

***Athletics and Nutrition -
Fueling Your Performance***

Nutrition—The Right Balance

Craig Couillard DC, CCSP, CSCS

Dianne Goodman

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CONCLUSION

It is our desire that this booklet will give you the basic understanding of the importance of proper nutrition and proper nutritional supplementation. Athletes today are inundated with different messages of how to succeed and out-perform their competition. Some of the messages include undesirable methods. However, we believe that eating a good diet, getting the proper amount of sleep, and taking a high quality nutritional supplement can enhance performance and help athletes succeed on the field and in life.

To purchase more copies of this booklet or for more information, contact us at:

Dr. Craig Couillard: drccraig@lakemarionchiropractic.com

Dianne Goodman: dianne.m.goodman@gmail.com

Position papers:

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SLEEP AND ATHLETIC PERFORMANCE

Today it is becoming harder and harder to get the appropriate amount of sleep. Sleep is vital to all organs and overall health and healing of the body. Many of us, especially athletes, feel that there are not enough hours in a day to accomplish everything on our schedules. However, experts show that athletes who get the right amount of sleep may have an advantage over their competition.

One researcher studied the effects of sleep with competitive swimmers. Five Stanford swimmers were studied with their regular sleep habits. They were then instructed to sleep 10 hours a day for a few weeks. The results for the swimmers after sleeping 10 hours per day included quicker times off the blocks, faster times in the water, and quicker/better turns. In addition, they were less fatigued and had better moods.

So how much sleep is needed? Some individuals may need more sleep than others. But overall, adults need between six and nine hours every night. For teenagers and athletes the numbers bump up to nine to 11 hours nightly. If it is impossible to get that much sleep, naps are a healthy way of adding to the total overall amount of sleep. Limit naps to no longer than 20-30 minutes. It is also beneficial to go to bed and wakeup at the same times every day.

SLEEP DO'S

- Strive for 9 to 11 hours of sleep every night.
- A nap may be needed to reach the number of recommended hours of sleep.
- Do not take sleep for granted, it could give you a leg up on your competition.

INTRODUCTION

There is a vast amount of information about what a competitive athlete should and should not eat and drink. Quality information is scattered in many different areas and it is hard to separate reliable from less reliable information. To add to this confusion, experts in this area have conflicting thoughts.

Our experience in working with athletes and our own children has helped us filter through the information. The goal of this booklet is to bring quality information together in order to make it easier for an athlete, coach, and parent to make wise and educated decisions about their athlete's diet and supplementation regimen in order to enhance performance and support overall health.

HYDRATION

Water

The easiest way to understand hydration is to talk about the opposite - dehydration. The body is made up of 60-70% water. If you wait until you are thirsty to begin your intake of water, you have waited too long and are already showing signs of dehydration. Even mild dehydration can decrease performance; therefore, it's important to stay hydrated at all times. Because the body is made up of mostly water and it functions best when it's hydrated, serious damage can be done when performing without the proper hydration.

A simple analogy is to compare dehydrated muscles to beef jerky. As an athlete's hydration levels decrease, the soft tissue starts taking on the appearance and texture of beef jerky. Beef jerky does not stretch, it's tough and leathery. Likewise, when muscles are not properly hydrated, they do not stretch. Micro-tears occur leading to injury and a whole host of other issues.

Signs of dehydration include:

Thirst	Decreased performance
Loss of appetite	Weakness
Lethargy	Cramps and fatigue
Anxiety	Dark urine
Nausea and dizziness	Headache
Irritability	

Dehydration also impairs the body's ability to dissipate heat and can cause an elevated internal body temperature. When the body is dehydrated, it can cause a decrease in plasma volume which will reduce the amount of oxygen being delivered to the muscles (as stated above, the muscles become like beef jerky). This may lead to a decrease in athletic performance. When plasma volume is decreased, blood flow

In the marketplace today, there are many specialized products that support the body's natural healing process. When health considerations are presented for an athlete, consulting with a qualified nutritional resource is highly recommended.

NUTRITIONAL SUPPLEMENT DO'S

- Choose a quality supplement at the right dosage for your age level.
- Contact a nutritional consultant to assess individual needs.
- Read and understand labels, be cautious about outlandish product claims.

*These statements have not been evaluated by the Food and Drug Administration. These recommendations are not intended to diagnose, treat, cure, or prevent any disease.

organizations such as the NFL, MLB and the World Anti-doping league recommend that if an athlete chooses to use supplements, the product carry the designation by NSF Certification for Sports. This program minimizes the risk that a dietary supplement or sports nutrition product contains banned substances. There are only a handful of companies that have received this recognition of NSF Certification for Sports.

Generally speaking, what supplements should an athlete consider taking? Every athlete has different requirements and their overall health needs to be considered. These are minimal guidelines for the majority of athletes:

- **Optimal levels of antioxidants and minerals.** We recommend optimal levels over the current RDA's. The RDA's were established over 70 years ago to eliminate vitamin deficiencies such as scurvy or rickets. Today, we need much more than the RDA's. Be sure to choose a product that is produced for your age level. Children do well with a chewable due to the issue of swallowing pills. While, older teenagers and adults require higher levels of key nutrients, younger teens typically do not need higher levels of certain nutrients.
- **Omega 3 Essential Fats.** Look for a product that is pharmaceutical grade and virtually free of contaminants such as Mercury, heavy metals and PCBs. Check the purification process used to be sure you're not adding additional free radicals from your supplements into your body.
- **Glucosamine.** Depending on the age, some athletes find it beneficial to supplement with glucosamine. Glucosamine is an amino sugar and is important in the health of cartilage. It is believed that glucosamine plays a role in regulating cartilage formation and normalizing cartilage metabolism.

to the skin may also be decreased. This will change the body's ability to dissipate heat thereby increasing the body's internal temperature. As the internal temperature increases, signs of dehydration occur. Without proper hydration, a more serious health condition such as heat stroke could occur.

Water plays many additional, important roles in the body. It's an important part of the digestion process. It's a component of all cells. It helps with the elimination of wastes, and it acts as a mechanism to transport nutrients and gases. These important bodily functions all require an ample supply of clean, filtered water.

How much water should you drink daily for the body to function properly? The daily minimum amount of water is easy to determine. Take half of your body weight, and that's the minimum amount of water in ounces you should consume in a day. This is an easy calculation for everyone to follow. For an athlete, however, especially if it's hot and humid, you'll want to consume even more.

- It takes 36-72 hours to properly hydrate. Consumption of extra water needs to begin two days before competition.
- An hour or two before competition, drink 8-16 ounces of water.
- Drink another 8-16 ounces 10-15 minutes before the activity.
- Drink another 6-12 ounces during an activity (every 15-20 minutes).

After practice or competition, you'll want to replace the water eliminated through sweat by drinking 16-24 ounces for every pound lost during the activity. An athlete needs only to lose about 2% of body weight in fluid to negatively affect performance (2% loss = 3 pounds for a 150 pound athlete).

Day to day hydration can easily be detected by checking urine color. If it's pale like lemonade, that's a sign of good hydration. If it's dark like apple juice, the body needs more water.

Sports Drinks

Most sports drinks (like Gatorade, G2, and Powerade®) contain simple carbohydrates and the listed ingredients typically include sucrose, glucose, and/or fructose. Be a label reader. Some drinks contain both fructose and the artificial sweetener sucralose. (See the notes below about artificial sweeteners.) Many sports drinks also contain artificial colors such as Red 40, Blue 1, and Yellow 5. These additives are controversial. Another additive found in several brands is glycerol ester of wood rosin. This is often used to help fruit flavoring oils mix with a water based beverage. However, most sports drinks do not contain fruit juice.

Many sports drinks cite the benefits of electrolytes in their product. Electrolytes are micro nutrients (minerals), also known as salts within the body. These substances are a vital component of many physiological functions. Muscle contractions and nerve impulses are a couple of important functions that are affected by electrolytes which are important for the competitive athlete. The main electrolytes are: sodium, chloride, potassium, magnesium and calcium.

Sources of these electrolytes/minerals are:

- Sodium Found in small amount in all foods
- Potassium Fruits, vegetables, meats, poultry, legumes
- Calcium Dairy, green vegetables
- Magnesium Nuts, whole grains, green vegetables
- Chloride Found in salt

There is much debate on how much and when an athlete needs to supplement with a sport drink for electrolyte balance.

antioxidants are contained in our foods, especially vegetables and fruits. Because of our polluted environment, stressful lifestyles, poor diet choices, and soil depletion, we are exposed to more free radicals than any previous time in history. Supplementation has become an important aspect of our life today.

Nutritional Supplements*

Today, like never before, supplementation is an important element of a healthy lifestyle. Because of the depletion of nutrients in the soil in which our foods are grown, eating a well-rounded diet still has short comings for optimal health and enhanced performance. Other factors, such as environmental and lifestyle choices, make it difficult to fight the free radical damage or oxidative stress our body experiences without assistance of a high-quality supplementation program.

Competitive athletes need to be wary of products that contain substances banned by the World Anti-Doping League. Trusting the label is not always safe or accurate. While current labeling laws require products to contain what is on the label, what is not required of manufacturers is the testing of every batch of product. Certain pharmaceutical grade vitamin manufacturers have stricter standards and test every batch. These standards ensure that a higher quality of product is consistently manufactured. The quality of ingredients that are used in the making of many supplements is also important. Inferior raw materials are cheaper and easier to obtain. Another important attribute is dissolution. Many products don't dissolve properly and in a timely fashion so that the product passes through the body without ever providing any benefits to the cell.

What are good resources when choosing a high-quality supplement? NSF (National Sanitation Foundation) is an organization that raises the bar in the industry to ensure the quality of supplements is at its highest standard. Sports

IMMUNE SYSTEM AND ATHLETIC PERFORMANCE

A healthy immune system is vital to athletic performance, and more importantly, overall health. Our body can perform at its peak when our immune system is equipped to handle the continuous task of keeping us healthy, and repairing free radical damage.

Free Radicals

Our body is made up of millions of cells. When our cells are healthy, the cells replicate and keep the body young, well, and disease free. A healthy cell has “paired” electrons. A cell missing an electron is called a “free radical.” Cells can lose an electron and become a free radical as a result of smoking, stress, pesticides, pollution, medications, food additives, highly processed foods, Mercury and many other avenues. Even exercise can result in the production of free radicals.

Our body was created to fight free radicals naturally. However, with the onslaught of toxins and poor diet choices, our body can no longer keep up. Free radicals alter or destroy other cells by stealing their electrons. They can go on to damage the cell wall, vessel wall, proteins, fats, and even the DNA nucleus of the cell. Medical literature has shown that free radical damage is the root cause of over 70 chronic degenerative diseases like heart disease, cancer, arthritis, macular degeneration, Alzheimer’s, dementia, and Parkinson’s disease. This is also called oxidative stress. Oxidation is what happens to an apple when you cut it and it turns brown or when you leave metal outside in the rain. It’s like our body is rusting from the inside out.

What can you do to prevent free radical/oxidative damage? Antioxidants have extra electrons which they easily release to eliminate or neutralize the harmful effects of free radicals. Our body makes a certain amount of antioxidants on its own plus

Because every athlete has different needs, sports vary in endurance levels, and weather conditions are a factor, a general rule to follow: For events lasting less than one hour, plain, filtered water is still the best fluid to consume. If exercising from 1-3 hours in duration, the weather is hot and humid, or the athlete has sweat a great deal, carbohydrates and electrolytes need to be replaced. Limit consumption to 32 oz of carbohydrates and electrolytes in an hour.

Energy Drinks/Caffeine

Since the introduction of Red Bull to the US in 1997, energy drinks have become very popular with the 12 to 25 year old age group. Every bottling company has their version of an energy drink including Budweiser (B^E beer with caffeine, ginseng and guarana). They have bold names such as Venom, Monster, and Full Throttle. The ingredients are similar (excluding the beer) sucrose or sugar, high fructose corn syrup, sucralose (an artificial form of sugar), taurine, sodium, ginseng, caffeine, and guarana. Some of them offer added B vitamins in small amounts. This makes energy drinks appear healthy, although they probably contribute little to the health of the drink. The other ingredients that add “energy” to the drink include:

- Taurine - an amino acid our body produces naturally.
- Ginseng - an oriental herb that is believed to help relieve stress.
- Guarana - a South American herb that is rich in caffeine and contains up to 4-8% caffeine (coffee beans contain approximately 1–2.5% caffeine).

Because an energy drink is consumed quickly instead of sipped like coffee, the caffeine is also ingested quickly. Health officials are seeing negative results from the quick and large ingestion of these drinks – nausea, abnormal heart rhythms, heart palpitations, and emergency room visits. In reviewing the literature on this topic, it is recommended that caution be

taken when consuming these drinks. Over consumption of these products is very easy. With a well rounded diet, they are not needed.

Soda and Artificial Sweeteners

Soft drinks in general should be consumed in moderation. Soda contains a great amount of sugar around 30 grams in an 8 oz serving. However, bottles and cans usually provide more than one serving. It takes just a couple of bottles and you've consumed a whole cup of sugar. Additionally, one side effect of soda that many people are not aware of is that carbonation can negatively affect the amount of calcium that is absorbed in the body. The phosphoric acid contained in soda interferes with calcium absorption and as a result most of the calcium we obtain from our diet goes out through the urine.

To avoid sugar, people often turn to artificially sweetened varieties. These, however, can create other issues and they are highly controversial. For the best performance, athletes should avoid all artificial sweeteners such as aspartame, saccharin, sucralose, and Splenda™.

HYDRATION DO'S

- Drink half your body weight in ounces of water every day.
- Minimize caffeinated beverages.
- Use sports drinks wisely – consume no more than 32 oz of carbonation/electrolytes in an hour.
- Avoid artificially sweetened drinks.
- Avoid energy drinks.

WEIGHT AND WEIGHT MANAGEMENT

It seems like you can hardly turn on the TV without hearing about the obesity issue in America today. And while many athletes don't have the issues that are touted on the news, weight management is important for young athletes. Performance can be hindered when weight is an issue. Plus, athletes who are overweight are more susceptible to injury.

There is not a magic weight management system that exists for every athlete. Consider these ideas when trying to manage your weight. Avoid or minimize:

- Fried foods
- Caffeine
- Excess salt
- Carbonated beverages
- White flour
- Processed foods, and foods that have a high glycemic index value

Also, decrease overall consumption of animal protein and sugar. Drink the recommended amount of water based on your weight. Include whole and raw foods (fruits and vegetables) with each meal. Eat smaller more frequent meals throughout the day.

WEIGHT MANAGEMENT DO'S

- Make healthy food choices to maintain a healthy weight and decrease risk of injury.
- Avoid fried foods, caffeine, carbonated beverages, processed foods, and white flour.
- Decrease overall consumption of sugar.

Hydration is very important after competition and intense workouts. The main components an athlete should consume include: water, electrolytes, carbohydrates, fat, and protein. These are all essential to restoring the vital nutrients the body just used in competition. The following chart gives examples of good choices to replace the electrolytes used during competition:

Electrolytes/required minerals	Examples of good sources
Sodium Chloride	Table salt is made of sodium chloride. Therefore salt and salty foods are a source of sodium. Pretzels are a good choice.
Potassium	Banana, cantaloupe, honey dew melon, tomato, asparagus, potato, cauliflower, sweet potato, low fat milk and cheese, most legumes.
Calcium	Low fat string cheese and yogurt, green leafy vegetables, broccoli, Brussels sprouts, spinach, legumes, almonds.
Magnesium	Nuts, whole grains, green vegetables such as spinach.

PRE-GAME, SNACKS AND POST-GAME DO'S

- Eat 2-4 hours before competition including a small amount of protein and low glycemic food choices.
- Consume whole foods as snacks, such as fruits and vegetables.
- Fuel the body with the highest “octane fuel” and provide the body with what it needs to perform.
- Consume a post-event meal that includes required electrolytes, higher glycemic foods, and water.
- Minimize processed foods.

PROTEINS

Next to water, protein makes up the greatest portion of our body weight – approximately 16%. Muscle, hair, skin, and connective tissues are primarily made up of protein. Protein is used for building and repairing muscle and tissues, red blood cells, hair and finger nails. Protein also plays a role in all of the cells and majority of fluids in our body. In addition, many of our body’s important chemicals, enzymes, hormones, neurotransmitters and even our DNA, are at least partially made up of protein.

Amino Acids are the chemical units or “building blocks” of the body that make up proteins. Our body produces 10 of the 20 needed amino acids. The other 10 must be supplied by food and are referred to as “essential amino acids.” Failure to obtain enough of these essential amino acids from our diet can result in the breakdown of the body's proteins (muscle, tissues, etc). Unlike fat and starch, our body does not store excess amino acids for later use, the amino acids must be in our food every day. Eating a well-balanced meal that includes protein will ensure appropriate amino acids are ingested.

How much protein does an athlete need? There are several sources that show an athlete, especially a high endurance athlete, requires more protein than the current USRDA of .8 grams per kilogram of body weight. To determine your requirements, use the simple formula of 1 gram of protein per 1 pound of lean muscle mass. Assuming an athlete has 20% body fat, a 150 pound gymnast would need to consume 120 grams of protein per day or 4.3 ounces.

$$150 \text{ lbs} \times .20 \text{ (body fat)} = 120 \text{ grams}$$

$$1 \text{ ounce} = 28.35 \text{ grams}$$

$$120 \text{ grams} / 28.35 = 4.3 \text{ ounces}$$

One thing to note is athletes under the age of 18 may require more protein to allow for growth.

It's easy to meet protein requirements because protein is found in most foods. Good sources of protein include:

- Lean cuts of red meat
- Eggs
- Poultry
- Fish
- Legumes—black beans, pinto, navy, etc.
- Avocados
- Nuts—most nuts are a good source, raw almonds, pistachios, and peanuts have the highest amount of protein
- Peanut butter—check the label to avoid hidden sugars and hydrogenated oils
- Vegetables—yams, asparagus, broccoli, Brussels sprouts, cauliflower, okra and spinach

PROTEIN DO'S

- Consume 1 gram of protein for every pound of lean muscle mass.
- Add nuts, green leafy vegetables, and beans to your diet.
- Minimize fried, canned and processed meats.

Bagels/Bread	Choose whole wheat over white flour breads.
Fruits	Whole fresh fruit is the best, frozen is a good second choice.
Vegetables	Raw or steamed is best.
Pretzels	Even though they are made with white flour, pretzels in moderation are a healthier snack than chips plus they provide additional sodium which needs to be restored after an intense workout.
Dairy	Low fat yogurt or string cheese.
Trail Mix	Instead of pre-packaged trail mix which may contain unwanted ingredients, purchase the items separately such as raw almonds, walnuts, and raisins and combine them in a large plastic bag for easy transportation.
Sports Bars	Watch for hidden fats and sugars.
Oatmeal/ Oatmeal Bars	Choose old-fashioned oatmeal over instant which is highly processed. Check the label of oatmeal bars for unnecessary ingredients such as hydrogenated oils.
Peanut Butter	Check the label for unnecessary ingredients including sugar and hydrogenated oils.

Post-competition/post-intense workout foods

Athletes take the post-event meal for granted but it should be consumed within an hour of the event. However, the athlete is tired and the last thing on their mind is eating. This time is critical to the recovery state of the body, and also replenishing glycogen stores to the muscles for the next practice or performance.

PRE-COMPETITION/PRE-INTENSE WORKOUT, SNACKS, AND POST-COMPETITION FOOD

Eating meals and snacks that are made of fresh, whole foods, preferably organic or locally grown, without colors, dyes, chemicals, preservatives or added hormones are best for anyone especially athletes. As stated in the Carbohydrate section, typically foods that are processed have a higher glycemic value than those that are whole, i.e. white flour products vs. whole grain products. Including some protein in all your meals and snacks (especially in the morning) will have a stabilizing effect on your blood sugar, which in turn can help you overcome caffeine and sugar cravings.

Pre-competition/pre-intense workout meals

The pre-game meal should be consumed 2-4 hours before competition to allow for digestion. Eating too close to competition can slow down the athlete and can result in a bloated feeling. Similar to hydration needs, the day before competition well-balanced meals are important. While the majority of the meal should be carbohydrate based, protein is important and should be consumed with every meal. Protein slows the digestion and helps to avoid the spiking of the blood glucose. As stated in the Carbohydrate Section, the pre-game meal should consist of foods that have a low GI value. For a more complete listing see the Carbohydrate Section.

Snacks

Making healthy snack choices is always important for the athlete as they try to keep their glucose levels stabilized and yet meet the demand for energy. Snacking between games or intense workouts should consist of low to medium GI foods (see the Carbohydrate Section). The following table is a quick reference for snacks.

FATS

Fats are critical for many vital functions of the body. Imagine making that statement in the 1980's when we were so worried about our fat consumption. Everyone was told to restrict their fats and that grains were good. Today, we know that's not the case.

Essential Fats

Fats provide fuel, protect organs, regulate hormone production, provide insulation to all types of tissue, assist in brain function, and enhance vitamin and mineral absorption. There are two main types of essential fats—Omega-3 and Omega-6. They play an important role in the body, they help regulate the body's balance of inflammatory response.

In its beginning stages, inflammation is the body's healing response to an injury, irritation, or microbial invasion. For instance, with a cold, our body creates inflammation in the form of a runny nose, sore throat, fever, and cough. As annoying as these symptoms are, they are signs of a normal healing process. Too much inflammation, however, can have serious long-term side effects, balance is important. Omega 3 is a natural anti-inflammatory agent while Omega 6 helps provide the needed inflammation.

Omega 3-the two main components are DHA and EPA. DHA is required in the brain and retina (eye) as an essential nutrient to provide for optimal functioning such as learning ability, mental development and visual acuity. DHA and EPA are considered to have beneficial effects in the prevention and management of cardiovascular disease. As stated above, Omega 3 is also beneficial as an anti-inflammatory. The major source of DHA and EPA comes from cold water fish such as salmon, mackerel, trout, tuna, sardines, etc. Because of Mercury and other contaminants in seafood, many people choose to limit their consumption of fish and supplement their diet with a high quality fish oil capsule. Cold-pressed extra

virgin olive oil and flax oil are also excellent ways of adding Omega 3 to the diet.

Omega 6 fatty acids are easily consumed in our western diet. They are found in vegetable oil and meats. As stated above, they too play a critical role in the body's overall healthy function.

Fats to Avoid or Limit

Two types of fat that you want to avoid or limit are saturated fats and trans fats. Saturated fats are typically solid at room temperature. They occur naturally in many foods and are mainly found in animal sources including meat and dairy products. Foods that are high in saturated fats are also typically high in dietary cholesterol. Saturated fat is also found in palm oil, palm kernel oil, and coconut oil.

Trans fats are made when manufacturers add hydrogen to vegetable oil in a process called hydrogenation. Hydrogenation increases the shelf life and flavor stability of foods containing these fats. Trans fats can be found in vegetable shortenings, some margarines, crackers, cookies, snack foods, and other foods made with or fried in hydrogenated or partially hydrogenated oils. These man-made trans fats have been linked to increasing overall cholesterol levels while lowering the healthy HDL cholesterol. When possible, make a different choice than something made with hydrogenated fats. The key is to check the ingredient label. Due to portion sizing, it's possible for a food manufacturer to label the product "0 Trans Fats" while it still contains hydrogenated oils.

FAT DO'S

- Ensure you consume Omega 3 daily. Good sources are flax seed oil, fish oil, salmon and other cold water fish.
- Use cold-pressed extra virgin olive oil.
- Minimize trans fats found in vegetable shortenings, margarines, crackers, cookies, and snack foods.

Group	Better Choice	Worse Choice
Grains	Rye bread, whole grain breads, high fiber cereals, brown or wild rice, whole grain pasta, old-fashioned oatmeal.	White bread, fried breads, sugary cereals, pancakes, waffles, crepes, white flour bagels, rice cakes, crackers, instant oatmeal.
Vegetables	Fresh vegetables (frozen ok), sweet potatoes, squash.	Canned or fried vegetables, white potatoes.
Fruit	Fresh or frozen (check for hidden sugars in the frozen fruit) bananas, grapes, raisins.	Canned fruit, dates, figs.
Dairy	Non-fat and low fat milk, cheese, yogurt.	Whole milk, high fat cheeses, heavy creams.
Fats	Food items prepared in a plant oil (canola or extra virgin cold-pressed olive oil), fish oil, cod liver oil, flax seed oil.	Food items prepared in animal source fats, margarine, fried snacks, trans fats/hydrogenated oils, coconut oil, palm oils.

CARBOHYDRATE DO'S

- Consume more fruits and vegetables daily. The darker and more colorful the broader spectrum of antioxidants the body receives.
- Eat more whole foods and whole grains.
- Look for bread and cereal sources with at least 3g of fiber per serving.
- Minimize processed foods.

Different sports require different amounts of carbohydrates for energy. Endurance (running) activities are going to require more carbohydrates than a non-endurance sport like golf. The higher the endurance sport the more important to balance low, medium and higher GI foods at the appropriate times. A well balanced diet and some minor changes depending on the sport will create the right balance of glucose. This balance can boost performance and decrease the risk of injuries.

Carbohydrates Better Choices vs. Worse Choices

Sixty percent of an athlete's total daily caloric intake should come from carbohydrates. Making good choices is essential for long term health and athletic performance. Label reading is a must if you're purchasing products that are not whole foods. Whole grains, fruits and vegetables are a preferred carbohydrate source eliminating as much processed foods and white flour as possible.

In general, if it has not been processed by man—it is a good carbohydrate. Don't be fooled by the bread label that boasts "made with whole grains." Often the first ingredient is "enriched wheat flour." There may be some whole grains in the bread but the enriched wheat flour has essentially been stripped of all the goodness during processing and then enriched with extra vitamins.

Look for bread and serving choices with at least 3g of fiber per serving. The following chart will give you more choices of good carbohydrates.

CARBOHYDRATES

Carbohydrates are the primary energy source for the brain and muscles. They are critical nutrients for the athlete who has high-energy demands during exercise and performance. Stamina, power and endurance are dependent on adequate carbohydrates in the diet. Like protein, carbohydrates are found in virtually all foods that we consume - cereals, grains, rice, bread, legumes, oats, vegetables, fruits, fruit juices, milk, and sweets.

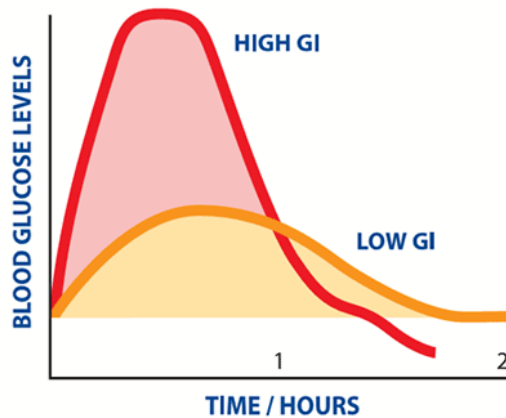
During digestion, the body breaks down carbohydrates to glucose (sugar) and stores it in the muscles as glycogen. During exercise, the glycogen which is stored in the muscles is converted back to glucose and is used for energy. The ability to sustain prolonged vigorous exercise is directly related to initial levels of muscle glycogen. The body stores a limited amount of glycogen in the muscles.

The body is much more efficient at using carbohydrates as a fuel source than fats and protein. Carbohydrates yield more energy per unit of oxygen consumed than fats. Because oxygen can be a limiting factor in long duration events, it is beneficial for the athlete to use the energy source requiring the least amount of oxygen per kilocalorie produced which are carbohydrates. As work intensity increases, carbohydrate utilization increases. Through physical training and a diet rich in carbohydrates, athletes are able to store more glycogen and to use its limited supply. When stores run low, athletes can become fatigued and performance suffers. A common symptom of low levels of glycogen is when your muscles start to feel heavy and your pace slows. This is also known as "hitting the wall."

Glycemic Index and Its Importance

Carbohydrates can be confusing. As you read, carbohydrates are a preferred source for athletes and some experts believe

in carbohydrate loading. This is the process of eating a large amount of carbohydrates such as pasta before a sporting event. Pasta and other simple carbohydrates spike the blood sugar (glucose) levels.



Another theory uses the glycemic index (GI).

The GI describes the way our body reacts to different carbohydrates by ranking them according to their effect on our blood glucose levels. Choosing low GI carbohydrates, the ones that produce only small fluctuations in our blood glucose and insulin levels, can provide for long-term reduction in the risk of heart disease and diabetes. It is also a key to weight management and weight loss. As the chart above shows, food with a high GI value spikes the blood glucose level shortly after consuming it. Within an hour or two the glucose level takes a dip leaving us hungry and craving something else with a high GI value.

Glycemic Index (GI) and Sports Performance

For an athlete to maintain enough energy, carbohydrates need to be readily available on demand. Carbohydrates equal fuel. Athletes must have the right balance of carbohydrates before, during, and after an event. If the wrong balance occurs performance and recovery times are compromised.

Many experts agree that eating low GI foods before exercise is preferred because it balances the blood glucose levels. In between games or competition, consuming medium GI carbohydrates may promote faster absorption of glucose into the bloodstream and provide energy at the right time. Shortly

after an intense workout or competition, higher GI foods replace glycogen stores that were used during the activity. This will allow energy to be available for the next event.

The following chart is an example of low, medium and high GI foods. (Rule of thumb - the more natural the food (fresh fruit as opposed to fruit juice) the lower the glycemic index and consequently the better it is for you.)

Classification	GI Range	Examples
Low GI	55 or less	Most fruit and vegetables (except white potatoes): apples, plums, peaches, oranges, grapes, mangos, kiwi, cherries, avocado, leafy vegetables (the darker green the more antioxidants), broccoli. Grainy breads, whole grain pasta, legumes, milk, Nutrimeal™ shake and bars, oatmeal bars (be careful of hydrogenated oils in some brands), corn muffin, yogurt, nuts: almonds, cashews, hazelnuts, macadamia, pecans, peanuts, walnuts.
Medium GI	56 – 69	Brown rice, basmati rice, sweet corn, sweet potato, new potatoes, carrots, rutabaga, pineapple, cantaloupe, banana, watermelon, apricots, strawberries, kiwi, pineapple, bran cereals, oatbran muffin, some powerbars, corn-based taco shells.
High GI	70 or more	Most processed cereals (like Corn Flakes or Rice Krispies®), white potato, some powerbars, white rice (e.g. jasmine), white breads, white pasta, white bagel, graham crackers, popcorn, pretzels.