in Sweden studied the effect of eating during the Christmas holidays on 46 obese patients in a weight-maintenance program. Those dieters who had lost more than 6.6 lb by pre-dieting during the six months prior to Christmas gained less weight (from 0.4 lb to 4.8 lb) between Christmas and Epiphany (a religious festival celebrated on January 6) than those who didn’t pre-diet. By contrast, the patients who gained more than 6.6 lb of body fat during the six months prior to Christmas put on an additional 5 lbs. on average during the holidays. The message is clear: Pre-dieting clearly keeps the holiday pounds from piling on.
Ultimate Endurance Performance
by John Parrillo

Parrillo Performance provides the best quality supplements in the world. Period. We don’t cut any corners when it comes to nutritional support for our athletes. We want you to get the most from your training, and we want you to reach your goals. We’re here to help you win. In addition to our famous success with bodybuilders, we also work with world class endurance athletes. In this article I will describe some of our best supplements for endurance athletes, why they work and how to use them. Even if you’re not an endurance athlete and are just looking for more energy, our approach to diet and supplementation is sure to help.

Finally, it’s also worth mentioning that many of the best bodybuilders also rely on our endurance supplements when they want to train longer and harder, and, more importantly, recover faster and more completely.

Ultra-endurance activities are associated with loss of lean body mass (1,2). Endurance activity causes loss of lean tissue because as fat and carbohydrate fuels are exhausted the body draws on its own muscle tissue to use as fuel (3). Amino acids can be converted to glucose in the liver via a process known as “gluconeogenesis” (4,5). The so-called “branched chain amino acids” (leucine, isoleucine and valine) seem to be especially preferred as fuel substrates. In addition to being converted to glucose in the liver, the amino acids are unique in that they can also be used directly as fuel by the muscles (5). These are the amino acids included in our product Muscle Amino™. Muscle Amino™ contains the balance of branched chain amino acids science has shown most beneficial.

Have you ever noticed an ammonia smell in your clothes after a hard workout? This is because your body was using some amino acids as fuel but was not able to clear the waste products efficiently. When this happens the carbon skeleton of amino acids is burned, leaving ammonia as a byproduct. Ammonia is quite toxic and is converted to urea in a metabolic pathway called “the urea cycle,” which prepares it to be excreted in the urine (4,5). The urea cycle requires certain chemical compounds called “aspartates,” (4,5) which are included in our Max Endurance Formula™. We have developed this product specifically for use during endurance activities. It works by providing nutrients which are used by the body to detoxify the waste products of protein catabolism. Max Endurance™ helps filter out toxic waste products your body generates during intense training. Eliminating these waste products helps you have more energy and recover faster. Ammonia is very toxic and will stop energy production in the cell. Using the aspartates in Max Endurance™ to “neutralize” the ammonia as soon as it forms enables you to have more energy and endurance. We suggest the product be used consistently everyday, not just on days of endurance events.

Perhaps the most crucial supplement for endurance athletes is our Liver Amino Formula™. I cannot overemphasize the importance of this product. What is endurance activity all about, anyway? It’s about producing energy over an extended period of time. Liver Amino™ helps in at least three ways — by providing heme iron, protein and B vitamins.

Energy production in the human body requires two things: a fuel substrate and oxygen (3,5). Many people build up the importance of carbohydrates in endurance performance — and rightfully so. Carbs are your body’s best fuel source for endurance activity (3,6,7). However, for those carbs to be used as fuel your muscles require a constant supply of oxygen. Contrary to popular belief, it is usually the rate of oxygen delivery to cells which limits energy production, not the availability of glucose.

As you know, it is the responsibility of red blood cells to deliver oxygen to all the working tissues of your body (4). What you may not know is that endurance training actually can destroy red blood cells rather than building them up — if your nutrition’s not right. Bodybuilders have long recognized that strength training actually breaks down muscles and that this damage provides the stimulus for subsequent growth during the recovery period. To build more muscle, you have to provide the nutrients muscles are made of. The same is true for endurance training, except it’s the blood system that takes a beating. And if you want to recover and be stronger as a result of your workout, you have to feed your body with the nutrients it needs to make red blood cells. Have you ever noticed that many endurance athletes are very thin and don’t have much muscle mass? Why is that? To understand why this happens, and what to do about it, you need to know a little about physiology and how the body adapts to endurance training.

Endurance activity causes a condition referred to as “sports anemia” (8-11). This occurs rapidly with the onset of training (9,11). Endurance training causes an increase in mitochondrial content of the muscle tissue (mitochondria are the furnaces inside the cell where fuels are burned — the more energy
you produce the more mitochondria you need), in myoglobin concentration (a protein like hemoglobin, which is involved in transporting oxygen inside muscle cells), and in cytochrome enzymes (enzymes of the electron transport chain, involved in aerobic energy production) (12). All of these are protein structures which are increased as an adaptive response to endurance training. To achieve this increase, the body draws on its erythrocytes (red blood cells), hemoglobin and plasma proteins as a source of protein (10-12). This is an example of the “plasticity” of the body — the body remodeling its own structures to adapt to changing conditions. In other words, what’s happening is the body needs to build up its energy producing systems inside muscle cells to adapt to the training stimulus. These energy producing systems are made of protein. And the easiest place for your muscle cells to find protein is to steal it from red blood cells and plasma protein.

Couple this increased protein need with the fact that endurance activity causes amino acids to be used as fuel substrates instead of as proteins, and you can see why endurance athletes are frequently borderline anemic and why they commonly experience muscle wasting.

Liver Amino™ contains heme iron — the most bioavailable iron source (8). The product contains desiccated liver (not cooked), as cooking can destroy the heme group and decrease its incorporation in red blood cells by 50% (8). Liver Amino™ formula also provides 1.5 grams of complete protein per tablet. Heme iron and protein are precisely the nutrients your body needs to produce red blood cells. This way you can build your energy producing systems inside muscle cells and your blood system all at the same time, without having to sacrifice one for the other. Plus it’s a rich source of B vitamins, which are used in energy production. Start taking the Liver-Amino five to eight with each meal) when you’re training hard and definitely at least six weeks before your event, since it takes that long to build up red blood cells.

References

Supplementation & Rest Go Together
by John Parrillo

Getting enough rest and taking the right supplements are important adjuncts to your fitness and health. There are different categories of rest. One quantifiable type is the rest interval between sets. How much time do you allow before commencing the next set? A second type of rest is the rest interval between training sessions. How long before you train the same muscle again? Then there is sleep: how long do you sleep each night and are you getting enough quality sleep? Finally, where in the “rest process” can you introduce supplements to optimize your progress? I’ll answer these questions for you in this column.

Rest Intervals Between Sets

Use different rest intervals between sets to elicit different muscular effects. The length you choose will trigger a different physiological effect. If you want to get cut-up and lean, you would naturally and correctly gravitate towards a focused and fast-type of workout style. If your goal is to increase your muscle mass, you will need to increase your strength. Increased strength occurs when additional poundage is handled or more reps are performed. In order to handle heavier weight or perform more reps per set you need to be totally recovered from the previous set. Allow plenty of time between sets when you are tackling the big weights. Heavy, compound exercise movements, those which involve the movement of two or more joints to push the weight to completion: i.e. squats, bench presses, rows, cleans, overhead presses, deadlifts, etc., will require more recovery time between sets than isolation exercises like curls or deltoid raises. Again, this is common sense stuff but basic concepts need to be repeated periodically.

Here is where supplementation comes in: Weight training is incredibly intense exercise and within seconds of the commencement of a heavy set, energy reserves are depleted and waste products begin to accumulate (1-4). Creatine phosphate serves as an energy donor and helps to maintain the supply of ATP, the molecule used by muscles to power contractions. ATP is rapidly depleted and strength fades as a heavy set proceeds, muscular contractions soon stop altogether. During the rest interval between sets ATP and creatine phosphate stores are repleted. Supplementation with Creatine Monohydrate™ can help the entire depletion-regeneration process as it increases intracellular Creatine pools (5-6). Supplement with our Creatine Monohydrate Formula™ and you will get a better training effect.

Rest between Training Sessions

What is the amount of time to rest between training sessions? Some people do best by training each muscle group once a week, but training it very hard. Others get better results by training a particular muscle two or in some instances even three times a week. One key factor is your strength level. As you get stronger and lift heavier weights it takes longer to recover. Many experienced bodybuilders like to train each muscle group once a week for this reason. Beginners do much better by training each muscle two or three times weekly. After all, a man who bench presses 500 for reps and does forced reps and negatives will need a lot longer to recover than a rookie handling 100x5 in the same exercise. Like most everything about training, variation is the name of the game. You could develop a two-day a week routine, a three-day routine, or a six-day routine. Variety is the spice of life and the way we keep progressing. Sameness equals stagnation.

Overtraining Is Really Under-nutrition

Other questions are often asked of me, such as: When should I take a day off? What is the strategy behind rest and recuperation? What is the relationship between exercise, nutrition, rest and muscle growth? Generalizations are dangerous since everyone is different and circumstances are never the same. In addition to weight training, a Parrillo-trained bodybuilder needs to do aerobics on a regular and systematic basis. Pre-contest bodybuilders will do aerobics twice a day in addition to regular weight training. This is a lot of work but it gives us that bodybuilding advantage we are known for.
of work, particularly since we insist the athlete train intensely whatever the discipline. Our rule of thumb is that you should take off the least amount of days you need in order to recuperate. If you are eating properly and plentifully and getting plenty of sleep at night, you can train harder, longer, heavier and more often.

You hear a lot of talk on how to avoid over-training but often this is an excuse for laziness. Over training can be avoided if you take in lots of quality calories and get plenty of deep, restful sleep. In fact, at Parrillo, if athletes think they are over-training, I advise that they up their calories rather than cut back on the weight training or aerobic activity. It is tough to make progress by exercising less. If you are not making good gains and feel zapped and tired, try increasing your calories and adding another hour of sleep to your nightly allotment. Make sure you are training intensely enough to stimulate growth. What is intense enough? Pushing the envelope and upping poundage or weights every session. Push hard and make gains, then refuel and rest.

**Muscle Characteristics & Recovery**

Another key recovery factor is the characteristic of the muscle itself. Large muscles need more time to recover between workouts. Because big muscles are stronger, you can lift more poundage and are subjected to greater stress, you need longer to recover. You might find that your arms recover faster than your legs, for example. Or your triceps recover quicker than your lower back. Be aware of these muscular phenomena when scheduling your sessions.

**Sleep and Stress Issues**

Always try to get enough sleep. If you are unable to sleep optimally, your recovery will suffer and you won’t be able to train each muscle group as frequently. Stress can be a definite detriment to recovery. Emotional stress is a very real factor as is illness. During stress your body produces cortisol, which helps you through the stress but has the unfortunate side effect of breaking down muscle. Cortisol is a catabolic hormone that breaks down muscle tissue so that the protein can be used as fuel. Illness reduces your ability to recover as your body devotes its energy to fighting the sickness rather than repairing muscle tissue. If you have a cold and don’t feel too bad, then go ahead and train. But if you have a fever or are too sick to work take a few days off from the gym or do mild aerobics until you feel strong enough to weight train.

**Recovery Nutrition**

Nutrition plays an absolutely central role in the recovery process. The foods you eat supply you with the building blocks the body needs to repair itself. If you are training intensely and getting enough sleep but not eating right, then your growth potential will be severely limited. You should be getting one to two grams of protein per pound of body weight every day for optimal growth and recovery (7-10). Most bodybuilders use a protein supplement as the foundation for their nutritional program. We think the best protein on the market is our Hi-Protein Powder™ or Optimized Whey Protein™ or our new All-Protein™. Our whey protein is fortified with extra glutamine and branched chain amino acids. In terms of recovery and growth the two most important supplements are protein powder and Creatine Monohydrate™.

Carbohydrates are required to maintain your muscle glycogen stores. When muscle glycogen is depleted, strength and endurance drop off markedly (1-4). If you are no longer getting a good pump after a set, this is a sign that you are running low on glycogen. In this case, increase your carbs by using two to four scoops of Parrillo Pro-Carb™ after your workout. This is the perfect time to supplement with carbs as they will be stored as glycogen. Don’t forget to take your vitamins and minerals. I suggest six meals a day, spaced at regular intervals. Each meal should include a protein source (such as lean chicken or turkey), a starch, and a fibrous vegetable. Good starches include potatoes, rice, beans, and corn. Stay away from simple sugars and refined carbohydrates such as pasta or bread. Metabolically, refined carbohydrates behave much like simple sugars. Also avoid milk and fruit, which are rich in sugars. Consult the Parrillo Performance Nutrition Manual for detailed instructions. Adequate nutrition and sleep are two critical ingredients in achieving optimal recovery. Don’t be afraid to vary and experiment with your rest intervals and training frequency.

**References**

1. McArdle WD, Katch FI, © 2004, 1992 Parrillo Performance • Fairfield OH 45014 • (513) 874-3305 • ORDERLINE 1-800-344-3404


In the new year, our thoughts turn to getting in shape or getting in better shape. Good news: there are some relatively easy ways to speed up your fat loss and encourage your body to tap into its fat stores more rapidly. What follows is an explanation of certain techniques that can help you accelerate your fat loss as the new year begins.

Increase the “Intensity” of Your Exercise

Intensity refers to the level of effort you exert during exercise. Higher-intensity exercise helps you get leaner much faster.

How do you know if you’re exercising intensely enough? There are a couple of ways to tell. With aerobic exercise, you should be breathing hard but still be able to carry on a labored conversation. This indicates that your body is processing a significant amount of oxygen. When more oxygen is “extracted” by your muscles, more stored fat and carbohydrate can be used to supply energy.

Another way to determine aerobic intensity is by monitoring your heart rate. For best results, you should exercise at a level sufficient enough to raise your heart rate to 70 to 85 percent or higher of your maximum heart rate (MHR). MHR is expressed as 220 minus your age. For example, suppose you’re 40 years old, and you start an aerobic exercise program.

Your maximum heart rate is 180 (220 - 40). You should work out at an intensity such that your heart reaches between 126 and 153 beats a minute (70 to 85 percent of 180 beats per minute = .70 x 180 = 126, or .80 x 180 = 153).

If you’re a newcomer to aerobic exercise, start out in the lower end of your range. Gradually increase your intensity so that you reach the higher end of your range as your body becomes more aerobically fit.

Higher-intensity aerobic exercise burns more fat. To illustrate what I mean, let’s look at two examples. First, suppose you walk for about 45 minutes at about three miles per hour, elevating your heart rate to about 65 percent of its maximum — a moderate level of intensity. At this intensity, you’re burning a total of 216 calories — 108 calories from carbohydrates and 108 calories from fat.

In the second example, you pick up your pace by walking 4 miles per hour and elevating your heart rate to 75 percent of its maximum. In the same 45-minute period, you’ll burn a total of 288 calories — 176 calories from carbohydrates and 112 calories from fat. So at the higher intensity level, more of your energy comes from fat (112 fat calories versus 108 calories).¹

Increase Your Strength Training Intensity

Intensity in strength training refers primarily to the demand you place on your muscles — in other words, how much weight you lift or how many repetitions of an exercise you do. For greater intensity, you must challenge your muscles to lift more weight or do more repetitions each time you work out. Working your muscles hard ultimately leads to more lean tissue and less body fat.

Shift Your Body into a Fat-Burning Mode By Performing Aerobics after Strength Training

You can shift your body into a fat-burning mode faster if you perform your aerobic exercise after strength training. Lifting weights causes your body to draw on muscle glycogen for fuel. During a 30 to 45-minute training session, you can use up a lot of glycogen. Afterwards, your body is glycogen- needy — the perfect time to start your aerobics. Theoretically, your body then starts drawing on fatty acids for energy during the aerobics. You’ll burn more fat, and get leaner as a result.
Lose More Fat by Increasing The Duration of Your Aerobic Workout
For various reasons, some people just can’t push for higher intensities. If you’re one of them, don’t despair! Simply increase the duration of your aerobic workout. The longer you work out aerobically — 45 minutes or longer — the more fat you’ll burn.

Lose More Fat by Increasing the Frequency of Your Workouts
You can burn more fat by increasing the number of times you work out each week. If you’ve been exercising aerobically three times a week, gradually work up to four or five times a week. You’ll burn more calories. Many of those calories will be fat calories, especially if you’re working out at higher intensities.

Take Gradual Steps
It can be tempting to work out harder and longer or add more exercise sessions — and do it right away. But proceed with caution or else you could hurt yourself. Make small upward increments in intensity, duration, and frequency, and you’ll be gratified by what you can accomplish.

Reference
Vitamin C’s Performance Punch
by John Parrillo

When you read about vitamin C, it’s usually in reference to its cold-fighting power. But did you also know that vitamin C – the most commonly supplemented nutrient in the United States – can perform some important performance-enhancing feats as well?

That’s right. Vitamin C, also known as ascorbic acid, contributes to athletic performance in at least three possible ways - as an antioxidant, a promoter of respiratory health, and a factor in endurance.

Antioxidant Action
With exercise, there’s a dramatic increase in the amount of oxygen used by your body. A fraction of this oxygen is converted into “free radicals.” Free radicals are unstable oxygen molecules that attack bodily tissues.

Fortunately, the body is equipped with a mighty defense team of substances known as antioxidants, which neutralize free radicals and prevent them from doing harm. Vitamin C is one of these antioxidants. It keeps free radicals from destroying the outermost layers of cells and has the power to regenerate vitamin E, another antioxidant.

Normally, free radicals don’t cause much of a problem. But during strenuous activity, free radicals can start outnumbering antioxidants - a condition called “oxidative stress.” It leads to muscle tissue damage and inflammation, increases the body’s consumption of antioxidants, and leaves you vulnerable to disease.

You may be able to ward off oxidative stress, however, by supplementing with vitamin C. In a recent experiment, investigators discovered that oxidative stress was highest when subjects did not supplement with vitamin C.

Taking vitamin C, along with vitamin E, has been found to help muscles recover and regenerate more quickly following exercise – which means you can get back in the game faster. In one study, researchers gave endurance athletes 1000 mg of vitamin C and 1000 IU of vitamin E a day, or placebos, in divided doses at lunch and dinner. The supplemented athletes showed about a 25 percent reduction in tissue damage. Further, vitamin C has been found to reduce the delayed muscle onset soreness (DOMS) felt in the 24 to 48-hour period following exercise.

Vitamin C also confers a heart-protective benefit, particularly if you’re a serious exerciser or endurance athlete. Free radical production during very-intense exercise tends to oxidize low-density lipoproteins, otherwise known as LDL cholesterol (dubbed “the bad kind”), leading to plaque build-up in the arteries. A study conducted with highly trained runners demonstrated that supplementing with 1 gram daily of vitamin C decreased the tendency of LDL cholesterol to oxidize.

Respiratory Health
If you work out regularly or train for athletic competition, you know that a cold or respiratory infection can sideline you pretty fast. Vitamin C to the rescue. When ultramarathon runners supplemented with 600 milligrams of vitamin C a day for 21 days prior to a marathon, they experienced fewer upper respiratory tract infections. This benefit may be due to vitamin C’s antioxidant effect, or to its overall immune-boosting capability.

Do you ever develop shortness of breath and wheezing after strenuous exercise? If so, you may have “exercise-induced asthma” (EIA). EIA affects an estimated 10 percent of all exercisers, and nearly all asthma sufferers. EIA symptoms typically occur after about six to eight minutes of exercise and can last 20 to 30 minutes.

During an attack, tiny muscles wrapped around the outside of the bronchi (the two large tubes that branch out from the windpipe to the lungs), constrict in what is known as a “bronchospasm.” It’s difficult to breathe, your chest hurts, and you may wheeze.

There are numerous preventative treatments for EIA, and one of these is supplementation with vitamin C. Patients with asthma who supplemented with 500 milligrams of vitamin C daily experienced fewer spasms in response to exercise. A two-gram dosage taken one hour prior to exercise has demonstrated a protective effect.

Endurance Factors
If you take vitamin C, will you
be able to bike farther, work out longer, or get across the finish line faster? Possibly.

Scientists have discovered that hard-training athletes, specifically endurance and ultraendurance athletes, often have low levels of vitamin C circulating in their bodies. If you’re deficient in vitamin C, your endurance will suffer – a side effect confirmed by research. Deficiencies can be easily prevented by supplementing with vitamin C and eating vitamin C-rich foods.

The best sources of vitamin C in the diet are citrus fruits. Other foods, such as green and red peppers, collard greens, broccoli, Brussels sprouts, cabbage, spinach, potatoes, cantaloupe, and strawberries are also excellent sources.

**Supplemental Vitamin C**

To ensure that you get the vitamin C your body demands, supplementation is an excellent idea. Our Bio-C™ formula contains 1000 mg of vitamin per tablet, and is formulated with health-building Citrus Bioflavonoids (concentrate from lemons, oranges, grapefruit, limes, tangerines). Take one or more tablet daily, preferably with meals.

**References**


Joint Health
by John Parrillo

If your joints are creaky and achy, don’t despair. You can help your joints with some natural approaches, and hopefully not have to resort to over-the-counter or prescription pain-killers (unless your physician recommends them). Here are some options available:

Evening Primrose Oil
Evening primrose oil, in particular has specific benefits for athletes, bodybuilders – really, anyone who is interested in improving personal health and fitness. It comes from a plant that grows wild along roadsides. It is so named because its yellow flowers resemble in color real primroses, and these flowers open only in the evening.

From this oil, your body can directly obtain GLA, which stands for gamma-linolenic acid. GLA is ultimately converted into the prostaglandin E1 series, a group of beneficial chemicals that helps reduce inflammation, regulates blood clotting, decreases cholesterol levels, and lowers high blood pressure, among other functions. Thus, evening primrose oil is indicated for various diseases or conditions in which prostaglandins are associated, and these include premenstrual syndrome (PMS); heart disease; diabetic neuropathy, a type of nerve damage that is a complication of diabetes; and arthritis.

A growing number of medical experts and scientists now believe that taking GLA-rich oils can effectively fight the inflammation - the major cause of swollen, painful joints. GLA is a building block of a beneficial type of prostaglandin, which exerts an anti-inflammatory effect on the body. Thus, supplementing with GLA increases production of these prostaglandins and may help control the pain and inflammation associated with joint problems and arthrits.

Parrillo Performance recognized the need for a product that counteracts joint and inflammation problems. The Parrillo Performance solution is Evening Primrose Oil™ a concentrated source of essential fatty acids, including GLA. EFA’s keep joints lubricated, hair and skin healthy, and brain neurons firing correctly. Each 1000 mg gel cap contains 30 IU’s of vitamin E, 100 mg of Gamma Linolenic Acid and 760 mg of Linoleic Acid. Take one to three capsules daily.

Other Joint-Friendly Nutrients
Our ongoing research recently led us to develop the Parrillo Joint Formula to assist in the rebuilding of damaged joints, tendons, cartilage, and soft tissue. The nutrients contained in this supplement include:

Glucosamine
Chemically, glucosamine is a combination of glucose and amino acids, and it has been extensively studied for joint health and support. When you supplement with glucosamine, it gathers in the liver, kidneys and articular cartilage. Once it reaches the chondrocytes, the cells that produce cartilage, the glucosamine is incorporated into those cells. Eventually, it forms a viscous fluid that helps protect and lubricate your joints and cartilage.

Chondroitin
Like glucosamine, this is another one of the molecules that make up cartilage. One of its functions is to attract fluid into the tissue, and this gives cartilage resistance and elasticity. Also like glucosamine, chondroitin appears to stimulate cartilage cells to create new cartilage and it may also slow the breakdown of cartilage.

Shark Cartilage
This supplement can provide relief to painful, swollen, and stiff joints. The secret to shark cartilage’s success in treating arthritis primarily lies in the complex carbohydrates it contains: mucopolysaccharides, which relieve the chronic and painful inflammation that is so injurious to joints. Other benefits of shark cartilage are to regulate the immune system and prevent new blood vessel growth into the cartilage of the joints. European researchers have reported dramatic reductions in pain and inflammation in arthritis patients supplementing with shark cartilage.
**Green Sea Mussel**

This nutrient supports the restoration and maintenance processes of synovial fluid and connective tissues, including joints, ligaments, tendons, cartilage and intervertebral discs.

Keep in mind that all these products should be used in conjunction with The Parrillo Performance Nutrition Program for best results. Joint Formula™ should not be taken if you are allergic to seafood.

**Reference**

Vitamin E for Health & Exercise
by John Parrillo

Vitamin E is a fat-soluble vitamin, meaning that it can be stored with fat in the liver and other tissues. Vitamin E is also a component of cells, sandwiched between the fatty layers that make up cell membranes. When disease-causing free radicals come along, they hitch up to vitamin E, damaging it instead of the rest of the cell membrane. In the process, vitamin E soaks up the free radicals, and the cell is protected from harm. Vitamin C and other antioxidants can regenerate vitamin E. But with a shortage of vitamin E, there is an increase in free radicals, cellular injuries, and subsequent disorders to bodily tissues.

Vitamin E is thus an important antioxidant that saves cells from damage. Specifically, vitamin E prevents a free radical-initiated process known as “lipid peroxidation.” In a domino-like series of chemical reactions, free radicals hook up with fatty acids in the body to form substances called “peroxides.” Peroxides attack cell membranes, setting off a chain reaction that creates many more free radicals.

In addition, vitamin E protects beta carotene from destruction in the body and is an important guardian of blood vessel health. Vitamin E also interrupts the plaque-forming process that can clog your arteries. Other important benefits include:

Helps Regulate Blood Sugar
In a study that looked at vitamin E’s effect on glucose metabolism and insulin action, 10 control (healthy) subjects and 15 people with type 2 diabetes underwent an oral glucose tolerance test before and after taking 900 milligrams of vitamin E for four months. In the control group, vitamin E improved the action of insulin and the body’s handling of glucose. In the diabetic patients, these benefits were even more pronounced, suggesting that vitamin E is a useful nutrient for blood sugar control.

Helps Fight Heart and Blood Vessel Disease
Heart disease is the major cause of death in men and women. Vitamin E, however, may prove beneficial against it. In a 14-week study of 21 patients, researchers at the University of Texas Southwestern Medical Center found that taking 1,200 IU of vitamin E daily reduced LDL cholesterol oxidation — a process that, if not stopped, can lead to clogged arteries, a precursor of heart attack and stroke.

Vitamin E and Exercise
Many studies on antioxidants and exercise have focused on vitamin E, with intriguing results. For example:

- An 800-milligram vitamin E supplement taken daily helped guard against muscle damage and free radical production, in subjects age 55 and older who exercised by walking or running downhill.

- Supplementation may prevent the destruction of oxygen-carrying red blood cells. That means your muscles benefit from higher or sustained oxygen delivery while you exercise.

- Supplementation may improve your exercise performance if you work out at high altitudes; however, it is not known yet whether there is a similar benefit when you exercise at sea level.

Because of vitamin E’s positive effect on the immune system and other factors, we believe supplementation with this vitamin is important. Our Natural Vitamin E Plus™, made from natural vegetable sources and therefore well assimilated by the body, is a good source of vitamin E. We recommend 1 capsule a day, taken with meals.

References


Blowing a sales call, missing deadlines, failing a test, getting laid off, working too hard, losing a loved one – these are just a few of the things in life that trigger stress, and with it, emotions of frustration, anxiety, or depression. This negative form of stress is referred to as “distress.”

But stress also comes in a positive form known as “eustress,” coined by stress researcher Hans Selye from the Greek word eu meaning good. Eustress arises from pleasant activities, such as planning a wedding or preparing to go on vacation. Rather than provoke negative emotions, eustress generally produces welcome anticipation, imparts high hopes, and gives you butterflies in your stomach.

Both types stem from your natural “fight or flight” response to events in which the body automatically prepares you to run from or contend with an unusual, or potentially threatening, situation. This sets off a cascade of biochemical events.

For example:

- Your body starts churning out increased levels of two chief stress hormones, adrenaline and cortisol.
- Your heart races and your pulse increases.
- Your muscles tense up.
- Your pupils dilate, and your hearing becomes more acute.

What is eustress from one person may be distress for another. For example, ask someone to give a speech to 1000 people. If that person is comfortable in front of an audience, he or she will see this as an exciting, positive experience (eustress). On the other hand, if someone who is shy is asked to speak before a group, he or she would view this as a source of distress. Whether you experience eustress or distress in any given situation depends largely on your attitude. To some, a situation is an opportunity (eustress); to others, a predicament (distress).

One point is certain, however: When eustress tips over into distress and goes unresolved, or if distress becomes chronic, there’s trouble. In fact, medical experts estimate that distress accounts for more than 90 percent of all illnesses and trips to the doctor. Here’s a glimpse into what happens physiologically when distress goes unresolved.

Distress gets under your skin
Hives, acne, itching, eczema, and other common skin disorders are caused or aggravated by chronic stress.

Distress produces tension headaches
The most common of all headaches, tension headaches occur when the muscles surrounding your skull go into painful spasms. Though not life-threatening, tension headaches are often a clear sign that you are depressed or under pressure.

Distress assaults your immune system
When you’re persistently stressed out, your body can’t metabolize stress hormones properly and they stick around it, damaging your immune system. Research shows that distress interferes with the function of “natural killer cells,” which help the body combat foreign invaders that cause disease. It also reduces the body’s production of interferon, a type of protein that fights viruses and boosts the immunity — your body’s armor against illness.

Distress is a heart breaker
Everyday mental stresses such as tension, frustration, and sadness may trigger myocardial ischemia – lack of oxygen to the heart muscle. This condition increases the chance of heart attack.
Clearly, distress is hazardous to your health. It wrecks practically every body system. How well you cope with distress makes all the difference in your health and well being. Here are some healthy lifestyle practices that will help minimize its potentially damaging health effects.

Fortify yourself nutritionally
Chronic distress robs your body of nutrients such as vitamin C, vitamin B complex, and protein. So what’s a stressed-out body to do? First, make sure to eat plenty of vegetables daily, and with every meal, some protein (fish, poultry, lean meats, legumes, or low-fat dairy products). Include several servings of whole grains daily too. As important, take daily vitamin and mineral supplements such as Parrillo Essential Vitamin Formula™ and Parrillo Mineral-Electrolyte Formula™ as nutritional insurance.

Sweat it out
Exercise, particularly the aerobic type, is one of the most effective ways to dissipate physical and emotional distress. It speeds up the production of natural feel-good chemicals called endorphins. Exercise also relieves muscular tension brought on by distress and anxiety. In fact, numerous studies have shown that aerobic exercise can be an effective part of treatment for anxiety.

Get enough rest
If you’re an emotional basket case right now, take it easy by getting more rest. During rest (including sleep), the body can heal injuries and infections, eliminate toxins and waste products, dissipate distress, replenish fuel stores in your muscle fibers and bloodstream, and restore energy. Rest also allows your immune system to re-charge so that you’re better protected from disease.
We’re a nation of dieters. In fact, about 50 million of us will go on a diet this year. Yet we’re also a nation of fatties. More than 97 million Americans are now considered obese or overweight, according to a report from the University of Maryland School of Medicine. What gives? Why is it that we diet, only to get fatter in the process? In two words: fad diets.

Weight-loss experts agree that diets promising quick weight loss, from the Grapefruit Diet to the Lose-Weight-While-You-Sleep Diet, won’t work for long. You’ll only regain your lost weight and then some. In fact, very few people — only around 5% — can keep weight off for good.

The most effective way to knock off the pounds and keep them off is with a plan that emphasizes a variety of foods, reduces calories and includes regular exercise. The Parrillo Nutrition Program is that diet. It’s healthy and energizing, plus simple and easy to follow. Stick with it, and before long, you’ll experience a fitness that you can see and feel.

The Parrillo Nutrition Program includes a five-part fat attack strategy:

**Eat lean, high-fiber foods in fat-burning proportions**

The emphasis in this plan is on low-fat, high-fiber foods, which have been shown in research studies to help peel off pounds and banish them for good. Proportionately, this plan is high in protein, moderate in carbohydrate, and low in fat. This approach suits the needs of active people and has been found in numerous studies to effectively promote fat loss.

**Eat multiple meals**

On this plan, you’ll forgo your usual three squares a day and eat six or more meals a day. Research shows that eating multiple meals stimulates fat burning and preserves lean muscle.

**Take supplements to enhance health & fat loss**

Supplementing with certain dietary products has been shown to facilitate fat loss and assist the body in building lean muscle. This increases your nutrient density and ensures that you’re getting exactly what you need to develop the best physique possible. Parrillo Performance has a great line of supplements and functional foods for your needs.

**Include a combination exercise program**

Incorporate both aerobic exercise and weight training into your weekly fitness program. Submaximal exercise, such as aerobics, uses fat as a fuel source, helping to burn off your fat stores. It also builds your aerobic power, so you can train longer and burn even more fat.

Weight training burns fat as well, but in a different way — by creating metabolically active muscle tissue. This maximizes your metabolism. So with a combination exercise program, you’re burning fat several ways.

**The BIG payoff**

Follow these simple strategies and you’re sure to melt away the pounds. Stick to it, and you’ll actually keep the fat off.
10 Reasons to Love Fats
by John Parrillo

Fats are the bad guys of nutrition, the most demonized of all nutrients. But are fats really that bad? Do they deserve all that bad press?

Sure, a few fats do pose health risks, including saturated fats found in animal foods, and trans fats, which are synthetic fats found mostly in margarine, vegetable shortening and processed foods. These fats have been associated with an increased risk of heart disease. In addition, saturated fat has been implicated in prostate cancer, and trans fats in breast cancer.

Fortunately, though, there are more good fats than bad ones. To understand the health importance of good fats, let’s start with a quick nutrition lesson.

The Fats of Life
Good fats fall under a general classification called unsaturated fats. There are two types of unsaturated fats: polyunsaturated and monounsaturated fats. Oils such as safflower, sunflower, corn, soybean and fish oils, evening primrose oil found in Parrillo Evening Primrose Oil 1000™ are polyunsaturated fats. They are “essential fatty acids,” or EFAs for short. Required for normal body function, EFAs must be supplied by your diet since the body cannot make them on its own.

From EFAs, your body synthesizes two other important fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These fatty acids, along with alpha linolenic acid, are referred to as omega-3 fatty acids, a term that describes their molecular structure. You can also obtain EPA and DHA directly from cold-water fish, flaxseed and omega-3 enriched eggs (eggs from chickens fed fish meal or flax meal).

Monounsaturated fats are plentiful in olive, canola and peanut oils; they are also found in shellfish and cold-water fish such as salmon, mackerel, halibut, black cod and rainbow trout.

With this background in mind, let’s take a closer look at 10 reasons to love fat.

1. Fat Provides Energy
Dietary fat is a highly concentrated source of energy. In fact, 1 gm of fat provides twice as much energy (calories) as 1 gm of carbohydrate or protein. Although your body prefers to run on glycogen (carbohydrate) for energy, fat serves as a good backup source.

2. Fat Is Required for the Production of Prostaglandins
The essential fatty acids available from good fats are converted into “prostaglandins” in the body. Prostaglandins are hormone-like chemicals that regulate numerous processes, including blood pressure, normal blood clot formation, blood lipids, immunity, inflammation in response to injury and many other vital functions. There are not-so-friendly prostaglandins in the body too, synthesized mostly from saturated fats. Fortunately, you can keep these prostaglandins at bay by cutting back on your intake of long chain saturated fats.

3. Fat Acts as a Carrier for Certain Vitamins
Fat helps your body transport, absorb and store vitamins A, D, E and K, collectively known as the fat-soluble vitamins. You need vitamin A for a strong immune system, vitamin D to absorb calcium, vitamin E to protect cells, and vitamin K for normal blood clotting. Without adequate fat in your diet, you won’t get the maximum benefits from these vitamins.

4. Fat Enhances the Flavor of Foods
Although fairly tasteless itself, fat imparts enticing flavor and aroma to foods, thus stimulating your appetite. You experience this every time you smell bacon frying or cookies baking.

5. Fat Can Protect Your Heart
Although excess fat in the diet—mainly saturated fat—has been linked to heart disease, certain fats are heart protective. One is fish oil, which is composed of EPA and DHA.

Fish oil reduces blood pressure, lowers triglyceride levels, prevents abnormal blood clotting and helps
Fat is required for normal brain development, as well as for mental well-being. In fact, your brain cells take up DHA in preference to other fatty acids.

For these reasons, researchers suspect that DHA may help prevent degenerative brain diseases such as dementia, memory loss and Alzheimer’s. A study conducted at Tufts University, Boston, discovered that a low level of DHA is a significant risk factor for these brain diseases.

**References**


A health condition tearing up the headlines is “prediabetes.” This is a precursor, or forerunner, to type 2 diabetes, which has reached epidemic proportions worldwide. Prediabetes is characterized by blood sugar levels that may be either normal or higher than normal, but not high enough to be considered diabetes. The major problem with prediabetes is that the body does not use insulin normally. Insulin is a hormone that, when not produced in sufficient amounts by the pancreas or used properly by the body, triggers diabetes. Nearly half of prediabetics develop the full-blown disease within five to ten years. And that’s the bad news. The good news is that prediabetes can be reversed with diet, weight loss and exercise.

But what kind of diet – and what kind of exercise?

Major studies show that if you reduce your fat intake to 30 percent of total calories; cut your saturated fat intake to less than 10 percent of total calories; and eat more fiber (more veggies, and whole grains), you will reduce your risk of diabetes and reverse prediabetes. So if you want to do either, it’s preferable to emphasize complex carbohydrates and downplay simple sugars. Simple sugars are a major source of calories, but offer no nutrients to go along with the calories. Because of this, it’s best to limit simple sugars in your diet.

Complex carbs also contain fiber, which helps transform your eaten-healthier efforts into something so simple and automatic. You’ll be able keep your blood sugar under better control, without constantly working at it or making yourself crazy. The reason is that high-fiber foods break down into glucose more gradually and are absorbed more slowly into the bloodstream. They stabilize your blood sugar, and do not cause post-meal surges. Shoot for a goal of 25 to 35 grams of fiber daily.

Another important move is meal combining. By combining protein, complex carbohydrates, and fat in the same meal, for example, you automatically slow-release glucose because your digestive system takes longer to break down this combination of foods. This manner of food combining helps prevent spikes in blood sugar after you eat a meal.

Additionally, one of the best ways to keep your blood sugar level as close to normal as possible is to eat multiple meals throughout the day, preferably at the same time each day. Generally, this involves eating breakfast, lunch, and dinner, plus a mid-morning meal and a mid-afternoon meal.

At every meal, have a protein and a carbohydrate (preferably a natural, high-fiber carbohydrate). This combination of foods produces a slow release of glucose to keep your blood sugar stabilized and your energy level high throughout the day.

What’s more, your body works best when nutrients are replenished every couple hours.

Here’s an added benefit, particularly if you need to lose weight: Eating multiple meals can help you with weight control. Every time you eat a meal your metabolic rate goes up. The reason is that your body starts working very hard to turn that meal into fuel. As part of digestion and absorption, heat is given off in a process called thermogenesis, and this elevates your metabolic rate. So by eating frequent meals throughout the day, your metabolism is constantly charged up, and your body burns calories more efficiently.

Dietwise, what I’ve described for preventing diabetes are the principles of the Parrillo Nutrition Plan! Our program not only helps you build lean muscle, it also contains the ingredients of a health-building diet.

As for exercise, all forms can lower your risk of getting diabetes. For prevention, however, strength training is extremely important. Strength training helps normalize the flow of glucose from the blood into the muscle tissue where it can be properly used for energy. This effect may help regulate the body’s use of glucose, thereby controlling or preventing diabetes and its
complications. Strength training also encourages insulin use by activating a key protein in muscle cells that helps insulin push glucose into these cells. Muscle cells need lots of glucose for energy.

If you're concerned about diabetes, rethink your diet and exercise program. And consider showing the Parrillo programs to your physician. They may just help you overcome, and deal with, this epidemic in your own life.
Inflammation and Your Diet
by John Parrillo

Research suggests that the typical Western diet, high in processed foods, sugar, and saturated fat may trigger the body to release inflammatory chemicals that stay in the body. This chronic low level of inflammation may be the platform on which several chronic diseases spring, including heart disease, diabetes, Alzheimer’s disease, some cancers, and aging. Most of the time, however, inflammation is a lifesaver that helps our bodies to fight off various disease-causing organisms. The instant bacteria, viruses, or other microbes enter the body, inflammation mobilizes a defensive attack that lays waste to both invader and any tissue it may have infected. Then just as quickly, the process subsides and healing begins.

But sometimes, the process doesn’t shut down and is kept going by a poor diet, smoking, high blood pressure, or another factor. Inflammation then becomes chronic rather than temporary. When that occurs, the body turns on itself, and this can result in disease. Changing some of the foods you regularly eat will boost your body’s levels of anti-inflammatory compounds and afford you protection against diabetes. You may not realize it, but the Parrillo Nutrition Program™ avoids or limits certain foods that are thought to trigger inflammation such as dairy, red meat, caffeine, alcohol, and peanuts. Further, it eliminates trans fats—another inflammation trigger.

On the other hand, the Parrillo Nutrition Program™ is big on one anti-inflammatory food: fish. It contains beneficial anti-inflammatory fats, which have been used in the treatment of rheumatoid arthritis, a joint disease in which the body’s immune system attacks its own tissues. Generally, fish oil provides moderate relief from symptoms and makes patients less reliant on anti-inflammatory drugs and pain medications. The effective dose for arthritis relief appears to be 3 to 6 gm of fish oil per day. Another supplement fat that may be of help in reducing inflammation is evening primrose oil, which is found in Parrillo Evening Primrose Oil 1000™.

The table on the following page provides a partial list of foods on the Parrillo Nutrition Program™ that help fight inflammation, followed by a list of foods you’ll want to limit.
<table>
<thead>
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<th>Proteins</th>
<th>Carbohydrates</th>
<th>Vegetables</th>
<th>Good Fats</th>
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<tr>
<td><strong>Fish</strong> (all varieties, particularly wild salmon, trout, sardines, and tuna)</td>
<td><strong>Beans and legumes</strong> (black beans, chick-peas, lima beans, kidney beans, pinto beans, etc.)</td>
<td><strong>Alfalfa sprouts, raw</strong></td>
<td><strong>Flaxseed oil</strong></td>
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<td>Shellfish</td>
<td><strong>Starchy vegetables</strong> (peas, potato, pumpkin, sweet potato, winter squash, and so forth)</td>
<td><strong>Artichokes</strong></td>
<td><strong>Olive oil</strong></td>
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<td><strong>Lean poultry</strong> (chicken, turkey, Cornish hen)</td>
<td><strong>Whole grains</strong> (amaranth, buckwheat, bulgur oats, oat bran, barley, brown rice, millet, quinoa, whole grain bread products, and so forth)</td>
<td><strong>Asparagus, cooked</strong></td>
<td><strong>Canola oil</strong></td>
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<td><strong>Eggs and egg substitutes</strong></td>
<td><strong>Flaxseed oil</strong></td>
<td><strong>Bean sprouts, raw</strong></td>
<td><strong>High-oleic safflower or sunflower oil</strong></td>
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<td><strong>Fish</strong></td>
<td><strong>Broccoli</strong></td>
<td><strong>almonds, raw</strong></td>
<td><strong>Evening primrose oil</strong></td>
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<td><strong>Shellfish</strong></td>
<td><strong>Brussels sprouts</strong></td>
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<td><strong>Eggs and egg substitutes</strong></td>
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<td><strong>Limit these foods:</strong></td>
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<td><strong>Trans fats like stick margarine</strong></td>
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<td><strong>Oils exceedingly high in omega-6 fats</strong> (safflower, margarine, sunflower and corn oil)</td>
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How do you know which nutritional supplements to take?

Before I answer that, let me re-state the case for taking supplements. To begin with, our foods today are not as nutritious as they once were — a result of poor environmental stewardship. Modern farming methods, for example, have depleted the soil in many areas of the country, ultimately reducing the nutrients in food. Also, weight-loss diets, exercise, and stress increase our need for nutrients. Cooking can destroy certain vitamins too.

Further, many people do not eat nutritiously enough to even satisfy the recommended daily intake for vitamins and minerals, according to several studies. Consider, for example, a typical American diet:

**Breakfast:** one glazed doughnut, one cup of orange juice, and one cup of coffee with a tablespoon of half-and-half.

**Lunch:** ham and cheese sandwich, small bag of potato chips, one medium apple, and a can of cola soda.

**Mid-afternoon snack:** one granola bar and a can of cola soda.

**Fast-Food Dinner:** Quarter Pounder cheeseburger and side salad with an ounce of red French dressing.

**Evening snack:** six ounces of vanilla ice cream (16% fat).

Although it supplies adequate calories (2264), this menu is deficient in several vital nutrients: calcium, a bone-building mineral; magnesium, important to heart health; selenium, widely recognized as a cancer preventative; vitamin A, vital for disease-fighting; and vitamin E, a nutrient that confers a wide range of health-protective benefits. This menu is critically low in fiber too (only about 10 grams), supplying less than half of what we normally need each day. Plus, 40 percent of the calories come from fat. Fat intake should be no more than 30 percent of your daily calories; people with heart disease should further reduce their fat consumption.

Thus, a very strong case for taking nutritional supplements can be built. That being so, how should you decide which supplements to take? Here’s a step-by-step guide:

**A Basic Formula**
A good motto to adopt is: Food first. Before you even consider taking supplements, make sure you’re following a nutritious diet. Each day, try to eat five to six times a day, as recommended on the Parrillo Nutrition Program™. These meals should consist of fibrous carbs, starchy carbs, and lean proteins.

But as nutritional insurance, take the recommended dosage of Parrillo Essential Vitamin Formula™ and Parrillo Mineral-Electrolyte Formula™. These contain antioxidants, which are vitamins and minerals such as vitamin A, beta-carotene, vitamin C, vitamin E, and selenium that help protect you against disease.

**A Personalized Supplement Program**
No two people are alike in their need for various nutrients. Our own individual nutrient requirements vary, depending on our sex, age, activity level, and physical health. Thus, based on your personal situation, you may want to consider additional supplements — in addition to a daily antioxidant product. Here’s a closer look:

**Sex:** If you are a woman, you require adequate calcium (about 1200 mg daily) to help prevent osteoporosis, a crippling bone disease. To get that much calcium from food, you’d have to eat the following each day: a cup of calcium-fortified orange juice; a cup of skim milk; a cup of low-fat yogurt; and a cup of cooked turnip greens. If you fall short on your calcium intake, you can make up the difference with a calcium supplement such as Parrillo Mineral-Electrolyte Formula™.
Men can be nutrient-needy in other areas. For instance, supplemental vitamin E and selenium have recently been shown to reduce the incidence of prostate cancer. Thus, if you're a man, you may benefit from an extra dose of these nutrients. Up to 50 micrograms of selenium and between 400 IUs and 800 IUs of vitamin E daily are considered health-protective. Good sources are Parrillo Mineral-Electrolyte™ and Natural Vitamin E Plus™.

Age: As we get older, our need for certain nutrients changes. People older than 60, for example, have trouble absorbing enough folic acid (a B vitamin), vitamin B12, and calcium. Age also increases our need for iron. Supplementation is an excellent way to guard against health-damaging deficiencies. Try the following: Parrillo Essential Vitamin Formula™, Mineral Electrolyte Formula™, and Liver Amino Formula™.

Activity Level: Exercise depletes nutrients. Thus, if you're physically active, you may benefit from additional nutrients. Taking antioxidants – namely vitamins E and C – has been found in studies to help muscles recover and regenerate more quickly following exercise. As well, specialty supplements such as the Parrillo powders may give you extra energy for exercise.

Physical Health: Depending on the condition of your physical health, you may want to explore “disease-specific” supplements – those that have been shown in scientific research to prevent, treat, and even reverse, certain diseases. A good example is glucosamine sulfate for treating osteoarthritis, a degenerative joint disease. Glucosamine is a type of sugar molecule manufactured naturally by cartilage cells. Where there is joint damage, cartilage cells self-destruct and stop making glucosamine. Joint health then continues to deteriorate. An overwhelming number of medical studies show supplemental glucosamine reverses this destructive process and stimulates the cartilage cells to rebuild cartilage. I recommend Parrillo Joint Formula™ for joint health.

Other examples of disease-specific supplements include folic acid, vitamin E, and carnitine (protein-like nutrient) to fight heart disease. A good source of supplemental vitamin E is Parrillo Natural Vitamin E-Plus™.

The amount of information currently available on nutritional supplements is certainly mind numbing. But if you're interested in attaining optimum health, take the time to bone up on nutrition and supplementation. Knowledge is empowering – and certainly health-protective.
Weight-loss diets frequently get criticized because they supposedly do not furnish a healthy supply of nutrients, and this is certainly true of many diets. But in far too many cases – and research bears this out – everyday eating habits tend to be more unbalanced, with an insufficient supply of critical nutrients, than most diets are. Further, the average person simply does not eat nutritiously enough to satisfy even the basic daily requirements, vitamins, minerals, and fiber, according to several studies. Consider, for example, a typical American diet:

**Breakfast:** One glazed doughnut, one cup of orange juice, and one cup of coffee with a tablespoon of half-and-half.

**Lunch:** Ham and cheese sandwich, small bag of potato chips, one medium apple, and a can of cola soda.

**Mid-Afternoon snack:** Cookies and a can of cola.

**Fast-Food Dinner:** Supersized cheeseburger and French fries.

**Evening Snack:** A bowl of vanilla ice cream.

Although it supplies plenty of energy (2,264 calories) – and Parrillo Performance is all about increasing calories – this menu is deficient in several vital nutrients: calcium, a bone-building mineral; magnesium, important to heart health; selenium, widely recognized as a cancer preventative; vitamin A, vital for disease-fighting; and vitamin E, a nutrient that confers a wide range of health-protective benefits. This menu is critically low in fiber too (barely 10 grams), supplying less than half of what we normally need each day. Plus, more than 40 percent of its calories come from fat. Fat intake should be no more than 30 percent of your daily calories.

The Parrillo Nutrition Program™ is devised to provide a healthy combination of basic nutrients – protein, carbohydrates, fats, vitamins, and minerals. For example:

**Protein**

Protein is to your body what a wood frame is to your house, or steel is to a bridge. Nutritionally, it is the basic, most important building material in your body, essential to high-level health because of its role in growth and maintenance. Your body breaks down protein from food into nutrient fragments called amino acids and reshuffles them into new protein to build and rebuild tissue, including body-firming muscle. Protein also keeps your immune system functioning up to par, helps carry nutrients throughout the body, has a hand in forming hormones, and is involved in important enzyme reactions such as digestion. The Parrillo Nutrition Program™ is purposely high in protein because it stimulates the reduction of body fat, particularly in the abdominal region of the body, according to the latest research into dietary protein and fat loss.

Proteins found in the Parrillo Nutrition Program™ include fish, white meat poultry, egg whites, and our line of protein powders and bars.

- **Carbohydrates**

Carbohydrates are energy foods. During digestion, they are changed into glucose (blood sugar), which circulates in your blood and is used as energy for the red blood cells and your central nervous system. Glucose not used right away is stored in the liver and muscles as glycogen, which provides an additional reservoir for energy.

Carbohydrates also supply an amazing fat-fighting nutrient – fiber, the non-digestible remnant of plant foods. A growing body of research shows that high-fiber eating helps peel off pounds and banish them for good.

How exactly does fiber work this weight-loss magic?

When eaten with other nutrients like protein, fiber slows the rate of digestion too, stabilizing your blood sugar between meals so that it is not converted to fat stores.

The carbohydrates found in the Parrillo Nutrition Program™ include certain types whole grains, brown rice, potatoes, sweet po-
tatoes, yams, some pastas, legumes (beans and lentils), and non starchy vegetables, from broccoli to cauliflower to salad vegetables (what we call “fibrous carbs”). A significant feature of this program is that these allowable carbohydrates do not promote fat storage.

• Fat
Dietary fat is an essential nutrient, required to help form the structures of cell membranes, regulate metabolism, and provide a source of energy for exercise and activity. Along with carbohydrates, fat is a vital fuel source for your body.

Allowable fats on the Parrillo Nutrition Program™ include canola, oil, flaxseed oil, olive oil, evening primrose oil, and our specially engineered fat, CapTri®. This fat has a unique molecular structure which causes it to follow a different metabolic route than regular fats. It behaves more like a carbohydrate in the body, except that it doesn’t increase insulin levels. This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. This is very similar to the strategy of the high fat diets except without relying on conventional fat as an energy source. In short, CapTri® lets you reap the benefits of the high fat approach without the problems that go along with conventional dietary fat.

• Vitamins
Required by your body in tiny amounts, vitamins play important roles in the metabolism of carbohydrates, proteins, and fats. The vitamins you need daily are found in the Parrillo Nutrition Program™ as follows:

Vitamin A: Green leafy vegetables, carrots, sweet potatoes, and yams.
Vitamin B-complex: Protein foods, whole grains, legumes, and vegetables.
Vitamin C: Vegetables.
Vitamin D: Fish.
Vitamin E: Whole grains, and green leafy vegetables.

• Minerals
Like vitamins, minerals play a role in metabolism. But a major difference between the two nutrients is that minerals are constituents of bodily structures, such as bone, cartilage, and teeth, providing their hardness and strength. While vitamins help manufacture these structures, they do not become part of the structures themselves.

The minerals you need daily are found in the Parrillo Nutrition Program™ as follows:

Iron: Poultry and green leafy vegetables.
Calcium: Salmon, green leafy vegetables, and broccoli.
Copper: Poultry and shellfish.
Magnesium: Various lean proteins.
Phosphorus: Various lean proteins.
Potassium: Vegetables.
Selenium: Whole grains, fish.
Zinc: Shellfish, whole grains, and vegetables.

• Nutrient Composition of the Parrillo Nutrition Program™
Proportionately, the Parrillo Nutri-
Carotenoids Count!
by John Parrillo

Don’t risk your health by short-changing yourself on orange, red, and yellow fruits and vegetables. They’re brimming with carotenoids, a kind of super-antioxidant making news.

Carotenoids are responsible for the colorful hues of plants and even some animal foods, including salmon and shrimp. But they do more than serve as natural pigments. Carotenoids have “provitamin A activity,” meaning that your body produces vitamin A from them, especially beta-carotene (the most well known of the carotenoids).

As antioxidants, these protective nutrients neutralize free radicals at the cellular level, thus protecting cell membranes, DNA, and other cellular components against damage.

The first carotenoid to be isolated was beta-carotene. Today, scientists have discovered more than 600 carotenoids and are reporting that many may be a hundred times more powerful than beta-carotene and other antioxidants alone. Among the main carotenoids now under the most investigation are alpha-carotene, beta-cryptoxanthin, lutein, lycopene, and zeaxanthin.

Alpha-carotene, which makes up about one-third of the carotenoids in carrots, shows promise in stalling the growth of certain malignant tumors and may be protective against breast cancer. Beta-carotene reduces the risk of cancers of the colon, rectum, breast, uterus, prostate, and lung.

Beta-cryptoxanthin looks promising against breast cancer and lung cancer. Lycopene appears to be protective against cancer of the colon, bladder, and pancreas, but is particularly noteworthy for its role in preventing prostate cancer. In a diet study sponsored by the National Cancer Institute, researchers identified lycopene as being particularly powerful against prostate cancer. Tomato sauce, tomatoes, tomato juice, and pizza are primary sources of lycopene, and those individuals who consumed greater than 10 servings of these combined foods per week had a significantly decreased risk of developing prostate cancer when compared to those who ate less than 1 1/2 servings per week.

Lutein, better known for preventing eye diseases, may guard against cancer of the colon, lung and breast. Its less-well-known companion carotenoid, zeaxanthin, is linked to a lower risk of breast, cervical, and colon cancers. Both carotenoids are being investigated for their role in preventing skin cancer.

The table on the following page provides an overview of the key carotenoids, their health benefits, and food sources in which they’re found.

As extra insurance for all the antioxidant nutrients you need, be sure you’re supplementing daily with Parrillo Essential Vitamin Formula™ and Parrillo Mineral-Electrolyte Formula™.

What You Can Do Now: There’s no recommended daily requirement for beta-carotene and other carotenoids. However, many health experts recommend 6 milligrams a day of beta-carotene. When you eat beta-carotene-rich foods, you’re automatically getting other carotenes.

Here are some tips for super-charging your diet with carotenoids:
- Use the counter to identify the best sources of carotenoids. Include these foods in your daily diet.
- Color your plate with as many colorful vegetables you can. The more colorful your food selections, the more carotenoids you’ll eat.
- Eat canned soups with a tomato base.
- Drink vegetable juices rather than sodas.
- Eat a hefty serving of tomatoes or tomato-based foods at least twice a week or more.
• Add extra tomato sauce or paste to soups or stews.

• Eat sandwiches and salads with tomatoes.

• Make sure fruits and vegetables are as fresh as possible. Once they’re plucked from the vine or harvested from the ground, their antioxidant power starts to dwindle.

• Snack on raw fruits and vegetables to get the most carotenoids. One exception, though, is carrots, which actually release more carotenoids when cooked.

• Enjoy exotic fruits such as guavas or mangoes for a change of pace.

• Blend cooked carrots or pumpkin into a smoothie.

### CAROTENOIDs

<table>
<thead>
<tr>
<th>Carotenoid</th>
<th>Health Benefits</th>
<th>Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha carotene</td>
<td>Detoxifies cancer-causing agents.</td>
<td>Carrots, pumpkin, other yellow and orange vegetables</td>
</tr>
<tr>
<td>Beta-carotene</td>
<td>Prevents free radical damage.</td>
<td>Carrots, pumpkin, other yellow and orange vegetables</td>
</tr>
<tr>
<td>Beta-cryptoxanthin</td>
<td>Prevents damage to cell membranes and to DNA.</td>
<td>Red bell peppers, yellow corn</td>
</tr>
<tr>
<td>Lutein</td>
<td>Essential to protect eyes from cataracts and other serious eye problems; shows promise against breast, colon, and lung cancers.</td>
<td>Collards, squash, kale, and turnips</td>
</tr>
<tr>
<td>Lycopene</td>
<td>Potentially lowers risk of developing prostate, lung, pancreatic, bladder, and colon cancers.</td>
<td>Tomatoes, tomato products</td>
</tr>
<tr>
<td>Zeaxanthin</td>
<td>May play a role in preventing breast, cervical, and colon cancers. Works together with lutein.</td>
<td>Egg yolks, peppers</td>
</tr>
</tbody>
</table>
With so many supplements on the market, sometimes the basic ones get forgotten – like minerals, the workhorse of just about every reaction in your body. Every supplement protocol we have in our program includes two important supplements: our Parrillo Essential Vitamin Formula™ and our Parrillo Mineral Electrolyte Formula™. Here’s a look at some of the key minerals in the latter – and how they can benefit your body and health.

Calcium: Of all minerals in your body, calcium is the most abundant. It accounts for 40 percent of your skeleton, and about 99 percent of the calcium in your body is deposited in bones and teeth. These structures are hardened and strengthened by calcium, working in combination with the mineral phosphorus. The remaining one percent of the body's calcium is concentrated in the soft tissues where it plays an essential role in muscle contraction, nerve transmission, blood coagulation, and the activity of the heart.

Calcium helps control and prevent high blood pressure – a silent killer you want to avoid.

Magnesium: Magnesium is the maestro of more than 400 metabolic reactions in your body. Some examples: It helps orchestrate the protein-making machinery inside the cells of soft tissues; helps direct the metabolism of potassium, calcium, and vitamin D; is necessary for the release of energy; helps your muscles relax after contracting; and plays a central role in the secretion and action of insulin. Bodily stores of magnesium are valuable in helping the body handle glucose and maintain proper blood levels for even energy levels throughout the day.

A magnesium deficiency can make the body’s cells less sensitive to insulin, and a severe magnesium deficiency can cause abnormalities in the function of the heart and is possibly related to cardiovascular disease, heart attack, and high blood pressure.

How do you know if you’re magnesium-needy? In some cases, your doctor may order a test in which magnesium is administered intravenously and urine is collected over a 24-hour period. The test is usually reserved for people at a known risk of magnesium deficiency, and these cases include patients with congestive heart failure, heart attack, ketoacidosis, alcohol abuse, potassium or calcium deficiency, and chronic use of certain drugs.

Potassium: Potassium serves the body in many ways. It assists the nerves in sending messages, helps digestive enzymes do their work, ensures proper muscle functioning (including that of the heart), regulates water balance, and releases energy from protein, carbohydrates, and fats. A potassium deficiency can lead to irregular heart beats, high blood pressure, muscular weakness, fatigue, kidney and lung problems, and insulin resistance.

Zinc: Zinc is at the heart of many activities in your body. For example, it helps: absorb vitamins; break down carbohydrates; synthesize nucleic acid, which directs the manufacture of protein in cells; and regulate the growth and development of reproductive organs. Zinc is also a component of insulin, and it prevents deficiencies that can lead to problems in your body’s use of insulin. Zinc-poor diets are also associated with cardiovascular disease, high blood pressure, elevated triglycerides, and impaired glucose tolerance.

Selenium: You can get powerful anticancer protection by stocking up on foods rich in selenium, an important antioxidant mineral. Such foods include fish, nuts, and...
whole grains. A huge body of evidence proves that diets low in selenium are a significant risk factor for cancers. In studying world populations, scientists have discovered that people with low-selenium diets are more prone to have cancers of the breast, colon, liver, skin, and lung. Over the years, several studies have suggested that selenium also helps reduce risk of prostate cancer, the second deadliest form of cancer in American men.

Selenium works by protecting cells from damage. It may also block the action of carcinogens by interfering with their metabolism.

Chromium Picolinate: Chromium is a trace mineral that helps turn carbohydrates into glucose (blood sugar), the fuel burned by cells for energy. Chromium also helps regulate and produce the hormone insulin. Plenty of research over the years has found that chromium picolinate may improve body composition and promote weight loss in healthy adults. It also may stimulate the burning of carbohydrates so that they are converted into energy given off as heat, rather than being turned into body fat. Chromium is also believed to help stimulate the metabolism. Further, it appears to aid in protein synthesis. Assisted by chromium, insulin helps amino acids gain access to cells, where they reassemble themselves to construct new muscle tissue. Thus, chromium may have an indirect effect on muscle growth.

Iodine: This mineral in our supplement comes in the form of kelp, a nutritious sea vegetable rich in iodine. Iodine is a trace mineral that helps the thyroid gland produce thyroxin, the principal thyroid hormone involved in metabolism.

**Supplementing With Minerals**
Yes, you can get protective levels of these minerals from natural foods – including lean proteins, whole grains, and vegetables, but it’s a good idea to hedge your bets and take a mineral supplement. Per pill, Parrillo Mineral-Electrolyte™ contains 250 mg of calcium; 5 mg of iron; 250 mg of phosphorus; 75 mcg of iodine in the form of kelp; 250 mg of magnesium; 11 mg of zinc; 50 mcg of selenium; 500 mcg of copper; 10 mg of manganese; 25 mcg of chromium picolinate; 45 mg of potassium; 500 mcg of boron; along with other nutrients. I recommend that you take one tablet with each meal during the day for improved metabolism and well-being.
Dessicated Liver: A Nutrient Treasure Trove for Exercisers
by John Parrillo

One of the best all-around supplements for active people is desiccated liver, available in the Parrillo Liver Amino Formula™. This is a concentrated form of beef liver that has been processed to remove the cholesterol but to preserve the nutrient content of the liver.

Desiccated liver is an important source of iron, a critical mineral for exercisers, bodybuilders, and athletes. The major job of iron in the body is to combine with protein and copper to manufacture hemoglobin, a component of red blood cells that carries oxygen in the blood from the lungs to the tissues. Without enough hemoglobin, tissues are deprived of oxygen, often resulting in fatigue, breathlessness, and a rapid heart beat.

Desiccated liver is also naturally rich in B-complex vitamins; vitamins A, B, C, and D; calcium and phosphorus, with four times the nutritional value in the same amount of cooked whole liver. B vitamins in particular, are responsible for providing energy to the body, mainly by converting carbohydrates into glucose, an important fuel for cells. B vitamins are also important for the metabolism of protein and fat, healthy functioning of the nervous system, maintenance of muscle tone in the gastrointestinal tract, and the health of the skin, hair, eyes, mouth, and liver.

When the body is properly fortified with iron from food and from a supplement such as Parrillo Liver Amino™, with its combination of iron and other nutrients, there are many benefits. Weight training, for example can deplete iron stores. Eating foods rich in iron, such as lean meats, dark leafy vegetables, and desiccated liver helps replenish that iron. Supplementing with iron may also help prevent something known as “sports anemia,” a temporary condition characterized by a drop in hemoglobin in response to exercise.

Getting the iron you need from proper nutrition and supplementation is clearly important to your exercise program and overall health. With your iron stores full, you can potentially increase your aerobic capacity (combined with aerobic training), extend your energy, and improve your body’s recuperative powers. This all adds up to maximum performance and better health.
Eating Out on the Parrillo Nutrition Program

by John Parrillo

It’s normal to want to get out of the kitchen occasionally and let someone else do the cooking for you. But what about sticking to the Parrillo Nutrition Program? Will dining out strike a fatal blow to your resolve? Not necessarily. These days, most restaurants cater to health-conscious diners, so it’s not that difficult to find healthy cuisine while dining out.

According to the National Restaurant Association, Americans eat out 4.1 times a week. And many of those meals are eaten at fast food restaurants, where food is typically high in fat and sodium.

But does dining out have to spell dieting disaster? Not necessarily. One of the many advantages of the Parrillo Nutrition Program is its adaptability to any eating-out situation. These days, healthy foods are served practically everywhere.

You don’t have to be a recluse while on the Parrillo Nutrition Program. You’re free to go out to restaurants, even fast-food places, to enjoy breakfast, lunch, or dinner with your friends, family, or business associates. Nor should you pass up invitations to parties or other social events just because you’re on a healthy eating program.

What follows are some practical guidelines for making healthy choices at any type of restaurant, as well as for enjoying parties and other events.

Restaurants for Breakfast
- Order scrambled egg whites, or scrambled egg substitutes (such as EggBeaters). Request that the eggs be cooked without added oil.
- For carbohydrates, your best bets are oatmeal or oat bran.

Asian Restaurants
- Select entrees made with lean proteins (such as chicken and fish) and vegetables. Some good suggestions for ordering are Moo Goo Gai Pan, Szechwan Shrimp or Chicken, and sushi.
- Request that the sauce be served on the side, or forgo it altogether.
- Asian restaurants serve generous helpings. Consider ordering one entree and splitting it with a friend, unless you want to take the leftovers home.

Italian Restaurants
- For an appetizer, try vegetable antipasto (if available), with dressing on the side.
- Look for entrees such as grilled chicken and fish, as well as Italian dishes that are marked as low in fat.
- Avoid entrees prepared in cream sauce or Alfredo sauce.
- Ask the waiter to leave the rolls and breadsticks in the kitchen or if you must indulge, use butter flavored CapTri® instead of butter.
- When ordering a dinner salad, request dressing on the side.
- Opt for steamed vegetables as your side dish over pasta. Make sure the vegetables are steamed.

Mexican Restaurants
- Grilled chicken, shrimp, or lean meat entrees are good choices.
- Request pico de gallo (a mixture of chopped tomatoes, green peppers, and onions) instead of salsa.
- Mexican rice or black bean soup are nice accompaniments to a Mexican meal. So are the refried beans, but check first to see whether they are prepared in lard, or baked or boiled, and seasoned. If they aren’t refried in lard, enjoy them.
- A dinner salad with non-fat salad dressing is a healthy meal-starter.

Steakhouse
- Order grilled lean meat, chicken, salmon, or other fish (prepared without oil).
- For a side dish, select a steamed vegetable such as broccoli.
- At the salad bar, stick to fresh vegetables and non-fat or low-fat salad dressing. Many salad bars serve fresh fruit too, which makes for a great dessert.
Homestyle or Cafeteria Restaurant
• Request grilled or lemon chicken, turkey breast without the gravy, or white fish prepared without sauce or oil.

• Select steamed vegetables (no sauce or butter), salad with non-fat dressing, or carrot/vegetable medley prepared without butter or margarine.

• Blindfold yourself when passing by the dessert line.

Fast-Food Restaurants
• Most fast-food establishments have salads on their menus; grilled chicken salads are your best bets. Order reduced-fat salad dressing with your salad.

• If there’s a salad bar, stick to fresh vegetables and fat-free salad dressing.

• At fast-food restaurants that serve fish, order baked fish, steamed vegetables, and a salad.

Parties
• Eat a meal before you go to the party to fend off hunger pangs and cravings.

• Snack on fresh vegetables and fruit (but pass up the dip).

• If you’re going to dinner with a group of friends and are concerned that you’ll overeat, eat some natural high-fiber foods (like raw vegetables or fruit) before you go. You’ll be less likely to pig out later.

• Offer to bring a couple of your own dishes (low-fat, of course) to the gathering.

• Instead of a cocktail, drink a diet soda or carbonated water with a twist of lemon or lime.

On the surface, it may not seem like fun to limit yourself to certain foods when eating out. But rest assured: The ability to make healthy choices at restaurants is just one more positive step toward getting in great shape. You’ll feel better, and your body will love you for it.
Fat-Burning Food Chemistry
by John Parrillo

If you have had trouble losing weight in the past, the reason may reside in two nutritional factors: your food balance and your food choices. “Balance” involves the relative proportion of carbohydrates, protein, and fat in your diet; and “choice” involves the type of food you eat. Scientists have only recently begun to unlock the highly complex processes by which our bodies burn fat, and one of the recently “solved mysteries” has to do with these two vital issues of nutrition.

Over the past several years, many popular diets have suggested that increasing or decreasing a single nutrient in your diet can dramatically affect your weight loss. Some diets have focused on carbohydrates, others on protein, still others on fat. Unfortunately though, highlighting one nutrient to the exclusion of others misses the boat. Weight loss through nutrition depends upon on a carefully designed balance of all of these nutrients and on the specific types of food in which those nutrients are found – which is exactly how the Parrillo Nutrition Program is put together.

Why is this true? Both factors positively influence the action of your hormones – chemical messengers that regulate a world of functions in your body. They also influence your metabolism, your body’s food-to-fuel processes. Thus, the interplay of food balance and food choices can greatly accentuate your ability to burn fat. It is this approach to weight loss that has the backing of medical science. A simplified explanation of these issues is provided below.

The Role of Food Balance and Food Choice in Fat-Burning
If you desire to burn fat – and who doesn’t – then you require a carefully designed balance of certain types of protein, carbohydrates, and fat in your diet – with enough calories to keep your metabolism running in high gear. Remember on the Parrillo Nutrition Program, we do not advocate cutting calories. Doing so only slows down your metabolism. But back to nutrient balance, let’s start with protein.

Protein As A Fat-Burner
When provided in your diet at higher levels, protein can clearly be nicknamed a “fat burner” – for two important reasons.

First, your body requires ample protein to develop and maintain muscle. If you don’t get enough protein, your body can start breaking down muscle tissue for the provision of energy. Consequently, you’ll lose metabolically active muscle, and this will sabotage your fat-loss efforts.

Second, protein boosts your metabolism, and it does this by stepping up the action of your thyroid gland. (One of the main duties of the thyroid is to regulate metabolism.) This benefit of a higher-protein diet was observed in a study of dieters conducted by the University of Illinois at Urbana-Champaign, released in 2001. In this study, 24 mid-life women went on a liberal 1,700 calorie-a-day diet for 10 weeks. Half followed a diet based on the USDA Food Guide Pyramid – 55 percent carbohydrates, 15 percent protein, and 30 percent fat. The other half followed a high-protein diet of 40 percent carbohydrates, 20 percent protein, and 30 percent fat.

Both groups lost the same amount of weight – 16 pounds, but the composition of that weight differed greatly. The high-protein group shed 12.3 pounds of pure pudge and only 1.7 pounds of lean muscle, while the Food Pyramid dieters lost 10.4 pounds of fat and 3 pounds of muscle. Translation: High protein means better, more fat loss. With a high-protein diet, you don’t have to sacrifice muscle. Also important in this study: The researchers detected an increase in the thyroid function of the high-protein dieters, and this was the concrete evidence for protein’s metabolism-boosting effect.

Do you realize the significance in all of this? With more protein in your diet, in the right balance, you can almost double your weight-loss and fat-burning efforts!

Carbohydrate Differentiation:
Carbohydrates also play a role in fat-burning, as long as you choose the right types of carbohydrates. This is where food choice becomes all-important to your weight-loss success.

For a very long time, carbohydrates have been classified as either simple or complex. Simple sugars are found in candies, syrups, many fruits and fruit juices, and processed foods, and complex carbohydrates are found in whole grains, beans, and vegetables. This classification is based on the molecular structure of the carbohydrate, with simple carbohydrates constructed of either single or double molecules of sugar, and complex carbohydrates made of multiple numbers of sugar molecules. Simple
sugars send your blood sugar soaring, and this sets off a hormonal reaction that can lead to weight gain.

Here is a closer look at exactly what happens: After you eat carbohydrate foods, your body breaks them down into glucose. Simple sugars are dismantled more quickly than others, and this causes a huge spike in your blood glucose. Complex carbohydrates take longer to break down, and consequently, blood glucose stays relatively even during the digestion process.

When glucose shoots upward in response to simple sugars, so does the hormone insulin. The problem with an overload of insulin in your system is that it activates fat cell enzymes. These enzymes move fat from the bloodstream into fat cells for storage and trigger your body to create more fat cells. Simple sugars thus create conditions in your body that are conducive to gaining fat.

What all of this tells us is very simple: Simple sugars promote fat storage; complex carbs like those recommended on the Parrillo Nutrition Program do not. Choosing complex carbohydrates makes it possible to lose weight more easily. If you base your carbohydrate selections on this nutritional element, you will lose weight more quickly. The Parrillo Nutrition Program is based on the selection of complex carbohydrates. These include certain whole grain cereals, brown rice, beans, legumes, potatoes, yams, and vegetables.

The Fat Factor: For decades, we were taught that in order to lose weight, we had to slash the amount of dietary fat in our diets. Since the 1980s, Americans did reduce their fat consumption, but at the same time, they got fatter. More than 60 percent of our population is now considered overweight or obese. Cutting the fat from our diets was clearly not the "magic answer" to weight loss.

Scientists studying this alarming trend probed the reasons. What could explain this confusing phenomenon? After much research, they discovered that people had been replacing the fat in their diets with too many simple sugars. This was the impetus – the main common denominator – behind the expanding waistlines of the American public, along with the fact that Americans are becoming increasingly inactive. So from a nutritional standpoint, simple sugars are among the prime culprits in weight gain, and dietary fat shoulders far less of the blame.

Taking all of this important information into account, the Parrillo Nutrition Program supplies roughly 10-20% percent of your daily calories from fat, with special emphasis on the essential fatty acids we recommend you have each day.

A Final Point: The foods allowed on the Parrillo Nutrition Program provide what has been scientifically proven to be an effective combination of specific types of protein, carbohydrate, and fat. This combination of easily available and delicious foods, in the right proportions, stimulates increased body fat metabolism, while supplying nutrients required to support your health. The food you will eat will be more satisfying and nutritionally rewarding, plus will provide the metabolic and hormonal catalyst you need to shed surplus fat.
Whether starting a nutrition plan like the Parrillo Nutrition Program, or renewing a commitment to get fit, everyone needs some “booster shots” from time to time to shore up motivation. Toward that end, here are 46 of the smartest tips ever for sticking to the Parrillo Nutrition Program so that you burn body fat and look great in 2008:

1. Eat all required foods on the Parrillo Nutrition Program: lean proteins, starchy carbs, fibrous carbs, and essential fats. Never skip a thing!

2. Use spices and seasonings to flavor your foods.

3. Do not eat fruits, or drink fruit juices or juice-based products. They contain fructose, which is easily converted to body fat.

4. Shoot for 25 to 35 grams of fiber daily. (The Parrillo Nutrition Program builds this requirement in automatically – no need to count grams.)

5. If you feel hungry, eat extra protein to tide you over.

6. Eat at least two servings of fish a week to obtain a type of healthy fat called omega-3 fatty acids. These beneficial fats help your body in numerous ways, including reducing triglycerides (fats in your blood), boosting your aerobic power, and normalizing your mood.

7. Remove skin and fat from poultry before cooking.

8. Avoid cured and smoked foods. They’re high in fat, salt, and nitrates (which are carcinogens).

9. Choose liberally from fibrous vegetables, especially for the preparation of salads.

10. Serve up salads prior to your meals to help you feel full and more satisfied faster.

11. Prepare your salads within your daily fat allotment, with fat-free salad dressings, or vinegar.

12. Spice your foods with red pepper (capsicum). This popular seasoning is believed to rev up your metabolism by creating heat. You’ve probably noticed this yourself. After you eat hot spicy foods, your body will heat up in a process known as “diet-induced thermogenesis.” When body heat rises, so does metabolism, and more calories are burned.

13. Blend chickpeas into a hummus for vegetable dips.

14. Try Parrillo’s Hi-Protein Cake and Cupcake Mix™ for a sweet treat.

15. Try using lemon juice or various herbs on your vegetables, rather than eat them with too much added fat.

16. Do not substitute or add to the Parrillo Nutrition Program.

17. Do not drink any alcoholic beverages. Have sparkling no-calorie beverages with a twist of lemon or lime when you’re out.

18. Other than water, you may drink the following beverages: regular or decaffeinated tea, green tea, herbal teas, regular or decaffeinated coffee, carbonated water, mineral water, sugar-free diet sodas, and sugar-free drink mixes.

19. Write down what you will eat each day – for better control over your food intake.

20. Drink eight to ten glasses of water a day. Water aids in weight loss by dulling your appetite and enhancing fat-burning processes in your body.

21. Drink green tea liberally; it can be helpful in burning fat.

22. Add in Parrillo supplements according to your goals. See the Parrillo Nutrition Manual for an explanation.

23. Don’t skip meals. Skipping meals only makes you hungry later.

24. Slow down your eating and chew your food thoroughly. Both actions help you feel full faster and are a proven weight-control measure.

25. Do you overeat or over-snack with fattening foods in front of the television? If so, make it a rule in your house to always eat in the din-
ing room while seated at the table.

26. Never let yourself get bored, stressed out, or depressed, if at all possible. These emotions can trigger cravings for sugary or high-fat foods.

27. If you don’t have time to cut up vegetables, buy pre-cut veggies from the grocery store, or take advantage of the store’s salad bar, which usually has plenty of freshly cut items.

28. Outwait your cravings for sugary or high-fat foods. Cravings generally last no longer than 10 minutes. If you feel the urge to splurge, find something else to do for 10 minutes, or until the craving passes.

29. Be assertive when people offer you food that’s not on the program. Train yourself to say “No, thank you.”

30. Visualize what you will look like in a bathing suit, then believe it will happen. What you believe you can achieve.

31. Hang your bathing suit on a door handle, or somewhere visible – as reminder of what you will accomplish.

32. Clear your kitchen cabinets of binge food.

33. Use non-stick saucepans for cooking foods so that you don’t have to add extra fat.

34. Keep plenty of cut-up crunchy raw vegetables around to snack on.

35. Never eat foods out of their original jars or containers; always eat them on a plate while you are sitting down at the dining table.

36. Tell your friends and family that you’re on the Parrillo Nutrition Program and that you need their support.

37. Grocery-shop only from the list of foods allowed on the Parrillo Nutrition Program.

38. Never go grocery shopping when you’re hungry, but always on a full stomach. That way, you won’t be tempted to buy something that would sabotage your program. Eat a Parrillo bar before going grocery shopping.

39. When you lose some pounds, or achieve other important milestones while following the Parrillo Nutrition Program, reward yourself with a non-food treat or gift, something that makes you feel good about yourself and your appearance. Some ideas: a massage, new pair of exercise shoes, new sports gear or equipment, new exercise video, a weekend get-away, a shopping spree, a new outfit, or an accessory or accent piece for your home.

40. If, after all of your planning and commitment, you do overindulge, try not to feel guilty. Guilt only weakens your resolve to maintain healthy habits.

41. Don’t ever resort to crash dieting. This can result in a loss of muscle, decreased strength and power, low energy, moodiness or irritability, and compromised immunity. Lose no more than a pound or two of pure fat a week. That’s a safe rate of fat loss for everyone.

42. Incorporate both aerobic exercise and weight training into your weekly fitness program. Submaximal exercise, such as aerobics, uses fat as a fuel source, helping to burn off your fat stores. It also builds your aerobic power, so you can train longer and burn even more fat. Weight training burns fat as well, but in a different way — by creating metabolically active muscle tissue. Weight training also helps to preserve lean muscle.

43. Incorporate supplements such as Parrillo Hi-Protein Powder™, Parrillo 50/50™, or Parrillo Optimized Whey Protein™ into your diet. These supplements are great for a post-workout meal. By providing nutrients when your body needs them most, proteins and carbs increase the production of two hormones (insulin and growth hormone) that are conducive to muscle growth and recovery.

44. Add Parrillo Creatine Monohydrate™ to your program. This is an effective sports supplement that enhances strength, promotes muscle growth and reduces body fat. The recommended dose is 5 gm a day.

45. Get enough rest. Lack of sleep has been associated with fat gain. Sleep deprivation increases the stress hormone cortisol. At chronically elevated levels, this hormone drives fat to the abdominal area. So get 7 to 8 hours of shut-eye each night.

46. Lose body fat for yourself, not because your husband, mate, or parent wants you to.
Using Creatine As a Weight-Loss Tool
by John Parrillo

Attention: if you’re ready to add a new tool to your fat-burning tool-box, try creatine. It’s a non-drug alternative that really works. It is one of the most important natural supplements available for exercisers because of its ability to extend endurance and coax the body into producing hard, firm muscle.

Creatine is produced naturally in the liver, kidneys, and pancreas – at the rate of about 1 to 2 grams a day – from the amino acids arginine, glycine, and methionine. Most of your body’s creatine is delivered to the muscles, heart, and other body cells. Inside muscle cells, creatine helps produce and circulate adenosine triphosphate (ATP), the molecular fuel that powers muscular contractions. Creatine is also found naturally in red meat. About 2 ½ pounds of raw steak yields roughly the equivalent of a single 5-gram dose of creatine.

Creatine is available from Parrillo Performance as Parrillo Creatine Monohydrate™. Through supplementation, you can build the volume of creatine in your muscle cells. There, creatine increases levels of a high-energy compound called creatine phosphate, which serves as a tiny fuel supply, enough for several seconds of action.

Creatine phosphate also allows more rapid production of ATP. The more ATP that is available to muscle cells, the longer, harder, and more powerfully you can work out. Thus, creatine monohydrate can indirectly help you lose body fat, since longer, more intense workouts help incinerate fat and build lean muscle. The more muscle you have, the more efficient your body is at using energy and burning fat.

Many creatine supplementation studies have shown gains in lean body mass, averaging 2 to 6 pounds, usually within several weeks of use. It can work fast too – in as little as one week. A study conducted at the Pennsylvania State University Center for Sports Medicine demonstrated the immediacy of creatine’s power. The researchers recruited 14 weight-trained men and divided them into a creatine group and a placebo group. Both groups performed bench presses and a jump-squat exercise in three different sessions, each separated by 6 days. Prior to the first session, neither group received any supplements. During the period leading up to the second session, both groups took placebos. Then, prior to the third session, the creatine group took 25 grams of creatine monohydrate a day, and the placebo group took a 25-gram placebo. All the participants were asked to follow their normal diets and keep food records during the study.

With this well-designed experimental situation, the researchers could easily observe and measure any changes due to supplementation. What happened was quite remarkable. In just a week, the creatine takers gained an average of 3 pounds of muscle. As for their strength, it went through the roof. The creatine takers upped their reps significantly on the bench press and could perform more jump squats. Those in the placebo group didn’t fare as well in either performance or muscle gain.

Creatine increases muscle size because it attracts water. Creatine is absorbed into the muscle cell and pulls a lot of water along with it, causing the muscle to swell. This results in larger, firmer muscles and a better pump. Please realize that creatine itself does not directly increase muscle protein. As with all supplements, it is vital that you use creatine in conjunction with a solid bodybuilding diet. You need protein to build muscle tissue and carbohydrates to provide energy. Creatine itself is not burned to produce energy, rather it acts as an energy buffer to transfer the energy derived from carbohydrate and fat oxidation to ATP. Creatine is not incorporated into protein. It will, however, indirectly increase the protein mass of muscles over time by allowing you to perform higher intensity workouts. That is, of course, if you are eating enough lean protein and quality calories to support muscle gains.

What can you expect from creatine? Typically, hard-training bodybuilders can expect an increase of 4-14 pounds of lean mass during the first month of
use. The more muscle mass you have, the more creatine you can assimilate leading to greater weight gains. We’ve seen athletes experience a 5-15% increase in strength on their maximum lifts and an increase of about 2 reps per set with their working weight during the first month. This increase in intensity allows you to put a greater load on the muscle, which will indeed increase your gains in muscle mass over time. Endurance athletes can experience a 5-10% increase in speed and a 10-20% increase in time to fatigue.

Increasing the levels of creatine and creatine phosphate in your muscles gives them another fuel source besides glycogen from carbohydrates. The question is: how much creatine do you need? To start, we recommend for the first one to two weeks you use 20-30 grams each day, divided into even servings of 5 grams each taken with each meal or with a Hi-Protein™/Pro-Carb™ or 50/50 Plus™ drink. This is the loading phase. Use the lower end of these recommendations if you’re in the 150-200 pound range and the upper end if you’re over 200 pounds. We recommend one to two weeks, but the loading phase can last up to four weeks in some individuals. After this, 5-10 grams a day should be sufficient to maintain elevated muscle stores of creatine. It takes approximately 4-8 weeks to deplete creatine stores after you stop taking it.

To support muscle growth, Parrillo Creatine Monohydrate™ works best with a nutritious diet that supplies ample calories, as outlined in the Parrillo Nutrition Program. Remember, creatine itself has little impact on gaining muscle when taken alone. The building blocks (amino acids) and extra calories must also be present in the muscle for serious gains to be made. Most people will see a significant increase in size and strength when using creatine, but a lot of this depends on the amount of protein and quality calories you are eating. If you don’t eat enough to support muscle gain, you won’t see any, it’s that simple.

Weight gain resulting from creatine supplementation may happen during the first month when you’re loading the muscle cells with creatine. You will experience an immediate gain in strength at the outset because of the increased leverage advantage from the increased water gain as well as the creatine phosphate stores. At some point the creatine pool becomes saturated and the muscle can’t hold any more. So you can expect a very rapid and dramatic gain in lean mass (muscle + water) for the first month, but after that creatine supplementation is mainly maintenance.

Remember, proper nutrition from food, increased calories and nutrients from supplements and intense training are the keys to packing on more lean muscle month after month, year after year. By using creatine you can improve the intensity and duration of your training for better overall workouts. And when you add to this proper nutrition, which includes plenty of high quality protein and increased calories, you’ll be right on track to gain one pound of lean mass each week.

Are there any medical concerns with taking creatine? Creatine is nontoxic even when taken in huge doses. The only known side effect is stomach upset if you take too much at once. Five to ten grams shouldn’t bother you. If you take 30 grams at once you might feel stomach cramps or nausea, but usually not. Excess creatine is converted into creatinine (note the similar spelling) and excreted in the urine. If you take too much creatine you’ll just lose the excess in your urine. If you have any blood work done you might find that creatine elevates your creatinine level. Doctors use the creatinine level in the blood as an index of kidney function. If your doctor notices an increase in your creatinine level and expresses some concern about your kidneys, tell him or her that you’re using creatine. Creatine does not damage the kidneys in any way, but is contraindicated if you have pre-existing severe kidney disease (for example, renal dialysis or kidney transplant patients). People with severe kidney disease have trouble eliminating creatinine, and creatine supplementation would increase creatinine levels further. In summary, creatine has been shown in placebo controlled clinical trials to improve exercise performance, both in terms of power output and endurance (1-6). We know from our work here that it increases lean body mass as well.

Creatine is stored in the muscle and does not contribute to fat stores. Any weight you gain on creatine will be in the lean compartment. We’ve seen many athletes experience dramatic gains in muscle size and strength during their first month of creatine use. And when you look for a good creatine supplement, make sure it is 100% pure, like our Parrillo Cre-
Make sure to look at the nutrient content on the label and not just the price when you’re considering which creatine supplement to take. Parrillo Creatine Monohydrate™ is one more nutritional tool to help you push your physique and performance envelope.

References


The Alternating Diet
by John Parrillo

A successful approach to losing body fat while keeping your metabolism revved up involves alternating one month on a weight gain cycle and one month on a fat loss cycle. The first month you would gain a pound each week (four pounds) and 75% of it is muscle. In the second month you lose a pound a week (four pounds total) and 75% of that loss is fat. At the end of the two month cycle you will have gained two pounds of muscle and lost two pounds of fat. Extend that to a year and you’re looking at 12 pounds of muscle gained and 12 pounds of fat lost. You’re constantly making progress, and your metabolism never gets the chance to slow down.

I believe these goals are quite realistic and very easily attainable for anyone, and particularly if you’re giving 100% effort to the training and nutrition program. The beauty of this idea is that you’re constantly making progress; you’re always either gaining muscle or losing fat; and the constant change prevents your metabolism from adapting so you can make continual progress without wasting time being stuck on a plateau and trying to figure out what to do.

In principle, you could keep this up year after year. If you’re 20% body fat or more, you may want to devote a few months to getting in shape first, or if you’re really skinny, you may want to spend a few months just putting on size. But if you’re somewhere in the middle, maybe around 10% to 15% body fat, you might consider giving this program a try. To gain a pound a week increase your calories to 300-500 more a day, do 20-30 minutes of aerobics a day, and train your top sets with heavy weights in the 3-6 rep range. To lose a pound a week, decrease carbs slightly if you have to, do 45-60 minutes of aerobics a day, and train with increased volume and moderate weight in the 8-12 rep range for your top sets.

There are other ways you can maximize this fat-burning mode. For example:

• Continue to eat five, six or more meals a day to keep your metabolism in a constant state of acceleration. This has several beneficial effects. Every time you eat, your metabolic rate increases a little due to the thermic effect of feeding (also known as diet-induced thermogenesis). Eating frequently keeps your internal furnace stoked and keeps your metabolism speeding along. If you go too long without eating, your metabolism begins to slow down.

• Eliminate as much fat as possible from your diet, since fat has a slowing effect on metabolism. Dietary protein and complex carbohydrates have negligible tendency to be converted to fat, whereas dietary fat is very prone to be stored as body fat (1,2,3,4). This is a hot topic in scientific literature these days and is a matter of debate in bodybuilding circles. (It is less a matter of debate in the scientific journals, where actual research is reported.) Very little of your body fat comes from complex carbohydrates or protein being converted into fat; almost all of it comes from fat you eat. How much fat your body stores seems to be more closely related to how much fat you eat rather than how many calories you eat.

• Decrease your carbohydrate intake, thereby lowering insulin levels and activating fat-burning mechanisms in the body. But: How do you cut down on carbs without decreasing calories? You consume more of something else. Fat is not an option, so your only other choices are protein or CapTri®. Either one will work, but a combination of both probably works best.

Let’s be brutally honest about this. If you’re used to getting most of your calories from carbs, cutting back significantly on carbs makes you feel bad, at least for a while. People who cut their carbs dramatically have low energy levels, are irritable and grouchy, and get headaches. CapTri® is more effective at relieving some of these symptoms than protein because it’s more readily used as an energy source. Protein is not a very efficient energy source. Its role is to serve as a building block for repair
and maintenance of tissues, not to provide metabolizable fuel. Using protein for energy is kind of like trying to burn a wet log. Carbs, on the other hand, are a great energy source. So if you want to reduce carbs in your diet to manipulate hormone levels and promote fat metabolism it makes sense to replace those calories with another fuel source, namely MCT oil. This supplement is a good choice because it is readily burned as fuel and won’t be stored as body fat, (5, 6).

I suggest you ease into this slowly. Start by eliminating starchy carbs (potatoes, sweet potatoes, rice, and so forth) from your last meals of the day. Replace those lost calories from carbs with an equivalent number of calories from CapTri®. It actually has a higher thermogenic effect than carbohydrate, meaning that more of this dietary energy will be lost as body heat with less energy available for storage. This further promotes additional fat loss. Continue in this way until you reduce your daily carbohydrate grams to about half of what you normally consume. At this point you’ll be eating mostly protein, vegetables, and CapTri®.

• Do your aerobics when you are relatively carb-depleted. This will cause your body to burn more fat for energy during your workout because fewer carbs are available. The best time is first thing in the morning before breakfast. Your glycogen stores are the lowest they’ll be all day, so you’ll rely more heavily on stored fat. To prevent muscle loss, consume two scoops of a quality protein powder prior to performing your aerobics.

For maximizing fat loss, another good time to perform aerobics is right after weight training, because then you’re relatively glycogen depleted too. You should do moderate to fairly high intensity aerobics, so that you’re breathing hard and sweating. While it’s true you burn a higher percentage of calories from fat during low intensity aerobics, you will burn more grams of body fat if you perform high intensity aerobics, because you’ll burn so many more total calories. Also, if you do reasonably intense aerobics you will get the added benefits of increased vascular density and enhanced fat burning capacity. Increase the volume of aerobics progressively as you get leaner.

If your fat loss plateaus, the first thing to try is to do more aerobics. If that doesn’t work you should probably back off for a couple weeks, increase your calories, put on some muscle, and get your metabolism going again. How do you know if you’re losing fat and not muscle? By having your body measured once a week with an accurate assessment method such as our BodyStat System. With the information you attain, you can determine your pounds of lean mass and pounds of fat every week and make adjustments in your training and diet accordingly to make sure you stay on track.

With proper assessment, you can pinpoint exactly what the problem is and make detailed adjustments to fix it. Otherwise, if you’re just going on what “feels right” or seems to make sense, and you don’t make good progress, you’re not sure what to change. Remove the guesswork from your bodybuilding program. Don’t leave anything to chance.

References


Protein Power - More Proof
by John Parrillo

The optimal amount of protein for athletes and exercisers has been debated ad nauseam, as have other issues related to protein. Finally, last year, the International Society of Sports Nutrition took a positive research-based position on protein, saying, really, what we have believed in at Parrillo Performance for decades. Let me give you a rundown of what this information tells us – and my take on it as it relates to your nutrition and training.

The Society has put together seven points related to the intake of protein for healthy, exercising individuals:

1) Vast research supports the contention that individuals engaged in regular exercise training require more dietary protein than sedentary individuals. Absolutely! What stirred the debate early on was that the National Research Council put the recommended daily allowance (RDA) for protein intake at 0.8 grams protein per kg body weight per day (g/kg/day). This works out to be 0.36 grams per pound body weight each day (g/pound/day), which is 56 grams per day for a typical male and about 72 grams per day for a 200 pound bodybuilder. This value was determined to be the amount required by most of the average population - not for athletes or other very active people. The RDA protein recommendation may be enough for sedentary people but endurance athletes and very muscular athletes need more.

2) Protein intakes of 1.4 - 2.0 g/kg/day for physically active individuals is not only safe, but may improve the training adaptations to exercise training. On The Parrillo Performance Nutrition Program, we recommend that bodybuilders consume 1.5 grams or more of protein a day per pound of body weight. At least one gram per pound of body weight should come from lean proteins, with the remaining .5 gram per pound of body weight coming from starchy and fibrous carbs. We’ve seen bodybuilders greatly improve their physiques by following these guidelines.

3) When part of a balanced, nutrient-dense diet, protein intakes at this level are not detrimental to kidney function or bone metabolism in healthy, active persons. True, there is no evidence suggesting that strength athletes consuming a high protein diet have an increased incidence of kidney disease. The data suggesting that a high protein diet contributes to the progressive nature of kidney disease come from people with pre-existing kidney problems.

4) While it is possible for physically active individuals to obtain their daily protein requirements through a varied, regular diet, supplemental protein in various forms are a practical way of ensuring adequate and quality protein intake for athletes. Amen – which is why Parrillo Performance has a full range of protein supplements available to you. To help you meet your protein needs, for example, we have developed Hi-Protein Powder™. Each serving provides 31 grams of ultra quality protein. Other high-protein supplements include our Protein Bars™, 50/50 Plus™ powders, Optimized Whey Protein™ supplements, and All-Protein™.

5) Different types and quality of protein can affect amino acid bioavailability following protein supplementation. The superiority of one protein type over another in terms of optimizing recovery and/or training adaptations remains to be convincingly demonstrated.

Our protein supplements give you a variety of protein types, from whey to casein, and all have benefits. For example, research shows that whey protein diets increase the amount of glutathione in body tissues. Glutathione is a peptide (an amino acid derivative) that is involved in strengthening immunity. The elevation of glutathione has been shown to inhibit the development of several types of tumors, according to numerous studies. Whey protein is found in the following products: Optimized Whey Protein™, Hi-Protein Powder™, 50/50 Plus Powder™, Parrillo Sports Nutrition Bars™, Parrillo Protein Bars™, Parrillo Energy Bars™, Protein Chew Bars™, Pancake & Muffin Mix™ and Cake & Cupcake Mix™.

We also offer our All-Protein Powder™, which covers just about every...
protein base there is. Plus it’s fortified with amino acids: glycine, l-glutamine, l-leucine, l-isoleucine, and l-valine. Our suggested usage is one or more servings (2 scoops mixed with 8 ounces or ¼ liter of water or beverage) taken as needed with or between meals, and taken before, during, and after workouts. All-Protein Powder™ can also be mixed with food as needed.

6) Appropriately timed protein intake is an important component of an overall exercise training program, essential for proper recovery, immune function, and the growth and maintenance of lean body mass. Used to be that carbs took precedence over any other nutrient as a post-workout recovery agent. Not any more. Protein is equally as important and pairs up with carbohydrate as a double punch for muscle building. Various research studies have proved that a carbohydrate/protein supplementation triggers the greatest elevations in insulin and growth hormone levels in exercising study subjects. Clearly, protein works hand in hand with post-exercise carbs to create a hormonal environment that promotes the greatest increase in muscle growth. This nutrient combination also jump-starts your body’s glycogen-making process — faster than if you just consumed carbs.

Research has found that a balanced amino mixture (0.15 gm per kg of body weight) taken immediately after resistance exercise will produce a better anabolic effect than when the same mixture was taken later. We think one of the best times to take our 50/50 Plus™ or protein supplements is right after you train, based on this cutting edge research. If you want to take your recovery efforts up one more notch, consider supplementation with 50/50 Plus™, Hi-Protein™, Optimized Whey Protein™ and All-Protein™.

7) Under certain circumstances, specific amino acid supplements, such as branched-chain amino acids (BCAAs), may improve exercise performance and recovery from exercise. Parrillo Performance supplies BCAAS in its Muscle Amino Formula™. A good time to use this product is immediately before and after training, as well as with meals. Hard dieting is a great time to supplement with branch-chain amino acids.

During times of energy insufficiency (dieting), your body will actually break down its own muscle to use as fuel if no other is available. Catabolism is a dreadful metabolic state that occurs when glycogen stores have been depleted and fat oxidation has maximized. Metabolically, your body requires a certain level of glucose (blood sugar) to be maintained in order for the brain to function. While body fat provides a long-lasting energy supply, fat cannot be converted into carbohydrate by the human body. But protein (amino acids) can. Under adverse conditions, carbohydrates are exhausted and your body breaks down protein stores (muscle tissue) to convert into carbohydrate to supply energy. Branched-Chain Amino Acids are effective because they form a substrate for growth and are metabolized as fuel directly within muscle cells. A handful of Muscle Amino Formula™ capsules will help prevent the onset of catabolism and has both anabolic and anti-catabolic properties. Hi-Protein™ and Optimized Whey™ are fortified with extra BCAAs for just this reason. We suggest two or more with every meal. Remember that BCAAs require insulin for absorption into muscle cells so take them with food (carbs) rather than on an empty stomach!

Endurance is critical in athletic training and bodybuilding. Can you increase your endurance through the use of nutritional supplementation? Science says yes. Endurance can be bumped up, regardless the degree of fitness, with a balanced nutrition program aided by supplementation. One of the supplements we recommend is Parrillo Max Endurance Formula™. It is specially formulated with the following nutrients:

**Inosine**

Though it sounds like one, inosine is not an amino acid but is classified as a nucleoside, one of the basic compounds comprising cells. It plays many roles, one of which is helping to make ATP (adenosine triphosphate), the body’s main form of usable energy. Inosine plays many other roles in the body, including releasing insulin, facilitating the use of carbohydrate by the heart and, potentially, participating in oxygen metabolism and protein synthesis which improves oxygen utilization.

**DL-Phenylalanine**

DL-Phenylalanine is an amino acid known to improve mental acuity and pain tolerance. Some interesting research has looked into whether this amino acid can improve mental focus and alleviate attention problems. In one study, adults with attention deficit disorder were given a 2-week double-blind crossover of DL-phenylalanine versus placebo. A significant improvement was noted on mood and attention. Treatment with DL-phenylalanine also appears to ease depression in patients receiving opiates for chronic non-malignant pain. This amino acid is included in Max Endurance™ to help maximize focus and minimize pain for more productive workouts.

**Ferulic Acid**

The phytochemical ferulic acid is found in the leaves and seeds of many plants, but especially in cereals such as brown rice, whole wheat and oats. Ferulic acid is also present in coffee, apples, and artichokes. As an effective antioxidant, ferulic acid helps protect the body against free radicals and bodily stress, which can otherwise cause fatigue and illness. This lessens the total body burden of free radical damage, which is a major contributing factor as to why we age and suffer from degenerative diseases. Ferulic acid also helps to increase energy, as well as stimulate an increase in strength and lean muscle mass and a decrease in body fat.

In one study of 7 Olympic weightlifters, all experienced an increase in strength and endurance, a decrease in waist circumference and reduced residual joint and muscle soreness. Studies have shown that ferulic acid can decrease blood glucose levels and can be of help to diabetes patients. In addition, ferulic acid seems to protect against cancer, bone degeneration, menopausal symptoms (hot flashes). Like many other antioxidants, ferulic acid reduces the level of cholesterol and triglyceride, thereby reducing the risk of heart disease.

**Potassium & Magnesium Aspartate**

Have you ever noticed an ammonia smell in your clothes after a hard workout? This is because your body was using some amino acids as fuel but was not able to clear the waste products efficiently. When this happens the carbon skeleton of amino acids is burned, leaving ammonia as a byproduct. Ammonia is quite toxic and is converted to urea in a metabolic pathway called “the urea cycle,” which prepares it to be excreted in the urine. The urea cycle requires certain chemical compounds called aspartates, which are included in our Max Endurance Formula™. Aspartates are used by the body to detoxify the waste products of protein catabolism.

They also help filter out toxic waste products your body generates during intense training. Eliminating these waste products helps you have more energy and recover faster. Ammonia is very toxic and will stop energy production in the cell. Using the aspartates in Max Endurance™ to neutralize the ammonia as soon as it forms enables you to have more energy and endurance. We suggest the product be used consistently every day, not just on days of endurance events. Take 5-10 capsules before training.
In addition to Max Endurance Formula™, there are other unique and powerful nutritional supplements for endurance. Anyone who wants more energy, strength and stamina should consider additional supplementation. I suggest you start with the Liver-Amino Formula™, since it provides protein and heme iron -- the precise nutrients your body needs to build muscle, red blood cells and energy producing systems. If you're not getting enough protein from conventional sources, the Hi-Protein Powder™ is probably the next thing to add. If you need more calories, go with Pro-Carb™, CapTri® or any of our Supplement Bars or puddings. If you're training on the edge and want to explore the limits of your potential, add in Muscle Amino™.

In general, I suggest you begin using endurance supplements when training hard and definitely for at least three to six weeks before your event to build up your nutrient level reserves. This is especially true for Liver-Amino™, since it takes about six weeks to build red blood cells. You'll get better results if the nutrition and supplements regimen is followed daily, not just around competition time. Consistency and dedication make the difference between champions and recreational athletes, and that applies to nutrition and supplementation as well as to training.

P.S. Don't forget your Essential Vitamin Formula™ and Mineral Electrolyte Formula™, both of which can be doubled when in hard training.
Ripped abs – every fitness-conscious person wants them, but few know exactly how to get them, and do so healthfully, without sacrificing lean muscle. The secrets are out – here’s how.

**Secret #1:**
**Eat fewer starchy carbohydrates.** Reducing your intake of starchy carbohydrates – potatoes, yams, whole grains, and brown rice, for example – is an amazing way to start stripping away fat. Metabolically, this dietary reduction helps shift your body into a fatburning mode. Your body simply starts burning fat for energy, since there is a deficit of carbs in your body. How much of a reduction will work? A good rule of thumb is to adjust your carbohydrate-to-protein ratio to between 1 to 1 or 1.5 to 1.

Be aware that one problem with reducing carbohydrate intake is a potential decline in your energy levels. To compensate, try supplementing your diet with CapTri®, our medium-chain triglyceride oil (MCT oil). This is a special type of lipid that provides quality calories and, unlike conventional dietary fats, is not likely to be stored as body fat. Calorie for calorie, CapTri® contributes less to body weight gain (fat gain) than carbohydrates or conventional dietary fat. Think of CapTri® as an immediate energy source that will get burned before the body has time to store it. It is an excellent metabolic-support supplement.

After a few days, increase to one tablespoon with each meal. During hard training, many athletes go as high as two to three tablespoons per meal - a level they have found to be beneficial.

**Secret #2:**
**Avoid or limit alcohol consumption.** Beer, wine and hard liquor are high in sugar and empty calories you don’t need. In fact, each gram of alcohol has 7 calories, compared to 4 calories per gram for other carbs. Alcohol also stimulates your appetite. Plus, new research shows that heavy drinkers tend to gain weight in their abdomen area, giving credence to the idea of a “beer belly.” When there’s alcohol in your system, the liver has to work overtime to process it, so it doesn’t have adequate time to process fat. A study conducted at the University of Lausanne in Switzerland found that the addition of only 3 oz of alcohol per day to the diet resulted in about one-third less fat being processed. You can avoid drinking alcohol and still remain social by sipping on juice, seltzers, club soda or sparkling mineral water on the rocks with a citrus twist.

**Secret #3:**
**Shun fructose.** Of course, I’ve been saying this for decades. Now new research shows that fructose, found naturally in sugar and as high-fructose corn syrup in sodas and junk food, promotes belly fat. The reason for this is because the calories from fruit come in the form of fructose, which is quickly and easily converted to fat in the liver. Excess calories from any carbohydrate source can be converted to fat. The enzyme that regulates whether carbs are stored as glycogen or fat is phosphofructokinase-I. The job of this enzyme is to shuttle carbs into glycogen stores until full, then switch the flow of carbs from glycogen synthesis to fat synthesis. Fructose, however, skips this step in the liver where it is converted to fat.

**Secret #4:**
**Manage stress.** Stress churns out and elevates cortisol, a hormone. If cortisol stays elevated, it directs fat storage to the abdominal area. If you’re like most people, you’ll need to let off some steam during stressful times, and exercise is the perfect stress reliever. Plus, it helps to burn off fat. So why not engage in a little additional aerobics to keep stress under control? Do a bit more of your usual aerobic activity or try some new types just for fun. Spend an afternoon at an ice or roller-skating rink. Whack a ball around the racquetball court. If the weather permits, hit the ski slopes, try cross-country skiing or rent some snowshoes and go exploring. Or get in the pool and swim a few laps.

**Secret #5:**
**Increase the duration and/or frequency of your usual aero-
bic exercise routine.
Duration refers to the length of time that you work out. It’s amazing how many additional calories you’ll consume by pushing your body just a little longer. Increase your exercise frequency too: working out more times per week to obtain a greater caloric expenditure and burn more fat. In one study, men who worked out at moderate intensity on exercise bikes six days a week, twice a day, for 100 days lost an average of nearly 18 lbs—and most of it was pure fat. Although you don’t have to work out this much to keep your six-pack ripped, these findings demonstrate that increased workout frequency translates into more fat loss.

Aerobic exercise, even something as simple as walking is great for obtaining and keeping ripped abs. Researchers at the Washington University School of Medicine in St. Louis, Missouri, put a group of men and women, aged 60 to 70 on a nine to 12-month exercise program that consisted of walking or jogging. On average, the subjects exercised 45 minutes several times a week. By the end of the study, both the men and the women had lost weight. But get this: Most of their weight was shed from the abdominal area. This all goes to show that a simple exercise program like walking or jogging can melt off abdominal fat, which creeps on as we get older. From a health perspective, this type of exercise — by fighting waistline flab — may reduce the risk of diseases linked to abdominal fat. Compared to other fat storage sites on the body, the abdominal region is “lipolytically active.” This means it gives up fat easily. A group of Canadian researchers put this to the test. In their study, 13 obese women exercised moderately for 90 minutes four to five times a week for 14 months. At the end of the study, the women underwent CT scans to detect any changes in body fat patterning. More flab was lost from the abdominal region than from the mid-thigh, proving that ab fat is easily burned with a consistent, long-term exercise program.

Always concentrate on beefing up your aerobic intensity. Make the effort count. For optimum fatburning, you should exercise at a level that is hard enough to raise your heart rate to 70 to 80 percent of your maximum heart rate. (You can calculate your desired heart rate by subtracting your age from 220 and multiplying that number by 70 or 80 percent.)

Secret #6:
Cut the bad fats.
Cutting fatty foods such as red meats, other fatty cuts, butter, and margarine from your daily diet should be part of a total plan to zap tummy fat. Interestingly, when a group of 124 women reduced dietary fat, they each lost 10 to 15 pounds, and more than half the women lost body fat mostly from their abdomen. See the Parrillo Nutrition Manual for how much fat to include in your diet, including essential fatty acids.

Secret #7:
Stop yo-yo dieting.
Be forewarned about dieting: Going on and off a reducing diet can make your waistline look like the equator. The proof is in some interesting research conducted at Yale University several years ago. Researchers there studied pre-menopausal women who had gone up and down in weight many times during their lives — a result of repeated efforts at dieting. What they found was intriguing: Those women with a history of on-again, off-again dieting and fluctuations in weight tended to gain fat mostly in the abdominal region. In other words: When fat returns after you go off a diet, it returns to your waistline. It’s best to not diet too drastically, but rather follow a healthy nutritional plan, like the Parrillo Nutrition Program.

Secret #8:
Work your six-pack.
True, waistline exercises will firm up abdominal muscles underneath the fat and wake up sluggish circulation so fat-burning can proceed. So don’t neglect your ab work. One of my favorites is the knee –up. You’ll need a dip stand to perform this exercise. Facing away from the stand, hoist yourself up between the two parallel dipping bars and support yourself there with your legs straight. Bend your knees and pull your thighs in toward your midsection. Return to the starting position and repeat. Perform as many repetitions as you can.

Good looks aren’t the only benefit you get from your ab workout. The four sets of muscles that make up your abdominal column work together with your back muscles to help you sit straight, stand tall, and move with ease. If you’ve ever had a low-back problem, you know that one of the first rules in restoring health and preventing future back ailments is to strengthen your ab muscles.
Remember too: Trimming that roll around the middle lowers your risk factor for heart disease, high blood pressure, diabetes, some cancers, and many other life-shortening diseases. There’s a healthy payoff for anyone who gives the abdominals individual attention.

References


Rest and recuperation can work in conjunction with growth hormone (GH) if this relationship is properly understood. For background, growth hormone (GH) is a protein hormone made by the pituitary gland, a small secretory gland at the base of the brain. Hormones, chemical messengers secreted by endocrine glands into the bloodstream, are delivered to target tissues, where they exert their effects. (1) Although growth hormone is of interest to adults, its primary function is to promote growth during childhood. Actively growing children have the highest levels of growth hormone. Gradually, GH release decreases with age. The decline in GH levels may in fact be the cause of some of the processes of aging. If you haven’t made good gains in awhile try to incorporate some of the following GH-releasing ideas.

GH & Rest between Sets
An important exercise parameter that seems to enhance GH release is to use shorter rest intervals when training. To do this, of course, you have to use lighter weights (and more reps). A difficult protocol that works well to increase GH levels is to train to failure at 10 reps (use 10 rep maximum weight) combined with one-minute rest intervals (5). If you’re used to resting 3-5 minutes between sets, shorten up the rest interval to one minute or less; it will work wonders. Sometimes bodybuilders get into a rut; they plateau and can’t figure out the problem. It might be that they’re training like powerlifters: very heavy weights, very low reps with long rest intervals.

In 1993 a scientific study compared the GH-release of 20 sets of one rep each (done maximally) to 10 sets of 10 reps (also maximum) and found the 10 sets of 10 reps resulted in greater GH release (6). Why? Probably the larger volume of work, done with enough reps to result in some lactic acid production, combined with short rest intervals, is the best way to trigger GH release. It may prove beneficial to include some high intensity aerobics as part of your cardiovascular training. There seems to be theoretical justification to include sprinting for better results.

A postscript here: Weight training is incredibly intense exercise and within seconds of the commencement of a heavy set, energy reserves are depleted and waste products begin to accumulate (1-4). Creatine phosphate serves as an energy donor and helps to maintain the supply of ATP, the molecule used by muscles to power contractions. ATP is rapidly depleted and strength fades as a heavy set proceeds, muscular contractions soon stop altogether. During the rest interval between sets ATP and creatine phosphate stores are repleted. Supplementation with Creatine Monohydrate can help the entire depletion-regeneration process as it increases intracellular Creatine pools (5-6). Supplement with our Creatine Monohydrate Formula™ and you will get a better training effect.

Sleep & Stress Issues
Always try to get enough sleep, especially since GH is naturally released at night. If you are unable to sleep optimally, your recovery will suffer and you won’t be able to train each muscle group as frequently.

You can also stimulate the release of growth hormone through the ingestion of amino acids. Arginine Pyroglutamate and Lysine Monohydrochloride, two potent amino acids, when isolated and grouped together and taken on a regular basis have been shown to promote the secretion of growth hormone in the body. Parrillo Performance has grouped this amino duo in its Enhanced GH Formula™. These two aminos have been shown to stimulate the release of GH in test subjects. Growth hormone is the mightiest of all hormonal secretions as it increases mass and decreases bodyfat simultaneously, and aids in joint repair!

This particular amino grouping is best taken on an empty stomach and it is suggested to take Enhanced GH Formula™ immediately upon awakening, before training and just before bedtime. Taken before bed (2 to 3 capsules), these easy to digest capsules will dissolve as you sleep, providing you with GH-trigging amino acids. Grow while you sleep! Take them in the morning too, and prior to training. Mus
cle growth and decreased body fat are the ultimate goals of every hard-training bodybuilder and strength athlete and muscle can’t grow without growth hormone. Growth hormone increases lean body mass by stimulating protein synthesis and increasing nitrogen retention. GH is anabolic, meaning that it acts to promote incorporation of nutrients into new body tissues (1,2). One way to increase your natural GH levels is through supplementation with a special combination of amino acids (3), combined with adequate rest and sleep. Nutrition plays an absolutely central role in the rest and recovery process. The foods you eat supply you with the building blocks the body needs to repair itself. If you are training intensely and getting enough sleep but not eating right, then your growth potential will be severely limited. You should be getting one to two grams of protein per pound of body weight every day for optimal growth and recovery (7-10).

Most bodybuilders use a protein supplement as the foundation for their nutritional program. We think the best protein on the market is our Hi-Protein Powder™ or Optimized Whey Protein™. Our whey protein is fortified with extra glutamine and branched chain amino acids. In terms of recovery and growth the two most important supplements are protein powder and Creatine Monohydrate. Carbohydrates are required to maintain your muscle glycogen stores. When muscle glycogen is depleted, strength and endurance drop off markedly (1-4). If you are no longer getting a good pump after a set, this is a sign that you are running low on glycogen. In this case, increase your carbs by using two to four scoops of Parrillo Pro-Carb™ after your workout. This is the perfect time to supplement with carbs as they will be stored as glycogen. Don’t forget to take your vitamins and minerals. I suggest six meals a day, spaced at regular intervals. Each meal should include a protein source (such as lean chicken or turkey), a starch, and a fibrous vegetable. Good starches include potatoes, rice, beans, and corn.

Stay away from simple sugars and refined carbohydrates such as pasta or bread. Metabolically, refined carbohydrates behave much like simple sugars. Also avoid milk and fruit, which are rich in sugars. Consult the Parrillo Performance Nutrition Manual for detailed instructions. Adequate nutrition and sleep are two critical ingredients in achieving optimal recovery. Don’t be afraid to vary and experiment with your rest intervals and training frequency.

References


If you’re an older athlete – say over 50 – and want to stay competitive, do you have different nutritional needs than your younger counterparts? Most research to date suggests that your nutritional needs are not significantly different. However, there are definitely ways you can optimize your diet and supplement program to help you keep your edge. The following tips can help you stay competitive.

The most important thing you can do is routinely eat quality calories from nutrient-dense, health-protective foods that support top performance, enhance recovery from hard workouts, and reduce the risk of heart disease, cancer, osteoporosis, and other debilitating diseases.

The Parrillo Nutrition Program is designed to supply quality calories in amounts to keep you well-fueled. It consists of lean proteins, starchy carbs, and fibrous vegetables. Combine these at each meal and you’ll obtain an excellent nutritional base for performance and health. Consult your Parrillo Nutrition Manual for details on how to plan your diet. Recovery is the process of regeneration that takes place in the aftermath of a workout. To appreciate its importance, consider what happens inside your body as a consequence of intense exercise: Energy-giving glycogen stores are depleted; muscle protein is dismantled; microscopic tears in muscle fibers occur; energy-producing compounds are lost from cells; and fluid and electrolytes dwindle.

Older athletes sometimes recover more slowly, so you’ll need to help the process along by supplying your body with all the nutritional building blocks it needs to restore what’s lost and repair what’s damaged. Of all the nutrients necessary for optimal recovery, dietary carbohydrate takes precedence for two reasons. First, carbohydrate restocks your body with muscle and liver glycogen, which can be depleted during exercise. Replenishing these stores allows you to train harder on successive workouts for greater gains. Second, carbohydrate reduces the need for muscle protein breakdown to provide energy for resistance exercise, leading to a more favorable protein balance in the body. Carbohydrate also triggers the release of the hormone insulin, which promotes muscle growth as well. Various research studies have proven that a carbohydrate/protein supplement triggers the greatest elevations in insulin and growth-hormone levels in exercising study subjects. Clearly, protein works hand in hand with post-exercise carbs to create a hormonal environment that promotes the greatest increase in muscle growth. The nutrient combination also jumpstarts your body’s glycogen-making process — faster than if you just consumed carbs. Carbs produce a surge in insulin levels. Biochemically, insulin is like an accelerator pedal that races the body’s glycogen-making motor. Good recovery drinks include Parrillo Pro-Carb™, 50/50 Plus™, or Optimized Whey™. As we get older, our protein needs increase slightly.

Nutritionally, protein is the basic, most important building material in your body, essential to high-level health because of its role in growth and maintenance. Your body breaks down protein from food into nutrient fragments called amino acids and resuffles them into new protein to build and rebuild tissue, including body-firming muscle. Protein also helps your immune system functioning up to par, helps carry nutrients throughout the body, has a hand in forming hormones, and is involved in important enzyme reactions such as digestion.

Proteins found in the Parrillo Nutrition Program include fish, white meat poultry, egg whites, and our line of protein powders and bars. Although your bones have stopped growing, you can keep them strong with weight training and daily calcium. Yes, you can get protective levels of calcium from natural foods, but it’s a good idea to hedge your bets and take a mineral supplement. Per pill, Parrillo Mineral-Electrolyte™ contains 250 mg of calcium; 5 mg of iron; 250 mg of phosphorus; 75 mcg of iodine in the form of kelp; 250 mg of magnesium; 11 mg of zinc; 50 mcg of selenium; 500 mcg of copper; 10 mcg of manganese; 25 mcg of chromium picolinate.
minate; 45 mg of potassium; 500 mcg of boron; along with other nutrients. I recommend that you take one tablet with each meal during the day for optimum metabolism and well-being.

Yes, your joints may get creaky and achy with age, but don’t despair. You can help them with some natural approaches, and hopefully not have to resort to over-the-counter or prescription pain-killers (unless your physician recommends them).

One option available is evening primrose oil, in particular has specific benefits for athletes, bodybuilders – really, anyone who is interested in improving personal health and fitness. It comes from a plant that grows wild along roadsides. It is so named because its yellow flowers resemble in color real primroses, and these flowers open only in the evening. From this oil, your body can directly obtain GLA, which stands for gamma-linolenic acid. GLA is ultimately converted into the prostaglandin E1 series, a group of beneficial chemicals that helps reduce inflammation, regulates blood clotting, decreases cholesterol levels, and lowers high blood pressure, among other functions.

A growing number of medical experts and scientists now believe that taking GLA-rich oils can effectively fight the inflammation - the major cause of swollen, painful joints. GLA is a building block of a beneficial type of prostaglandin, which exerts an anti-inflammatory effect on the body. Thus, supplementing with GLA increases production of these prostaglandins and may help control the pain and inflammation associated with joint problems and arthritis.

Parrillo Performance recognized the need for a product that counteracts joint and inflammation problems. The Parrillo Performance solution is Evening Primrose Oil™ a concentrated source of essential fatty acids, including GLA. EFA’s keep joints lubricated, hair and skin healthy, and brain neurons firing correctly. Each 1000 mg gel cap contains 30 IU’s of vitamin E, 100 mg of Gamma Linolenic Acid and 760 mg of Linoleic Acid. Take one to three capsules daily.

Our ongoing research recently led us to develop the Parrillo Joint Formula™ to assist in the rebuilding of damaged joints, tendons, cartilage, and soft tissue. This supplement contains glucosamine, a combination of glucose and amino acids that has been extensively studied for joint health and support. When you supplement with glucosamine, it gathers in the liver, kidneys and articular cartilage. Once it reaches the chondrocytes, the cells that produce cartilage, the glucosamine is incorporated into those cells. Eventually, it forms a viscous fluid that helps protect and lubricate your joints and cartilage. This formula also contains chrondroitin, which appears to stimulate cartilage cells to create new cartilage and it may also slow the breakdown of cartilage; shark cartilage, with its mucopolysaccharides that help relieve the chronic and painful inflammation that is so injurious to joints; and green sea mussel, a nutrient that supports the restoration and maintenance of synovial fluid and connective tissues.

The suggested usage is one or two tablets three times daily. For best results, use in conjunction with the Parrillo Performance Nutrition Program.

Adequate fluid replacement is essential for athletes of all ages. But the older you get, the less your thirst mechanism kicks in. In other words, you may need fluids but not feel thirsty. To reduce the risk of dehydration, drink at least 8 to 10 glasses of pure water every day. For the older athletes who are competing in high intensity endurance exercise, evidence for the usefulness of carbohydrate-containing sports drinks, such as Parrillo Pro-Carb™, exists. Eat plenty of good calories, recover properly, protect your joints, and drink plenty of fluids – and you’ll enjoy feeling young as you keep your winning edge.

Reference
MCT Oil Really Is A Fat-Burning Fat!
by John Parrillo

I love it when research confirms what we at Parrillo Performance have known for decades. Yet another study has shown that MCT oil really is a fat-burning fat. Of course, you know MCT oil as CapTri®, one of our flagship supplements. MCT oil was first formulated in the 1950s by the pharmaceutical industry for patients who had trouble digesting regular fats. It is processed mainly from coconut oil but does not have any of the adverse effects associated with tropical oils.

Here’s the latest, greatest news on MCTs: A 2008 study published in Journal of the American College of Nutrition found that substituting moderate amounts of MCT oil for other fats in a weight-loss program resulted in fat loss, including around the waist, with no adverse impact on cardiovascular risk factors.

In the 16-week study, 31 overweight patients consumed either olive oil or MCT oil in muffins. All of the subjects participated in dietitian-led weekly group weight-loss counseling sessions that stressed following a prudent diet, and encouraged healthy eating patterns. The oils accounted for roughly 12 percent of participants’ calorie prescription. At 16 weeks, the MCT group had lost significantly more weight: an average of 7 pounds, or 3.8 percent of their baseline body weight, compared with 1.7 percent in the olive oil group. That’s 200% better than the control group for all you math whizzes. That’s over twice the weight loss of the control group. The MCT group also had a 1.5 percent decrease in total fat mass as measured by CT scan, including a reduction in intra-abdominal fat. (1) Unlike conventional oils, MCT oil gets burned immediately by the liver before it even has a chance to get stored as body fat, and many researchers feel that it has a place in weight management. Of course, I agree!

CapTri® is a unique high thermogenic ultra pure MCT available exclusively from Parrillo Performance. CapTri® comes unflavored for cooking or making salad dressings, etc. or butter flavored for drizzling over vegetables, fish, popcorn and more. CapTri® contains around 115 calories per tablespoon. I have very specific recommendations for how to use CapTri® in a weight-loss program, and it is Parrillo Performance’s own version of the low-carb diet (but without the side effects of typical low-carb diets). The calories from CapTri® provide the energy you need to keep training hard, while you’re trying to lose body fat. Also, by substituting CapTri® for an equivalent number of calories from carbohydrates you avoid the slowdown in metabolic rate which inevitably results from calorie-restricted diets.

My approach to low-carb dieting allows you to utilize the power of the low carb diet without resorting to using regular fat as a food source. Instead of regular fat, you use high thermogenic CapTri®, which behaves more like a carbohydrate in the body, except that it doesn’t increase insulin levels. This means you can use CapTri® in place of carbs to decrease insulin levels and shift your metabolism into a fat-burning mode. This is very similar to the strategy of low-carb diets except without relying on conventional fat as an energy source.

To use CapTri® for fat loss, continue to keep your protein intake high at about one to 1.5 grams per pound of body weight per day, then reduce carbohydrate intake and provide an equivalent number of calories from CapTri®. For example, if you normally consume 300 grams of carbs per day (1200 calories worth), reduce that to 150 grams per day and add 5 tablespoons of CapTri® per day (providing 570 calories). By reducing carbs and always combining your starches with protein, vegetables, and CapTri® at each meal, you will dramatically reduce insulin levels and maximize fat loss. One more point: Unlike conventional fats, CapTri® also works well during weight gain because it doesn’t contribute to fat stores (2, 3).

Of course, CapTri® isn’t just for weight loss; it’s also for building and maintaining lean mass, since it has a positive effect on your metabolism. CapTri® is very thermogenic and dramatically increases the rate of oxygen consumption af-
ter a meal. It’s no accident that we’ve incorporated CapTri® at the core of our supplement program. The reason? As you know, CapTri® is a very concentrated source of calories - calories that can be used for energy and to support weight gain. The increase in oxygen consumption that occurs after you eat CapTri® means that it is being burned very fast (4, 5). Remember, foods are burned by reacting with the oxygen we breathe, so the reason oxygen consumption increases after you eat is to supply enough oxygen to burn the food to produce energy. Some of the energy from CapTri® is converted into body heat in a process known as thermogenesis (4, 5).

This is the single most important reason why excess calories from CapTri® have less of a tendency to make you fat than excess calories from other foods. CapTri® is burned so fast that excess calories from it are turned into body heat instead of being converted into fat. This is why I’ve called CapTri® the best supplement ever developed for active people - it’s an excellent way to supply extra calories but has very little tendency to make you fat. CapTri® is available exclusively from Parrillo Performance. You can use CapTri®: 1. To maintain energy levels while dieting. 2. To add clean calories for gaining muscle. 3. To replace regular fat with healthier CapTri®.

References
Take your amino acids! A supplement – amino acids – that has been around for ages is getting a fresh look from science and the news for athletes and exercisers has never been better.

Case in point: Investigators at the College of New Jersey studied the effect of a pre-exercise energy sport drink on the acute hormonal response to resistance exercise in eight experienced resistance-trained men. The subjects were randomly provided either a placebo (a carb drink) or the supplement (a combination that included branched chain amino acids and creatine) and they drank it 10 minutes prior to exercising. The men then performed 6 sets of no more than 10 repetitions of the squat at 75 percent of their 1 repetition maximum (1RM) with 2 minutes of rest between sets.

The men who supplemented with the amino acid formula could do more repetitions and lift heavier weights than those on the carb-placebo drink. Equally impressive, the enhanced exercise performance resulted in a significantly greater increase in both growth hormone and insulin concentrations, indicating an augmented anabolic hormone response from supplementing with the amino-acid formula. (1) There is more: amino acid supplementation works as a treatment for “cachexia,” the life-threatening muscle loss that occurs with cancer and other diseases that cause muscle-wasting. Nutritional supplementation with amino acids has been shown to significantly improve blood sugar control and insulin sensitivity in poorly controlled elderly subjects with type 2 diabetes. And, amino acids are being studied in cardiovascular diseases, which show it might improve well-being, enhance physical function, and improve recovery from exercise. (2)

For years, Parrillo Performance has recommended that active people, from bodybuilders to endurance athletes to exercisers, supplement with amino acids. Here is an overview of what a solid amino acid supplement program should entail – and why:

**Incorporate BCAA’s**

Parrillo Performance provides an important mixture of amino acids – the branched chain aminos - in its Muscle Amino Formula™. The time to use this product is immediately before and after training as well as with meals. Hard dieting is a great time to supplement with branch chain amino acids. During times of energy insufficiency (dieting), your body will actually break down its own muscle to use as fuel if no other is available. Catabolism is a dreadful metabolic state that occurs when glycogen stores have been depleted and fat oxidation has maximized. Metabolically, your body requires a certain level of glucose (blood sugar) to be maintained in order for the brain to function. While body fat provides a long-lasting energy supply, fat cannot be converted into carbohydrate by the human body. But protein (amino acids) can. Under adverse conditions, carbohydrates are exhausted and your body breaks down protein stores (muscle tissue) to convert into carbohydrate to supply energy. Branched chain amino acids are effective because they form a substrate for growth and are metabolized as fuel directly within muscle cells. A handful of Muscle Amino Formula™ capsules will help prevent the onset of catabolism and has both anabolic and anti-catabolic properties. Hi-Protein™ and Optimized Whey™ are fortified with extra BCAAs for just this reason. We suggest two or more with every meal. Remember that BCAAs require insulin for absorption into muscle cells so take them with food or a protein and/or carb drink rather than on an empty stomach!

**Don’t Forget Growth Hormone Releasing Aminos**

Certain combinations of specific amino acids, such as those found in Enhanced GH Formula™, are shown to enhance GH release (8). Probably the best way to use these is on an empty stomach, first thing in the morning, right before a workout, and before bed. (MCTs, like CapTri®, can be a potent stimulus for GH release.)

Our supplement contains arginine pyroglutamate and lysine monohydrochloride, two potent amino...
acids, when isolated and grouped together and taken on a regular basis have been shown to promote the secretion of growth hormone in the body. Growth hormone is the mightiest of all hormonal secretions as it increases mass and decreases body-fat simultaneously, and aids in joint repair!

Arginine has a number of other important functions in the body, including the fortification of the immune system. In studies with animals and humans, arginine has been found to improve wound healing and bolster immune responses, plus reduce the incidence of infection following surgery. Arginine has other duties, as well. It is required to manufacture creatine, an important chemical in the muscles that provides the energy for contractions. In addition, Arginine apparently helps prevent the body from breaking down protein in muscles and organs to repair itself when injured. Meat, poultry, and fish are good sources of arginine, as are numerous supplements, including our Enhanced GH Formula™ and our Ultimate Amino Formula™.

Glutamine & Ultimate Amino Formula™

Glutamine is another important amino acid. It is the favored fuel of your immune system. This means you need it when you’re ill, stressed, or recovering from surgery. Researchers have discovered that many athletes are deficient in glutamine – a shortage that makes them vulnerable to infections. Glutamine is technically described as a “glucogenic,” meaning that it assists your body in manufacturing glycogen, the chief muscle fuel. Also, supplemental glutamine has been shown to elevate growth hormone levels – and may even curb the desire for sugary foods.

Each capsule in our Ultimate Amino Formula™ contains 103 milligrams of glutamine. We recommend that you take two or more capsules of this supplement with each meal. That should supply a gram or more daily – which is appropriate for athletes and active individuals. So – there are plenty of wonderful benefits to supplementing with amino acids, especially if you want to maximize performance, muscle development, and overall well-being.

References


Back on the Wagon: My 2-Day Undo Diet
by John Parrillo

If you’re like millions of Americans right now, you indulged over the holidays – and that’s okay and that’s normal. You probably don’t even have to jump on the scales to confirm that you’re heavier. A quick look in mirror says it all: yes, you look bloated.

But hold on. Don’t throw in the towel yet. With the holidays over, you can start again with a clean slate and get your momentum going with my 2-Day Undo Diet. Start it on Monday and continue on Tuesday. It will re-energize you, help flush out salt and processed sugar, leave you feeling full, and prep you for dropping fat pounds. Time is of the essence, so let’s get started!

Pre-Breakfast Aerobics
When your alarm goes off that morning, start with 16 ounces of pure, fresh water. Then get into your exercise clothes for pre-breakfast aerobics. That’s right, do your aerobics on an empty stomach. Then your glycogen levels are somewhat depleted from your overnight fast and insulin levels are low. This internal situation forces your body to start drawing on your fat reserves for energy. With pre-breakfast aerobics, you’ll start stripping away fat.

Do pre-breakfast aerobics Monday and Tuesday mornings – for 30 to 60 minutes each time.

While it’s true you burn a higher percentage of calories from fat during low intensity aerobics, you will burn more grams of body fat if you perform high intensity aerobics, because you’ll burn so many more total calories. Also, if you do reasonably intense aerobics you will get the added benefits of increased vascular density and enhanced fat burning capacity. Increase the volume of aerobics progressively as you get leaner. If your fat loss plateaus, the first thing to try is to increase the intensity of your aerobics, while increasing your calories to get your metabolism going again.

Mon. & Tues. Weight Training
In addition to aerobics, lift weights 45 to 60 minutes a day on Monday and Tuesday. On this program I would recommend a two-day split, which means you train your upper body on Monday and your lower body on Tuesday. That way, you hit your entire body and all your muscles.

Multiple Meals
Divide your food choices evenly over five or six meals. Most people get better results if they keep food selections relatively simple for this program. You will get good results using egg whites, skinless chicken breast and low-fat tuna for protein sources. Have generous portions of vegetables and salad at each meal. You can have essentially all the vegetables and salad you want. It’s very difficult to eat too many calories from vegetables. I’m talking about things like broccoli, cauliflower, asparagus, spinach, green beans, and so on. Refer to the Parrillo Performance Nutrition Manual for a more extensive list, as well as the nutrient breakdown.

Some tips for taste: Use green leaf lettuce with fresh peppers and onions, tomatoes and some fresh cilantro. Balsamic vinegar or lemon juice make tangy dressings with practically no calories. Grill your chicken outside to keep things flavorful. Or have some fresh grilled salmon or swordfish instead of tuna. Add some fresh mushrooms and chopped peppers to the egg whites. It doesn’t take too much effort to make this diet enjoyable. You will enjoy it even more once you see how fast the results come.

Limit Starchy Carbs
Starches are things like potatoes, oatmeal, corn, peas, beans and rice. Treat yourself to a cup of oatmeal in the morning and maybe one other starch during the day. By supplying most of your carbs as vegetables and salad instead of starch, you will find it easier to drop pounds and flush your system of toxins. The bulk will help fill you up, the volume of food will be more satisfying and the vegetables will produce a smaller insulin response.

Eat Breakfast
Another important point is to always eat breakfast - this gets your
metabolism going first thing. This is why breakfast is probably your most important meal. You have the whole day to burn off any excess calories you consume at breakfast - any excess calories you consume right before bed are likely to be stored as fat.

Add in CapTri®
Since you’re temporarily reducing starchy carbs to promote fat metabolism, it makes sense to replace those calories with another fuel source, namely CapTri®. CapTri® is a good choice because it is readily burned as fuel and won’t be stored as body fat. CapTri® actually has a higher “thermogenic effect” than carbohydrate, meaning that more of this dietary energy will be lost as body heat with less energy available for storage. This further promotes additional fat loss. Include up to 3 tablespoons of CapTri® daily over the two-day period.

Supplement!
In addition to CapTri®, there are four supplements that really help on this program. First are the Essential Vitamin™ and Mineral-Electrolyte™ formulas. Since you are avoiding fruit and milk, you will need a vitamin and mineral supplement. It is difficult to supply your body’s requirement for calcium without using a lot of dairy products, unless you use a supplement. Next is Parrillo Creatine Monohydrate™, which is in a class by itself in terms of supplements. You cannot be your most muscular and lean without using creatine. No matter how good you look, you’ll be better if you add creatine.

Last is Optimized Whey Protein™. We started with the finest quality whey protein and then fine tuned the amino acid profile by adding extra glycine, glutamine and branched chain amino acids. I would consider this a “must have” supplement while dieting strictly. The high levels of glutamine and BCAAs act to protect muscle tissue during energy restricted diets.

Sleep
Always try to get enough sleep. If you are unable to sleep optimally, your recovery will suffer and you won’t be able to train each muscle group as frequently. During sleep, your body releases growth hormone (GH), a protein hormone made by the pituitary gland, a small secretory gland at the base of the brain that enhances protein synthesis and other functions.

Keep Your Momentum
You probably have a long-term objective of losing a certain number of fat pounds and gaining muscle. After the two-day diet, keep going! Renew your commitment daily to yourself and to the Parrillo Nutrition Program. Do this, and you’ll guarantee long-term results.

Okay - Get ready to take action! I know you can do it. Here’s the diet:

Monday Undo Diet
Meal 1
• 5 to 6 scrambled egg whites
• 1 cup oatmeal
• Water or black coffee

Meal 2
• 1 serving Parrillo Optimized Whey Protein Powder™

Meal 3
• 2 cups mixed-greens salad with 4 to 6 ounces tuna, with balsamic vinegar and 1 – 2 tablespoons CapTri®
• 1 large baked potato
• Water, black coffee or unsweetened tea

Meal 4
• Parrillo Hi-Protein Bar™

Meal 5
• Skinless chicken breasts
• Plenty of steamed fibrous vegetables (broccoli, green beans, cauliflower, summer squash, etc.) with 1 – 2 tablespoons CapTri®
• Parrillo Protein Ice Kreem™ - Frozen Protein Dessert or Parrillo Pudding™ (Protein Ice Kreem™ is easy to make, just add 4 scoops of mix and 2 cups of water to your Ice Cream Maker and follow the machine’s directions. In only 25-30 minutes your Ice Kreem™ is ready to enjoy!)
• Water

Tuesday Undo Diet
Meal 1
• 5 to 6 scrambled egg whites
• Pancakes (Made with Parrillo Hi-Protein Pancake and Muffin Mix™)
• Water or black coffee

Meal 2
• 1 serving Parrillo Optimized Whey Protein Powder™

Meal 3
• 2 cups mixed-greens salad with 6 ounces skinless chicken breasts, with balsamic vinegar and 1 – 2 tablespoons CapTri®
• 1 large baked sweet potato or yam
• Water, black coffee or unsweetened tea
Meal 4
• Parrillo High Protein Bar™
• Water, black coffee or unsweetened tea

Meal 5
• Baked salmon
• Plenty of steamed fibrous vegetables (broccoli, green beans, cauliflower, summer squash, etc.) with 1 – 2 tablespoons CapTri®
• Parrillo Pudding™
• Water, black coffee or unsweetened tea
The Real Superfoods
by John Parrillo

There’s a lot of talk these days about “superfoods” – foods that give you extra nutrients, provide energy, help fight disease and aging, and for bodybuilders and athletes, build muscle. Obviously, superfoods are the way to go to get the most health- and muscle-building nutrition for your time and money. And fortunately, the Parrillo Nutrition program is packed with superfoods. For example:

Lean Proteins
Proteins are found in all cells and tissues and are required for the structure and function of every part of the body. And of special interest to bodybuilders, muscles are made of protein.

Protein is required in the diet to maintain tissues and organs and to supply building blocks for growth. Proteins from animal sources such as meat, eggs, and milk, are called “complete” proteins because they supply all the essential amino acids. Animal proteins provide a balance of amino acids similar to that of human tissues. Plant proteins have a profile of amino acids different from human proteins. For this reason animal proteins are considered to be higher quality protein foods. Most vegetable proteins are deficient in one or more of the essential amino acids and are therefore called “incomplete” proteins. However, if vegetable proteins are combined properly, the balance of amino acids in the combination can approach the amino acid profile found in animal proteins.

Superfood protein sources include skinless turkey breast, skinless chicken breast, fish, and egg whites. Fish, in particular, is vital in terms of heart disease. Salmon and other fatty fish - like mackerel, lake trout, herring, sardines and tuna - are rich in omega-3 fatty acids that decrease the risk of heart attack and stroke, and may cut your risk of death from coronary artery disease in half. Omega-3 fats also have immune-enhancing and anti-inflammatory effects, reduce the risk of prostate and colon cancers, and ease the symptoms of rheumatoid arthritis and some psychiatric disorders.

Starchy Carbohydrates
Carbohydrates are energy foods. During digestion, they are changed into glucose (blood sugar), which circulates in your blood and is used as energy for the red blood cells and your central nervous system. Glucose not used right away is stored in the liver and muscles as glycogen, which provides an additional reservoir for energy.

Carbohydrates also supply an amazing fat-fighting nutrient – fiber, the non-digestible remnant of plant foods. A growing body of research shows that high-fiber eating helps peel off pounds and banish them for good.

How exactly does fiber work this weight-loss magic?

When eaten with other nutrients like protein, fiber slows the rate of digestion too, stabilizing your blood sugar between meals so that it is not converted to fat stores.

The superfood carbohydrates found in the Parrillo Nutrition Program include certain types of whole grains, brown rice, potatoes, sweet potatoes, yams, legumes (beans and lentils), and non starchy vegetables (see below), from broccoli and green beans to cauliflower to salad vegetables (what we call “fibrous carbs”).

Non-Starchy Vegetables
You can’t go wrong with vegetables; every one is a superfood. But here are a few stand-outs:

Broccoli
This amazing vegetable is rich in sulforaphane, an antioxidant linked with a reduced risk of a number of cancers, especially lung, stomach, colon and rectal cancers. The nutrients in broccoli also have anti-inflammatory properties, and we know that an important factor in reducing the risk of disease is to decrease inflammation.

Spinach
Improve your vision and protect against cancer with spinach, one of the richest dietary sources of an antioxidant called lutein. Lutein helps protect against heart disease and some cancers, and has been shown to reduce the risk of cataracts and macular degeneration. Spinach is
also rich in beta-carotene, which may protect against cancer. Other lutein-rich foods include kale, collard greens, chard and beet greens.

*Tomatoes*
These are loaded with lycopene, an antioxidant that reduces the risk of prostate, breast, lung and other cancers, and has heart-protective effects. Research shows that the absorption of lycopene is greatest when tomatoes are cooked with olive oil.

*Good Fats*
Good fats are superfoods. They fall under a general classification called unsaturated fats. There are two types of unsaturated fats: polyunsaturated and monounsaturated fats. Oils such as safflower, sunflower, corn, soybean and fish oils, evening primrose oil found in Parrillo Evening Primrose Oil 1000™ and Parrillo Fish Oil DHA 800 EPA 200™ are polyunsaturated fats. They contain “essential fatty acids,” or EFAs for short. Required for normal body function, EFAs must be supplied by your diet since the body cannot make them on its own.

From EFAs, your body synthesizes two other important fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These fatty acids, along with alpha linolenic acid, are referred to as omega-3 fatty acids, a term that describes their molecular structure. You can also obtain EPA and DHA directly from cold-water fish, flaxseed and omega-3 enriched eggs (eggs from chickens fed fish meal or flax meal).

Monounsaturated fats are plentiful in olive, canola and peanut oils; they are also found in shellfish and cold-water fish such as salmon, mackerel, halibut, black cod and rainbow trout.

So if you’re looking for what really works for optimal health and disease prevention, focus on superfoods. The Parrillo Nutrition Program is filled with them.
Parrillo Performance Technical Report #1
Metabolism of Medium Chain Triglycerides: Introduction

by Arthur E. Robertson, Ph.D.

I. Introduction

Nomenclature of Fats

Fats, or lipids, are found in all cells and perform a variety of functions essential for life. These include their roles in energy storage, membrane structure, and incorporation in vitamins, hormones, and prostaglandins (Zubay, 1983). Fats are used to cushion and insulate the body and function as electrical insulation in the nervous system. Triglycerides are the most common form of fat found in foods and stored in body fat depots. Triglycerides are comprised of three fatty acids (figure 1) esterified to a glycerol backbone (figure 2). Most naturally occurring triglycerides contain fatty acids 16-20 carbon atoms in length. Such fatty acids are called “long chain fatty acids” (LCFAs), and their corresponding triglycerides are called “long chain triglycerides” (LCTs). Medium chain triglycerides (MCTs) are comprised of medium chain fatty acids (MCFAs), which are 6-12 carbons in length. Although the carboxylic acid part of fatty acids is soluble in water, the hydrocarbon chain is not. Thus, LCFAs are not water soluble. Since the hydrocarbon chains of MCFAs are shorter, MCFAs are more water soluble than LCFAs. Likewise, MCTs are also relatively soluble in water, due to ionization of the carboxylic acid groups and the small size of the hydrocarbon chains. Their small molecular size and greater water solubility cause MCTs to undergo a different metabolic path than that experienced by LCTs (Bach and Babayan, 1982).

Occurrence and Purification of MCTs

Medium chain triglycerides occur naturally in small quantities in a variety of foods, and are present naturally in the blood of the human fetus and in human milk (Bach and Babayan, 1982; Souci, Fachmann, Kraut, 1989/90). In cow’s milk, C6-C14 fatty acids together account for 20% of the total fatty acid composition (Christensen et al, 1989). Commercially, medium chain fatty acids are prepared by the hydrolysis of coconut oil (an abundant source) and are fractionated by steam distillation. The MCFAs so obtained consist of predominantly C8:0, with lesser amounts of C10:0, and minute amounts of C6:0 and C12:0. The fractionated MCFAs are re-esterified with glycerol to generate MCTs (Bach and Babayan, 1982). MCT oil softens or splits certain plastics such as polyethylene and polystyrene, but not polypropylene. It is recommended that MCT oil be stored in metal, glass, or ceramic containers (Sucher, 1986). MCT oil has a caloric density of 8.3 calories per gram; one tablespoon equals 14 grams and contains 115 calories. MCTs are not drugs and have no pharmacological effects (Bach and Babayan, 1982).

Historical Uses of MCTs

Since their introduction in 1950 for the treatment of fat malabsorption problems, medium chain triglycerides have enjoyed wide application in enteral and parenteral nutrition regimens (Bach and Babayan, 1982). Fat emulsions can be used to provide up to
60% of nonprotein calories. Before the availability of lipid emulsions suitable for intravenous use, glucose was used as the only nonprotein source of calories (Mascioli et al, 1987). Not only did this result in essential fatty acid deficiencies, but it was also undesirable because it increased hepatic lipogenesis and respiratory work. Although inclusion of LCTs in intravenous feedings represented an improvement, problems remained with slow clearance of LCTs from the bloodstream and interference with the RES component of the immune system. When medium chain triglycerides or structured lipids (triglycerides containing both MCFAs and LCFAs) are added to the regimen, calories are provided in a more readily oxidizable form (Schmidl, Massaro, and Labuza; 1988), and less interference with the RES is observed (Mascioli et al, 1987). In one case, MCT was fed as the exclusive source of fat (along with a small amount of LCT to provide essential fatty acids) to a patient with chyluria (a fat malabsorption disease) for over 15 years without producing side effects (Geliebter et al, 1983).

**Sports Nutrition**

Although MCTs have been used in hospital environments for years, their use by healthy individuals is relatively new. Recently, athletes have begun to use MCTs to increase caloric consumption, thereby providing energy and facilitating weight gain. Their low food efficiency, due to the thermogenic effect, means that MCTs have very little tendency to be converted to body fat. The calories from MCTs represent an additional energy source which (in contrast to conventional fats) can be used concurrently with glucose.

**II. Metabolism**

*Digestion and Absorption of Fats*

Since LCTs are not very soluble in water, the body has to go through an elaborate digestive process in order to absorb these nutrients. Bile salts are secreted by the gall bladder to help dissolve the LCTs. Upon ingestion, LCTs interact with bile in the duodenum (upper small intestine) and are incorporated into mixed micelles (Record et al, 1986). Enzymes called lipases (pancreatic lipase and phospholipase A2) remove the fatty acid molecule from the glycerol backbone. The mixed micelles are passively absorbed into the intestinal mucosa where the free fatty acids are re-esterified with glycerol. The intestinal mucosa synthesizes a lipoprotein carrier called a chylomicron to transport the reformed triglyceride. Chylomicrons are secreted into the lymph and are released into the venous circulation via the thoracic duct. In the bloodstream, lipoprotein lipase again breaks down the triglycerides into two free fatty acids and a monoglyceride. The monoglycerides go to the liver to be further degraded, while many of the circulating free fatty acids are taken up and stored by adipocytes (fat cells). When carbohydrates are consumed insulin is released, and insulin stimulates adipocytes to re-esterify the fatty acids into triglycerides and store them as body fat. In general, body fat stores are not mobilized and used for energy to any significant extent in the presence of insulin. In contrast, since MCFAs are more water soluble they are more easily absorbed and do not require this complicated digestive process. MCTs can be absorbed intact and do not require the action of pancreatic lipase or incorporation into chylomicrons. Instead, a lipase within the intestinal cell degrades the MCT into free MCFAs and glycerol. The MCFAs are bound to albumin, released into the bloodstream, and transported directly to the liver by the portal vein. The vast majority of MCFAs
are retained by the liver where they are rapidly and extensively oxidized. Whereas conventional fats are largely deposited in fat cells, MCTs are transported directly to the liver and used for energy. Very little of the MCFAs ever escape the liver to reach the general circulation (Bach and Babayan, 1982). Only 1-2% of MCTs are incorporated into depot fat (Geliebter et al., 1983; Baba, Bracco, and Hashim, 1982). Medium chain triglycerides are digested and absorbed much faster than conventional fats (in fact, as rapidly as glucose) and are immediately available for energy.

References


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Once inside a cell, fatty acids can be oxidized (burned) to release energy. The site of energy production within the cell is a membranous organelle called a mitochondrion. Long chain fatty acids cannot simply enter the mitochondria by themselves; they must be actively transported across the mitochondrial membrane (Record et al., 1986). First, the fatty acid is converted to its active form, acyl-CoA. The long chain acyl-CoA is then transesterified to L-carnitine by carnitine acyltransferase I (CAT I), generating acylcarnitine. A protein carrier embedded within the mitochondrial membrane acts as a shuttle to transport the LCFA-carnitine complexes into the inner mitochondrial space. Once there, carnitine acyltransferase II (CAT II) releases the fatty acid in its activated form, acyl-CoA (figure 1). The enzymes responsible for oxidation of fatty acids are located inside the mitochondria. Therefore, if fatty acids are not permitted to enter the mitochondria they cannot be burned for energy. Entry into the mitochondria is regulated by the activity of the carnitine shuttle. This transport system is not very active if carbohydrates are available because carbohydrate metabolism generates malonyl-CoA, which inhibits CAT I. In addition, glucagon (the hormonal antagonist of insulin) is involved in stimulating mobilization of body fat stores and use of fat for energy. Following carbohydrate ingestion insulin is released and glucagon is suppressed, so very little body fat is used for energy. After carbohydrate reserves have been diminished, the body releases glucagon as a signal to begin burning fat. These are the reasons why fat stores are drawn upon for energy only after glycogen has been depleted.

The inhibition of CAT I by malonyl-CoA represents a regulatory mechanism to prevent the wasteful use of energy substrates. Generally speaking, the body uses carbohydrate fuels first and stores fat as an energy reserve. Fat contains twice the energy density of carbohydrate (9 calories per gram versus 4 calories per gram) and does not require water for storage, as does carbohydrate. Fat is thus a more efficient molecule for energy storage. Animals are able to store only a small amount of energy as carbohydrate (in the form of liver and muscle glycogen) but can store a virtually unlimited amount of energy as fat.

In contrast to long chain fats, MCFAs (includes MCTs) are immediately available for energy. Medium chain fatty acids are retained by the liver, where they are rapidly and extensively oxidized (Bach and Babayan, 1982). Medium chain fatty acids can enter the mitochondria by passive diffusion and do not require the carnitine transport system (Record et al., 1986; Bach and Babayan, 1982). MCFAs thus can be used for energy even in the presence of carbohydrates, and in fact have a carbohydrate-sparing effect (Lavau and Hashim, 1978; Cotter et al., 1987). Once inside the mitochondria all fatty acids are burned in a process...
During beta-oxidation, blocks of two carbon atoms are removed from the activated fatty acid (acyl-CoA) to form acetyl-CoA (figure 2). The intermediate acetyl-CoA can then undergo several metabolic fates: i) it can enter the Krebs cycle to generate ATP; ii) it can be used to generate ketone bodies; iii) it can be used as a substrate for fatty acid synthesis or elongation; or iv) it can be consumed in an energy transforming process known as reversed electron transfer (Bach and Babayan, 1982; Berry et al, 1985; Crozier et al, 1987).

The vast majority of MCFAs (includes MCTs) are retained in the liver where they undergo beta-oxidation, producing acetyl-CoA. To enter the Krebs cycle (the body’s central energy producing pathway) the acetyl-CoA combines with oxaloacetate, producing citrate. Medium chain fatty acids are oxidized in the liver so rapidly that the supply of oxaloacetate becomes limiting. As a result, the capacity of the Krebs cycle is overwhelmed and a large proportion of the acetyl-CoA is directed toward the synthesis of ketone bodies (Bach and Babayan, 1982). This process is known as “ketogenesis” (figure 3). Ketone bodies are released from the liver into the blood and are subsequently taken up by muscles and used as fuel. LCT ingestion also causes an increase in blood levels of ketone bodies during fasting, but only MCT will still produce ketone bodies if carbohydrates are concurrently ingested (Sucher, 1986). Once inside muscle cells, ketone bodies are converted back to acetyl-CoA, which then enters the Krebs cycle to produce ATP. The conversion of MCFAs to ketone bodies occurs even in the presence of carbohydrates. This additional source of energy decreases glucose uptake and utilization (Lavau and Hashim, 1978) and thus may extend endurance by sparing glycogen (Cotter et al, 1987).

References


Cotter, Taylor, Johnson, and Rowe, A metabolic comparison of pure long chain triglyceride lipid emulsion (LCT) and various medium chain triglyceride (MCT)-


Humans and other animals obtain energy to support life, growth, and activity from food. The basic question is how is the energy contained in food extracted and transformed into a form which can be directly used as fuel by the body. The source of energy used by the body is the potential energy contained in the chemical bonds of food. Energy is either released or consumed during chemical reactions, depending on the relative energies of the reactants versus the products. The main foods used as energy substrates by the body are carbohydrates and fats. Carbohydrates and fats are different chemically, but have in common that they both contain carbon-hydrogen bonds. In this state, carbon is said to be reduced. In aerobic metabolism the carbon and hydrogen react with oxygen, forming CO2 and H2O. The reaction between hydrogen and oxygen to make water is extremely exergonic (this is the reaction that turned the Hindenburg into a fireball). This reaction releases energy because hydrogen and oxygen are more stable (i.e., have less energy) when they are joined together as water than when they exist separately. Most of the energy derived from the aerobic metabolism of foods is from this reaction. Fats provide twice the caloric density of carbohydrates - 9 calories per gram for fat as compared to 4 calories per gram for carbohydrate. The reason fat contains more energy than carbohydrate is that in fat the carbon is in a more reduced form (Zubay, 1983, p. 482) - more hydrogen is packed in per carbon atom.

In aerobic metabolism the carbon and hydrogen in foods react with oxygen to produce CO2 and H2O. This reaction releases energy because carbon dioxide and water molecules contain less energy than the original food molecules and oxygen. The same reaction occurs when a piece of food burns in the camp fire. In that situation the energy released by the reaction is simply liberated as heat to the surroundings. In the body the reaction is broken down into many small steps and the energy which is released is captured in a molecule called adenosine triphosphate, or ATP. About 67% of the energy obtained in glucose (the body’s chief fuel molecule) is captured by ATP and the rest is liberated as heat (Zubay, 1983, p. 395). This is a very impressive efficiency level compared to other machines. ATP is the immediate source of energy used to fuel nearly all cellular processes, including muscular contraction. The role of ATP is not to store energy (that is the role of body fat and glycogen) but rather to transfer energy from a food molecule to some other cellular molecule which is going to perform work (Vander, Sherman, Luciano, 1980, p. 80). Energy is the ability to do work. Potential energy is energy which is stored and has the potential to perform work if it is released. The energy contained in a chemical bond is a form of potential energy. The potential energy contained in the chemical bonds of food molecules is released during oxidation, and this energy is transferred via ATP to other molecules which perform cellular work - everything from muscular contraction to protein synthesis.

Conceptually, it is convenient to break up this process into four stages, although in fact these stages are intimately linked in the cell. The first stage of carbohydrate metabolism is glycolysis and the first stage of fat metabolism is beta-oxidation. The following stages of energy production are common to both fats and carbohydrates, and are the Krebs cycle, electron transport, and oxidative phosphorylation.

**The Krebs Cycle**
The central energy producing pathway in the body is the Krebs cycle (figure 1), named for the German chemist Hans Krebs. Krebs originally postulated this process, also known as the TCA cycle, in 1937 and
was later awarded the Nobel Prize in 1953 for this work. Energy substrates derived from carbohydrates or fatty acids enter the Krebs cycle as the intermediate acetyl-CoA. The ultimate end of the process is to convert the chemical energy contained in foods into ATP. Adenosine triphosphate is an unstable molecule containing a high energy phosphate bond. When ATP is split, the energy contained in this phosphate bond is released and is available to perform work inside the cell. ATP is the immediate source of energy for nearly all cellular processes, and thus has earned its reputation as “the energy currency of the cell.”

Carbohydrates are initially metabolized via an anaerobic process known as glycolysis. Glucose enters the glycolytic pathway and is converted into two molecules of pyruvate, generating a net yield of two ATP molecules. Under anaerobic conditions, as may be temporarily experienced in muscular tissue during weight training, pyruvate is reduced to lactate, or lactic acid, which causes a burning sensation in the muscle. Glycolysis is a relatively inefficient process, yielding only two ATPs per glucose molecule. The two lactate molecules account for roughly 93% of the energy present in the original glucose molecule, so only about 7% of the energy embodied in glucose is made available for use. Of this, about 50% is captured in ATP (Zubay, 1983, p. 305). In the presence of oxygen a different metabolic fate is available to pyruvate. Instead of being converted into lactate, pyruvate is decarboxylated to generate acetyl-CoA. Acetyl-CoA is also produced by beta-oxidation of fatty acids, as discussed Technical Report #2.

The basic point of the Krebs cycle is to provide the chemical means of completely oxidizing the carbon of glucose or fatty acids to CO₂ and the hydrogen to H₂O. This allows much more of the energy contained in the food molecule to be extracted and used by the cell, as compared to anaerobic metabolism. In each turn of the Krebs cycle two carbons enter as acetate and two carbons exit as CO₂. The cycle involves eight intermediates, each of which is converted into the next by an enzyme specific for that step (figure 1). These reactions are localized in the mitochondria, the site of aerobic energy production within the cell.

The first stage of carbohydrate metabolism, glycolysis, occurs in the cytoplasm and does not require oxygen. The end-product of glycolysis, pyruvate, enters the mitochondria to be further metabolized. In the mitochondria pyruvate is converted into acetyl-CoA by pyruvate dehydrogenase. Fats are oxidized to produce acetyl-CoA within the mitochondria. Long chain fatty
Acids must be ferried across the mitochondrial membrane by the carnitine shuttle, while medium chain fatty acids can transverse the membrane by passive diffusion.

Acetyl-CoA donates the two-carbon compound acetate to a four-carbon acceptor oxaloacetate thereby generating citrate, a six-carbon compound. During one turn of the cycle two molecules of carbon dioxide are liberated, ultimately regenerating oxaloacetate. The Krebs cycle intermediates are not consumed in the cycle and there is no net loss of carbon in the process, ignoring any side reactions which may occur. The cycle can thus be viewed as catalytic, since a relatively small amount of oxaloacetate can be used to metabolize an arbitrary amount of acetyl-CoA.

The activity of this pathway is controlled by the levels of its substrates and products, so that its level of energy production matches the energy needs of the cell. As the concentration of substrates increases, or the concentration of end products decreases, the activity of the cycle increases. The most sensitive factors which directly regulate the cycle’s activity are the NAD/NADH ratio and the ATP/ADP ratio. The activity of the first step in the pathway is also sensitive to the concentration of oxaloacetate.

Under normal conditions the concentration of intermediates such as oxaloacetate is not limiting. Medium chain triglycerides enter mitochondria independent of the carnitine shuttle, and thus bypass an important regulatory step in fatty acid oxidation (refer to Technical Report #2). Medium chain triglycerides are oxidized so rapidly that the acetyl-CoA which is produced can overwhelm the amount of oxaloacetate available to accept it (Bach and Babayan, 1982). Some portion of the acetyl-CoA is then diverted to another metabolic fate - ketogenesis. In ketogenesis two molecules of acetyl-CoA combine to form ketone bodies, primarily acetoacetic acid and beta-hydroxybutyrate (refer to Technical Report #2). This process is diminished if oxaloacetate precursors, such as aspartate and pyruvate, are co-administered with the MCTs (Bach and Babayan, 1982; Crozier, 1988). This suggests that the ketogenic properties of MCTs are due, in fact, to their ability to overwhelm the capacity of the Krebs cycle at the level of oxaloacetate.

Only one ATP molecule is produced directly by each turn of the Krebs cycle. This is referred to as “substrate level phosphorylation” since the generation of ATP is directly coupled to a specific chemical reaction. In other words, ADP participates as a substrate in the reaction. Most of the energy derived from aerobic metabolism comes from subsequent oxidation of the NADH and FADH2 produced by the cycle. This is referred to as ”oxidative phosphorylation” since here ATP synthesis is coupled to the oxidation of NADH and FADH2. Aerobic metabolism can be thought of as having two phases: the oxidative phase in which electrons (in the form of hydrogen atoms) are removed from organic substrates and transferred to coenzyme carriers (FAD and NAD), followed by the reoxidation of the reduced coenzymes (FADH and NADH2) by the transfer of electrons (again in the form of hydrogen) to oxygen, generating H2O (Zubay, 1983, p. 325). The reduction of oxygen to water is extremely exergonic and most of the ATP is generated during this process. The oxidation of acetyl-CoA involves removal of electrons (as hydrogen) from the Krebs cycle intermediates and transfer of hydrogen to the coenzymes FAD and NAD. In the process, these coenzymes are reduced to FADH and NADH2. (In chemistry, “oxidation” is the removal of electrons and “reduction” is the addition of electrons.) Subsequently, the reduced coenzymes are reoxidized by transfer of the hydrogens to oxygen in the “electron transport chain.” Ultimately, ATP is synthesized by oxidative phosphorylation of ADP, which is driven by a proton gradient generated in the process of electron transport (Zubay, 1983, p. 325).

The reactions of the Krebs cycle can be summarized by the following equation (Zubay, 1983, p. 335):

\[
\text{acetyl-CoA} + 2 \text{H}_2\text{O} + 3 \text{NAD}^+ + \text{FAD} + \text{ADP} + \text{Pi} \rightarrow 2 \text{CO}_2 + 3 \text{NADH} + 3 \text{H}^+ + \text{FADH}_2 + \text{CoA} + \text{ATP}
\]
Two carbons enter as acetate and exit as CO2, producing ATP, NADH, and FADH2 as byproducts. The FADH and NADH2 in turn enter the electron transport chain to be further metabolized.

**Electron Transport and Oxidative Phosphorylation**

Although some ATP is directly generated by the Krebs cycle, more significant products of the cycle are the reduced coenzymes NADH and FADH2. Most of the energy contained in the starting material is still present in these coenzymes. The primarily energy yield of aerobic metabolism occurs when NADH and FADH2 are re-oxidized to NAD and FAD. This process is known as electron transport because electrons from NADH and FADH2 are transported via a chain of electron carriers and are ultimately transferred to molecular oxygen.

Oxygen is a very electronegative element, meaning that it has a strong affinity for electrons. In essence, oxygen and hydrogen combine to form water because oxygen has a high affinity for electrons, and hydrogen represents an easy source. Hydrogen does not have a strong affinity for electrons and basically gets trapped into sharing its electrons with oxygen. The overall reactions can be summarized as (Zubay, 1983, p. 364):

\[
\begin{align*}
\text{NADH} + \text{H}^+ + \frac{1}{2}\text{O}_2 & \rightarrow \text{NAD}^+ + \text{H}_2\text{O} & G = -52.6 \text{ kcal/mol} \\
\text{FADH}_2 + \frac{1}{2}\text{O}_2 & \rightarrow \text{FAD} + \text{H}_2\text{O} & G = -43.4 \text{ kcal/mol}
\end{align*}
\]

The reduced coenzymes NADH and FADH2 serve as donors of electrons (as hydrogen) which combine with oxygen to form water. The delta-G expression indicates that the reaction will proceed spontaneously with the release of energy. Enough energy is released to drive the synthesis of several ATPs. Therefore, rather than wasting energy, the above reaction is divided up into several small steps. The energy release is thus parcellled out in small packets to allow ATP to be generated more efficiently (Zubay, 1983, p. 365).

To achieve this, electrons are transported from the reduced coenzymes to oxygen via a series of carriers, arranged in the order of increasing electron affinity (figure 2). These electron carriers are molecules (some of them proteins) capable of undergoing reversible oxidation-reduction reactions.

These electron transporters are embedded within the mitochondrial inner membrane (mitochondria are double-membraned structures). The energy which is released as electrons are transported down the chain to acceptors of ever increasing electron affinity is not directly used to synthesize ATP. Instead, the energy is used to generate a proton gradient across the inner mitochondrial membrane. This results in an electric

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**Figure 2.** The electron transport chain. Electrons removed from fuel molecules in the Krebs cycle are passed down a chain of carriers of increasing electron affinity. The energy released in this process, which occurs within the mitochondrial membrane, is used to establish a proton gradient across the membrane. This electromotive force in turn drives ATP synthesis.
Most of the energy from aerobic metabolism is in the form of the reduced coenzymes NADH or FADH2. CO2. Hydrogen present in the original food is now in the bloodstream as water, a well known exergonic reaction. However, this does not happen directly. Instead, the energy released as electrons are transported down the chain (to electron acceptors of increasing electron affinity) is used to generate a proton gradient across the mitochondrial membrane. The movement of protons back inside the membrane through the F0-F1 complex provides the driving force for ATP synthesis by F1. This is referred to as “oxidative phosphorylation” because the phosphorylation of ADP to form ATP is coupled to the oxidative events occurring in the electron transport chain.

Energy Production and the Athlete

Athletes experience increased energy need as compared to sedentary people. Bicycle racers and other endurance athletes can require as much as 10,000 calories per day to support their activity level. Bodybuilders commonly consume in excess of 8,000 calories daily to fuel their training and support gains in body weight. The body draws on three different types of food as energy substrates: fats, carbohydrates, and protein. Of these, carbohydrate is the most preferred. Carbohydrates are easily digested and rapidly enter the bloodstream as glucose. Glucose is immediately used as fuel by the cell. A byproduct of glucose metabolism is malonyl-CoA, which inhibits carnitine acyltransferase I. Since long chain fatty acids require the carnitine shuttle in order to be transported inside the mitochondria, they are not used as fuel to a significant extent until the carbohydrates are depleted. Similarly, amino acids can be also oxidized to produce energy but are not used as fuel to a significant extent until carbohydrate is depleted.

Of course, one of the primary goals of bodybuilders is to increase muscle mass. Therefore amino acids are more valuable to use as protein rather than as fuel. Conventional fats are not a good energy source for bodybuilders either since they cannot be metabolized anaerobically and are not burned rapidly enough to meet the energy demands of high intensity exercise such as weight lifting (Coleman, 1991). Medium chain triglycerides are absorbed and metabolized much more rapidly than conventional fats and are immediately available for energy (Bach and Babayan, 1982). MCTs are an excellent quick energy source, harnessing the caloric density of fat but being metabolized as rapidly as glucose (Bach and Babayan, 1982).
Furthermore, MCTs and the ketone bodies they produce decrease glucose uptake and utilization (Lavau and Hashim, 1978) and this seems to result in a glucose-sparing effect (Cotter et al., 1987). MCTs also have a protein-sparing effect and may reduce skeletal muscle protein catabolism, leaving amino acids available for use as protein instead of being oxidized as fuel (Babayan, 1987; Haymond, Nissen, and Miles, 1983). Medium chain triglycerides are an excellent energy source for anyone experiencing increased energy needs (Bach and Babayan, 1982) and are ideally suited to the special needs of athletes.

References


Introduction

Even during rest the human body is constantly metabolizing energy to maintain itself. The rate at which energy is expended by the body, expressed in calories per hour (or more rigorously normalized to calories expended per kg body mass per hour), is known as the metabolic rate. The basal metabolic rate (BMR) is the body’s rate of energy expenditure while at rest. This represents just the energy requirements of maintaining life, consisting mostly of maintenance of body temperature, heart rate, breathing, nerve transmission, and electrochemical gradients across cell membranes. The basal metabolic rate accounts for 65-75% of daily energy requirements (Van Zant, 1992). Other components of metabolic rate include the thermic effect of feeding (TEF; also referred to as diet-induced thermogenesis, or DIT), the thermic effect of activity (TEA), and adaptive thermogenesis (AT); Van Zant (1992). The components of energy expenditure are illustrated in figure 1. Metabolic rate is affected by many parameters such as eating (caloric consumption as well as dietary composition), activity (dependent on type, intensity, and duration of activity), lean body mass, age, sex, hormones, and drugs.

Since all of the energy expended by the body is ultimately converted to heat (except when work is performed outside the body), metabolic rate can be determined by the amount of heat energy liberated by the body (Guyton, 1976).

A calorimeter can be used to directly measure the heat given off by the body. However, since greater than 95% of the energy liberated by the body is derived from the reaction of foods with oxygen, the metabolic rate can also be calculated from the rate of oxygen consumption (Guyton, 1976). In many studies metabolic rate, or energy expenditure, is expressed in terms of oxygen consumption.

Thermic Effect of Feeding Medium Chain Triglycerides

After consuming a meal the food is digested, released into the bloodstream, and transported to all the cells of the body. There, it reacts with oxygen to produce energy. Some of the energy is captured in ATP, the energy source used directly by cellular machinery performing work. Calories consumed in excess of energy requirements will be stored as body weight. About 55% of the energy contained in food is liberated as heat during the process of ATP formation (Guyton, 1976). This release of heat energy from the oxidation of foods represents an increase in metabolic rate and is accompanied by increased oxygen consumption.

Feeding different dietary items while maintaining caloric intake affects oxygen consumption.

Figure 1: Expenditure of available metabolizable energy. Approximately 25% of ingested energy is lost in feces and urine (Levin and Sullivan, 1985). The remainder is converted to heat, except a small amount used to perform work outside the body. Adapted from Van Zant (1992).
(Baba, Bracco, and Hashim, 1982). That different foods, normalized for energy content, increase the metabolic rate to different extents probably reflects the tendency of a particular food to be burned for energy versus being stored as body weight, as well as its extent of digestion and absorption. That protein increases the metabolic rate more than carbohydrate and conventional fat suggests that certain amino acids may directly stimulate thermogenesis (Guyton, 1976). The increase in energy expenditure caused by feeding is known as diet-induced thermogenesis or the thermic effect of feeding (Van Zant, 1992). MCTs cause profound postprandial thermogenesis because they are very caloric dense and are absorbed and metabolized very rapidly. The rapid oxidation of MCFAs in the liver causes an increase in postprandial oxygen consumption, i.e. metabolic rate. The increase in metabolic rate resulting from MCT ingestion has been measured in humans as well as in rats, using LCTs as controls (Seaton et al, 1986; Hill et al, 1989; Baba, Bracco, and Hashim, 1982). The data seem straight forward, well controlled, and statistically significant.

Baba, Bracco, and Hashim (1982) observed that rats overfed MCT gained significantly less fat than rats fed an isocaloric diet containing LCT as the fat source. This was attributed to higher resting oxygen consumption (metabolic rate) in the MCT group. The authors explained this by pointing out that while conventional fats are transported as chylomicrons and are largely stored as body fat, MCTs are transported directly to the liver where they are oxidized extensively to produce energy. The rapid oxidation of MCTs results in increased oxygen consumption, increased heat generation, and increased metabolic rate.

In 1986 Seaton and colleagues demonstrated in humans that a meal containing MCTs increased oxygen consumption 12% above basal levels for 6 hours following the meal, while the LCT-containing meal increased oxygen consumption by only 4%. This indicates that MCTs are burned faster than conventional fats and increase the metabolic rate more. The increase in energy expenditure accounted for 13% of the energy contained in the MCT meal and 4% of the energy contained in the LCT meal. Hill and coworkers (1989) also compared the thermogenic effect of medium chain triglycerides with that of long chain triglycerides. Ten male volunteers were hospitalized and fed diets containing 30% of calories from either MCT or LCT. Metabolic rate was measured before, during, and after the experiment. Each subject was studied for one week on each diet in a double-blind crossover design. The thermic effect of food (TEF) is defined as the difference between metabolic rate during a six hour period after eating and the resting metabolic rate. That is, it is a measure of the increase in metabolic rate caused by eating the test meal. On day one of the experiment, the TEF of the meal containing MCT accounted for 8% of the ingested energy, while the TEF of the LCT meal accounted for 5.5% of the ingested energy. On day six of the experiment, the TEF of the MCT meal had increased to 12% of ingested energy, and the TEF of the LCT meal was 6.6% of ingested energy (figure 2). This means that the MCT-enhancement of the metabolic rate increased during the course of the experiment as the subjects became acclimated to the MCTs. On the last day of the trial the subjects were fed a liquid diet by continuous tube feeding. During this experiment it was found that the TEF of the MCT meal increased to 15.7% of ingested energy, and the TEF of the LCT meal was 7.3% of ingested energy. So the increase in metabolic rate was even greater when MCT was administered continually.

Mechanisms of Thermogenesis

The chemical mechanism underlying this thermogenic effect is unknown at present, but several suggestions have been advanced. Hill and coworkers (1989 and 1990) demonstrated that MCT overfeeding results in increased hepatic de novo fatty acid synthesis in man. This process is energetically costly and could account for the lesser efficiency of storage of MCT-derived energy. The observed increase in thermogenesis agrees well with the energy cost associated with de novo lipogenesis (Hill et al, 1990). This observation was corroborated by Crozier (1988) working with isolated rat hepatocytes. Alternatively, if electron transport is uncoupled from oxidative phosphorylation the energy spent to establish an electrochemical potential gradient across the mitochondrial membrane is dissipated as heat.
instead of being conserved as ATP (Baba, Bracco, and Hashim, 1987). For example, in brown adipose tissue a pathway exists allowing proton leakage across the mitochondrial membrane (Nicholls, 1979).

Another means of dissipating energy as heat, believed to occur in liver mitochondria, is redox cycling involving the glycerophosphate and malate shuttles (Berry et al, 1985; Crozier et al, 1987). In the glycerophosphate shuttle, energy is spent to pump reducing equivalents outside the mitochondria to drive the reduction of dihydroxyacetone phosphate to glycerol-3-phosphate in the cytoplasm. The glycerol-3-phosphate then diffuses into the mitochondria and is oxidized to reform dihydroxyacetone phosphate, which then diffuses out of the mitochondria to complete the cycle. The net result is the shuttle of glycerol-3-phosphate and dihydroxyacetone phosphate across the mitochondrial membrane (Berry et al, 1985; Crozier et al, 1987; Zubay, 1983, p. 401). Free energy is consumed to drive the cycle, but since no net work is performed the energy ultimately appears as heat (Berry et al, 1985). The malate/aspartate shuttle is analogous.

Finally, increased activity of Na-K ATPase has also been suggested as a thermogenic mechanism for wasting energy as heat (Levin and Sullivan, 1985). It is estimated that 10-40% of the total energy expended by the cell is used to maintain the concentration gradient of sodium and potassium ions across the cell membrane (Vander, Sherman, and Luciano, 1980). Since these ions also can cross the membrane by passive diffusion, an increase in the activity of the enzyme could be a mechanism for spending ATP.

In all of the models - de novo fatty acid synthesis, proton leakage, redox cycling (or other futile cycles), and Na-K ATPase - the MCFAs are rapidly oxidized (explaining increased oxygen consumption), energy is consumed (explaining the low efficiency of storage of MCT-derived energy) and heat is produced as a by-product (explaining the thermogenic effect). Considerable evidence exists to support the involvement of de novo fatty acid synthesis as a mechanism for MCT-induced thermogenesis (Hill et al, 1989; Hill et al, 1990; Crozier, 1988) but other mechanisms may be involved as well. The reader is referred to Levin and Sullivan (1985) and Van Zant (1992) for reviews on thermogenesis and energy balance.

References


Glossary

**Acetyl-CoA** - The metabolic intermediate that is produced when carbohydrate or fat undergoes beta-oxidation. It is then available to be used for energy production via the Krebs cycle or through the formation of ketone bodies.

**Acromegaly** - Pathological enlargement of the bones of the hands, feet and face resulting from chronic over activity of the pituitary gland. Only results from disease of the pituitary or exogenous growth hormone usage.

**Adenosine Triphosphate (ATP)** - The final step of the Krebs Cycle. This molecule collects the potential energy from nutrients that is released during beta-oxidation and carries it to the cells of the body to be used for energy.

**Adipose Tissue** - Bodily connective tissue that contains stored cellular fat.

**Adrenal Glands** - Either of two small endocrine glands, one located above each kidney, consisting of the cortex, which secretes several different hormones, and the medulla, which secretes epinephrine.

**Adrenal Medulla** - The center of the adrenal gland that secretes the hormone epinephrine.

**Adrenaline** - Another name for epinephrine.

**Aerobic** - Living or occurring only in the presence of oxygen.

**Aerobics** - Conditioning of the cardiopulmonary system by means of vigorous exercise that seeks to increase efficiency of oxygen intake, build the cardiovascular system and increase metabolic activity.

**Amino Acids** - The essential components of protein. These are the building blocks of the all the cells in the body. There are about 20 different amino acids that occur in the human body.

**Ammonia** - The byproduct of amino acid usage by the muscles for energy. Very toxic, it is converted to urea by aspartates in the urea cycle, which can then be disposed of in urine.

**Anabolic** - The process by which simple substances are synthesized into the complex tissue of living tissue.

**Anaerobic** - Living or occurring without the presence of oxygen.

**Androgens** - A steroid hormone that develops and maintains masculine characteristics. They also are potent stimulators of linear growth in children whose epiphyses has not closed yet. They also promote muscle growth.

**Anemia** - A deficiency in the oxygen-carrying material of the blood, measured in volume concentrations of hemoglobin, red blood cell volume and red blood cell number.

**Aspartates** - Chemical compound that is used by the body to detoxify waste products created by amino acid catabolism.

**Autocrine Hormones** - Hormones that exert their effect only on the cells that produce them.

**Basal Metabolic Rate** - The body's energy expenditure while at rest. This represents the energy requirements for maintaining life, consisting mostly of maintenance of temperature, heart rate, breathing nerve transmission, electrochemical gradients across cell membranes and the energy cost of protein turnover required to maintain cells.

**Beta-Oxidation** - Fatty acid catabolism in which two carbon fragments are removed from the fatty acid chain, producing acetyl-CoA which can then travel through the Krebs cycle or be synthesized into ketones and used as energy.

**Bile** - An alkaline liquid secreted by the liver and stored in the gall bladder which is sent to the intestines to be used to break down fat.

**Body Fat** - The amount of adipose tissue carried on the body.

**Branched Chain Amino Acids (BCAAs)** - The amino acids leucine, isoleucine and valine, these are important for synthesis of other amino acids and can be used directly by the muscle for energy.

**Calcium** - A very important mineral used in the formation and maintenance of teeth and bones as well as other metabolic processes in the body.
Calorie - The unit of heat required to raise one gram of water from 0 degree (C) to 100 degrees (C). It is the unit of measurement used when calculating potential food energy.

CapTri - A medium chain fatty acid that contains 8.3 calories per gram. Used as a supplement to food, it can increase energy while not being stored as body fat.

Carbohydrate - Any of a group of chemical compounds, including sugars, starches and cellulose, containing carbon, hydrogen and oxygen.

Carbon - A natural element occurring in many inorganic and all organic compounds.

Cardiovascular Density - The size and number of blood vessels and capillaries capable of transporting oxygen to cells and removing waste from cells.

Carnitine Shuttle - A metabolic process in which long chain triglycerides are actively transported across the membrane of the mitochondria to be burned for energy.

Catabolic - Metabolic change of complex molecules into simple molecules.

Cellulose - A carbohydrate, is the main constituent of all plant tissues and fiber. Cannot by digested by the human body.

Cholesterol - A crystalline substance, the most common animal sterol. Is a universal tissue constituent occurring most notably in bile, gallstones, the brain, blood cells, plasma, egg yolk and seeds. There are two types: high density lipoprotein and low density lipoprotein. High density lipoprotein is important for many physiological processes. Low density lipoprotein has been show to build up in arteries causing blockages which can lead to heart disease.

Chondrocytes - Layers of cartilage which are the framework for bone formation.

Chylomicrons - A microscopic fat molecule in the blood that is formed during the digestion of fat.

Cortisol - One of the glucocorticoids, this hormone, derived from the adrenal cortex, acts to stimulate optimal levels of metabolic enzymes used during growth. Low cortisol prevents growth because enzyme levels are too low, while excess cortisol causes protein catabolism.

Diabetes - A disease caused by a severe deficiency of insulin production by the pancreas. Mild cases can be regulated through diet while others require insulin injection.

Digestion - The primarily enzymatic process of breaking down the food ingested into simple, assimilable substances.

Dual Effector Hypothesis - The explanation of how GH injection can cause localized growth.

Duodenum - The beginning portion of the small intestine, extending from the lower end of the stomach to the jejunum.

Electrolytes - A substance that dissociates into ions in solution when fused, thereby becoming an electrical conductor. The body uses many different electrolytes for physiological processes.

Endochondrial Ossification - The process in which proliferating cartilage is replaced by bone.

Endocrine Hormones - A classification of hormones, meaning that they are released into the bloodstream and are carried throughout the body. Also know as telecrine hormones.

Endocrine System - Consisting of several organs of the body, including the pituitary, thyroid, adrenal and parathyroid glands, the pancreas, testes or ovaries and kidneys, this systems transports information to different parts of the body through chemical messages. These messages are called hormones.

Energy - The work a physical system is capable of doing in changing from its actual state to a specified reference state.

Energy Balance - The bodily process of using as much energy as it is provided through nutrition. This includes energy expenditure through basal metabolism, physical activity and thermogenesis.
Enzymes - Any of numerous proteins or conjugated proteins produced by living organisms and functioning as biochemical catalysts in living organisms.

Epinephrine - An adrenal hormone from the adrenal medulla that stimulates autonomic nerve action. Has been shown to have a great impact on fat loss. When activated, it is carried throughout the body, preparing muscles for action and mobilizing fat from adipose stores for energy. Also known as adrenaline.

Epiphyseal Plate - The ends of the bones that continue to grow throughout childhood and adolescence. They usually close during puberty, at which point bone growth is stopped.

Erythrocytes - The blood cell that contains hemoglobin and is responsible for the color of blood.

Essential Amino Acids - Eight amino acids which are not capable of being produced by the body and must be obtained through dietary protein.

Essential Fatty Acids - A group of fatty acids which are physiologically important to good health.

Estrogen - One of several steroid hormones produced chiefly by the ovary and responsible for the regulation of certain female reproductive functions and the development and maintenance of female secondary sex characteristics.

Fascial Stretching - A specialized form of stretching developed by John Parrillo in which the fascia tissue which envelopes the muscle is stretched, allowing for more muscle growth.

Fat - Any of various soft solid or semisolid organic compounds comprising fatty acids and associated phosphatides, sterols, alcohols, hydrocarbons, ketones and related compounds. A mixture of such compounds widely occurring in organic tissue, especially in the subcutaneous connective tissue of animals and in the seeds, nuts and fruits of plants.

Fatty Acids - Any of a large group of acids containing hydrogen and carbon and is obtainable from animals and plants. These acids combine to form fat.

Fiber - One of the elongated, thick-walled cells giving strength and support to plant tissue. An important part of the diet for regulation of digestion and elimination of digestive waste.

Food - Material, usually plant or animal, containing or consisting of essential nutrients, as carbohydrates, protein, fat, vitamins, or minerals, taken in and assimilated by an organism to maintain growth and life.

Food Efficiency - The calories consumed of a certain amount of food divided by weight gain. Foods with a high food efficiency tend to add to weight gain while foods with a low food efficiency are more prone to be used as energy rather than stored as body weight.

Fructose - A sweet sugar that is found in many fruits and honey. Is prone to being stored as body fat.

Gall Bladder - A small, pear-shaped sac located under the right lobe of the liver, in which bile secreted by the liver is stored.

Gastrointestinal Tract - Of or relating to the stomach and intestines and process by which food travels through these organs.

Glucagon - A hormone secreted by the pancreas which increases blood sugar by activating the metabolism of fat from adipose tissue and amino acids from muscle. This hormone has the opposite reaction of insulin.

Glucocorticoids - A group of hormones responsible for stimulating or regulating optimal levels of enzymes whose activities are then regulated by other hormones.

Gluconeogenesis - Process in which amino acids are changed into glucose in the liver which can then be used as energy.

Glucose - The combination of simple sugars that is formed by the digestion of food and is released into the bloodstream to be used for energy, converted into muscle glycogen or stored as body fat. Glucose is the trigger mechanism for the release of insulin from the pancreas.
**Glycogen** - The primary storage carbohydrate in animals. Glycogen can be stored in the muscles for immediate energy needs or can be stored in the liver.

**Glycogen Supercompensation** - A process of depleting glycogen stores in the muscle and liver by carbohydrate restriction, and then replenishing them past the storage limit they had before.

**Glycogen Synthase** - The enzyme responsible for glycogen storage.

**Glycolysis** - The anaerobic production of ATP from carbohydrate. This is the primary energy source for intense exercise for short periods of duration.

**Golgi Tendon Organ** - A group of sensory receptors in the muscle that fire when the tendon is stretched too far and shuts down the muscle.

**Golgi Tendon Reflex** - The shutting down of the muscle by the golgi tendon organ during exercise.

**Growth Hormone** - Produced by the pituitary gland, this anabolic hormone is the most responsible for growth during childhood. It has profound effects on development of the skeleton and muscles. Even after physical stature is attained, growth hormone can still have a great effect on muscle growth.

**Growth Hormone Releasing Hormone (GHRH)** - A hormone released by the hypothalamus which triggers growth hormone release.

**Heme** - The non-protein, ferrous-iron-containing component of hemoglobin.

**Hemoglobin** - The oxygen-bearing, iron-containing protein in blood cells.

**Hi-Protein** - A high-quality supplement formulated with casein and lactalbumin, two of nature’s best protein sources and maltodextrin, a slow-release carbohydrate.

**Hormone Receptors** - Special molecules on cells that interpret the signal being sent by hormones.

**Hormone Sensitive Lipase** - An enzyme produced by epinephrine that breaks down fat triglycerides into free fatty acids and glycerol. The free fatty acids can then leave the adipose tissue into the bloodstream and be used for energy by the muscles.

**Hypercaloric** - Increasing caloric consumption.

**Hyperphagia** - Overeating.

**Hypocaloric** - Restricting caloric consumption

**Hypoglycemia** - An abnormally low level of glucose in the blood. Can be caused by carbohydrate restriction or overly high insulin levels.

**Hypophysectomy** - Removal of the pituitary gland.

**Hypothalamus** - The part of the brain that lies below the thalamus and functions to regulate autonomic activities, like body temperature and weight. It connects the pituitary to the brain and is the link between the endocrine system and the nervous system.

**Insulin** - Powerful anabolic hormone released by the islands of Langerhans in the pancreas. Functions to regulate carbohydrate metabolism by controlling blood glucose levels. Also has a hand in storage of fat and in the entry of amino acids into muscles.

**Insulin-Like Growth Factor (IGF)** - An important peptide for the regulation of growth hormone. Produced by the liver, it has an insulin-like effect on glucose.

**Iron** - An important metallic element that is used by the cardiovascular system to bind iron to hemoglobin and myoglobin. It also is required by enzymes when oxygen is consumed in the cells.

**Ischemic Rigor** - When the muscle is depleted of ATP and it locks in a contracted state and cannot relax properly.

**Jejunum** - The section of the small intestine between the duodenum and the ileum.
Ketones - An organic compound made in the liver when carbohydrate or fat is metabolized and creates an abundant amount of acetyl-CoA. This overwhelms the Krebs cycle and the extra acetyl-CoA is synthesized into ketones. These ketones are then released into the bloodstream and taken up by the muscles and used as fuel.

Ketogenesis - The process of two acetyl-CoA molecules joining to create a ketone molecule.

Kidneys - Either of a pair of structures in the dorsal region of the abdominal cavity, functioning to maintain proper water balance, regulate acid-base concentration, and excrete metabolic wastes as urine.

Krebs Cycle - A series of enzymatic reactions in aerobic organisms involving oxidative metabolism of acetyl units, especially during the process of respiration, to provide the main source of cellular energy in the form of ATP.

Lactic Acid - Produced by anaerobic metabolism of carbohydrates in the muscle. It is what gives the muscles a burning sensation during and after strenuous work. Most lactic acid makes its way out of the muscle and into the bloodstream where it can be transported to the liver to be converted back into glucose for fuel again.

Lactose - A simple sugar found in greatest quantities in milk products.

Lipid - One of numerous fats and fat-like materials that are generally insoluble in water but soluble in common organic solvents. They are related to the fatty acid esters and together with carbohydrates and proteins constitute the principal structural material of living cells.

Lipolysis - The breakdown of fat for energy.

Lipoprotein Lipase - A fat-storing enzyme triggered by low caloric intake.

Liver - A large compound, tubular gland that secretes bile and acts in formation of blood and in metabolism of carbohydrates, fats, proteins minerals and vitamins.

Liver Amino Formula - This supplement is an excellent source of balanced protein, essential amino acids, heme iron and B-complex vitamins. It also includes peptide-bonded protein and dibenzozone, an excellent oral form of B-12 and choline.

Lymphatic System - A network of vessels throughout the body for transporting large particles. This is the pathway used by fat to get from the intestines to the bloodstream and finally to adipose tissue.

Malonyl-CoA - A substance produced during carbohydrate metabolism that inhibits the action of the carnitine shuttle in moving fat into the mitochondria.

Maltodextrin - Starch produced from grain containing the sugars maltose and dextrin.

Mass - The physical volume or bulk of a solid body. Different from weight.

Maximum Endurance Formula - This supplement contains aspartates, substances used in the detoxification and removal of toxins released during amino acid catabolism.

Metabolic Rate - The measurement of the body’s ability to utilize food for energy.

Metabolism - The complex of chemical and physical processes involved in the maintenance of life.

Minerals - A naturally occurring, homogeneous inorganic substance with a specific chemical composition. These play specific roles in the body.

Mitochondria - A microscopic body occurring in the cells of nearly all living organisms and containing enzymes responsible for the conversion of food for usable energy.

Muscle - A tissue made up of fibers that can contract and relax to effect body movement. It is the most metabolically active tissue in the body.

Muscle Amino Formula - This supplement contains the branched chain amino acids leucine, isoleucine and valine. These amino acids can be metabolized directly in the muscles, act as nitrogen carriers, and can decrease muscle catabolism by being used energy in the muscle.
Myofibrils - Muscle fibers.

Myoglobin - The form of hemoglobin found in muscle cells.

Negatives - The eccentric or lowering part of an exercise.

Nervous System - A coordinating system that regulate internal body functions and responses to external stimuli; in vertebrates it consists of the brain, spinal cord, nerves, ganglia and parts of receptors and effector organs. This system transmits messages throughout the body through electrical signals.

Nitrogen Balance - The difference between the amount of nitrogen taken into and lost by the body. Used to determine if protein intake is adequate.

Nutrients - The basic substances that are necessary for life derived from food.

Nutrition - The process of nourishing or being nourished. Especially by which a living organism assimilates food and uses it for growth, energy and tissue replacement.

Obesity - A condition of having an overabundance of adipose tissue on the body. Usually is determined by having 30% body fat or more.

Oxidation - Combination of a substance with oxygen, usually generating another substance and heat.

Oxidative Phosphorylation - A vital process of intracellular respiration occurring within the mitochondria of the cell, responsible for most ATP production.

Oxygen - A colorless gas comprising 21% of the atmosphere by volume and essential to most combustion and combustive processes.

Pancreas - A long, soft, irregularly shaped gland lying behind the stomach that secretes digestive enzymes and produces insulin and glucagon.

Paracrine Hormones - Hormones that are released into the interstitial space between tissues and exert their effect only on nearby cells.

Parathyroid Glands - Any of four small kidney-shaped glands that lie in pairs near the lateral lobes of the thyroid gland and secrete a hormone necessary for calcium and potassium metabolism.

Passive Diffusion - The act of a substance moving into a cell without resistance from that cell.

Peptides - A natural or synthetic compound containing two or more amino acids linked by the carboxyl group of one amino acid and the amino acid group of another.

Pituitary Gland - A small, oval, endocrine gland attached to the base of the vertebrate brain (hypothalamus) and whose secretions control the other endocrine glands and influence growth, metabolism and maturation.

Portal Vein - A vein that conducts blood from the digestive organs, spleen, pancreas and gall bladder to the liver.

Potassium - A metallic element found in or converted to a wide variety of salts. Used by the body in several different ways, but primarily for water balance.

Potential Energy - The energy of a particle or system of particles derived from position rather than motion. It is the amount of energy a substance has available for work but has not used yet.

Pro-Carb - A high-quality supplement containing maltodextrin, a slow-release carbohydrate, and caseinate, a high-quality protein. Provides 105 calories, 22 grams of carbohydrate and 4 grams of protein per ounce serving.

Protein - Any of a group of complex nitrogenous organic compounds that have amino acids as their basic structural units and that are found in all living matter and are required for the growth and repair of tissue.

Recommended Daily Allowance (RDA) - A group of standards put forth by the National Research Council indicating the minimum amount of nutrients that should be eaten daily.

Respiratory Quotient - The ratio of carbon dioxide produced to oxygen consumed. Used to determine the type of nutrient being used for energy.
Serum - The clear, yellowish fluid that comprises the liquid part of whole blood.

Skeletal Muscle - A collection of striated muscle fibers connected at either or both extremities with the bony framework of the body.

Sodium - A soft, metallic element. Used by the body for many purposes, mainly as a regulator of water.

Somatomedin Hypothesis - A theory that growth hormone on its own does not promote growth but that some other intermediate substance, known as somatomedin C, stimulated by growth hormone is the substance that stimulate growth.

Somatomedin-C (IGF-1) - Known also as insulin-like growth factor (IGF), this substance produced primarily by the liver has been shown to promote growth in the absence of growth hormone. It also has insulin-like effects on glucose.

Somatotropes - The cells in the pituitary gland which produces growth hormone.

Sugar - Any of a class of water-soluble, crystalline carbohydrates. Sugars can be either simple (only one) or starches (two or more sugars combined).

Supplement Bar - A nutrition supplement containing 240 calories, 38 grams of carbohydrate, 11 grams of protein and 5.5 grams of CapTri medium chain fatty acid.

Testes - The male reproductive gland, the source of spermatozoa and of the androgens, particularly testosterone. The testes is usually paired in an external scrotum in most animals.

Testosterone - A male sex hormone produced in the testes and controlling secondary sex characteristics.

Thermic Effect of Food (TEF) - Also known as the thermogenic effect, it is the measurement a food’s energy plus its tendency to be burned.

Thermogenesis - The process of food being burned and releasing energy as heat.

Thoracic Duct - The main duct of the lymphatic system, ascending along the spinal cord and discharging into the venous system.

Thyroid Gland - A two-lobed endocrine gland found in all vertebrates, located in front of and on either side of the trachea, and producing the hormone thyroxin.

Thyroid Hormone - Present in two forms, T3 and T4 and produced in the thyroid. Most of the circulating hormone is T4 which is then converted to T3 inside the target cell. This hormone has little growth factor by itself, but helps to regulate, synthesize and promote the action of growth hormone.

Thyroidectomy - The surgical removal of the thyroid gland.

Triglyceride - An ester of three fatty acids and a glycerol. Triglycerides can be classed as long chain (meaning they contain fatty acids that have 16-22 carbon atoms) which are predominant in conventional dietary fat, and medium chain (fatty acids with 6-14 carbon atoms) which are found in some foods but are not predominant. LCTs and MCTs are metabolized differently by the body.

Ultimate Amino Formula - A supplement that contains a profile of 17 different amino acids in free form state. This means that they are readily available for protein synthesis that occurs during muscle growth and repair.

Urea - A compound found in urine and other bodily fluids, synthesized from ammonia and carbon dioxide.

Vitamins - Any of various relatively complex organic substances found in plant and animal tissue and required in small quantities for controlling metabolic processes.

VO2max - 75% of the maximal aerobic capacity. This measure is used to determine the intensity of exercise.

Weight - The measure of the heaviness of an object as gravitational force is exerted on that object. Different from mass.