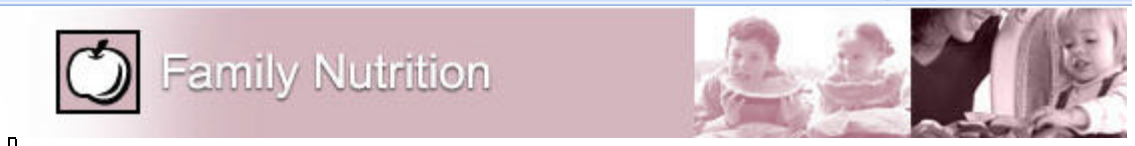

SPORTS NUTRITION

Topics included in this section are:

SPORTS DRINKS: WHAT? WHEN? AND HOW MUCH?

Should you be lugging a bottle of commercial sports drink to your child's soccer game? What drinks provide the best nutrition for optimal performance? The answers to these questions depend upon how long and how strenuous the exercise is. If you or your child exercise moderately for less than an hour, plain water is the best source of fluids. Water is absorbed more rapidly than any other liquid, but once you begin adding stuff to water, the absorption slows. Drink ahead. Drink a few glasses of water before a game. During the game, drink enough to quench thirst, and after the game drink enough water to quench thirst and then drink at least two more glasses, since thirst is not a reliable indicator of adequate hydration. For high endurance exercise lasting longer than 90 minutes, you will probably need a carbo-lyte-hydration drink (i.e., one containing sugar, salts, and water).

During strenuous exercise lasting more than one hour sports drinks help prevent dehydration, a major cause of muscle fatigue. The main nutritional elements in a commercial or homemade sports drink are water, carbohydrates, and electrolytes (sodium and potassium).

Try these carbo-hydration tips to enhance performance, and therefore enjoyment, of sports.

- Avoid junk juice "drinks," which contain a tiny bit of juice and a lot of added sweeteners. Instead, use "100 percent juice."
- Avoid carbonated drinks, which can leave the athlete feeling bloated.
- Before the game, instead of soft drinks, drink plain water. Besides the sugar in the soft drink slowing the absorption of much needed water, it could trigger low blood sugar during the game, just what the athlete doesn't need.
- Instead of commercial sports drinks, you could make your own. Juices, such as apple, orange, or grape are an excellent base for sports drinks, since they contain both glucose and fructose sugars, as well as potassium, which is lost with sweating. Fructose sugar is one of the best carbohydrates for replacing used up muscle glycogen stores. Add one tablespoon of salt (to replace the sodium lost while sweating) to a quart of dilute juice, and you've made your own sports drink.
- The best time to drink commercial or homemade sports drinks is during exercise, since the carbs in the drink do not cause high blood sugar fluctuations because insulin is not secreted during exercise. (Drinking a high-sugar drink prior to exercise may trigger insulin and lead to hypoglycemia in the middle of the game.)

- As a general rule, sip one quart of cool rehydration liquid per hour of strenuous exercise.
- It's better to drink liquid calories rather than solid food during exercise, since solids remain in the stomach longer and delay the absorption of the much-needed carbs and water.

A useful reference for eating and drinking wisely during exercise is: Nancy Clark's Sports Nutrition Guidebook, Human Kinetics Publishing, 1996.

5 WAYS NUTRITION CAN BOOST ATHLETIC PEFORMANCE

1. Make carbohydrates 70 percent of your calories three days before the game. A teen athlete consuming around 3,000 calories daily would need to consume around 500 grams of carbohydrates spaced in several meals throughout the day. Remember the sports axiom: "Saturday's game is played on Thursday's food." Eating a high energy, nutritious diet for several days before the game stores up energy.

2. Prehydrate your body for three days before the game. Drink extra water, approximately three-quarters of an ounce per pound (a 160-pound athlete would drink twelve 10-ounce glasses of water a day.) Since muscle contains so much water, a slight degree of dehydration can greatly diminish muscle performance. Dried-up muscles become weak.

3. Enjoy a performance-boosting pre-game meal. The pre-game meal should be low in fat, since fatty foods take longer to digest and may leave an athlete still feeling full at game time. Ideally, the pre-game meal is eaten three hours prior to the game. The best pre-game meal would be high in complex carbohydrates (about 70 percent of calories), with medium amounts of protein (about 20 percent of calories), and low in fat (around 10 percent of calories). Protein stimulates insulin to help the muscles use glucose more efficiently. Protein also helps to energize the brain. The small amount of fat slows the intestinal absorption of carbohydrates, so that the sugar enters the bloodstream at a steady rate.

For a teen athlete, the pre-game meal should contain about 100 grams of complex carbohydrates. Here are some good foods to include:

- Oatmeal (or cereal), fruit, and carrot juice
- Peanut butter and jelly sandwich on whole-grain bread
- Whole-grain pasta with a lowfat sauce
- low-fat yogurt and fruit

4. Eating and drinking just before and during the game. Studies show that taking sugars, such as candy, honey, or sucrose before exercise results in reduced performance. Some research suggests that eating or drinking sweets within an hour of exercise may decrease performance, due to too much of an insulin rush and the roller coaster effect of high and low blood sugar. While the amount of energy already in your body at the start of the game has the most influence on your performance, it's also important to replenish food and fluids during the game. Quick-energy carbohydrates are those with a high glycemic index, carbs that raise blood sugar quickly, such as orange juice, bananas, raisins, and carrots.

5. Rehydrate your body after the game. After vigorous exercise, you need to replenish water, carbohydrates, and electrolytes that were used up during the game. As soon as the game is over, drink at least two full glasses of plain, cool water. Then eat and drink carbohydrate-rich foods. Remember to eat and drink slowly after a game to avoid nausea, heartburn, and cramps that may result from overloading your intestines with too much food and drink too soon. Rehydrating yourself with plain water first will often prevent after-game fatigue, cramps, and abdominal upset.

THE SCIENCE BEHIND SPORTS NUTRITION

Young athletes burn a lot of calories, so obviously, they need to eat more food than

the average person. Yet, for optimal athletic performance, they not only need more food, but they need the right kind of extra nutrition. Besides needing food to meet the body's basic nutritional requirements, the young athlete will need extra energy in proportion to the demands of the sport. For example, if an athlete in training uses a thousand extra calories per day (the average amount used in two hours of vigorous exercise), the child needs to add a thousand extra calories of high energy food to an already balanced diet. These foods should be primarily complex carbohydrates, foods such as fruits, juices, and grains. These additional energy requirements cannot be met by taking vitamins, protein powders, or mineral supplements, since these are not energy sources.

Get your stamina from starch. Studies of athletes and the foods they eat have shown that complex carbohydrates are the best energy boosters. To appreciate the connection between what you eat and how your body uses the energy, it helps to understand a bit of muscle biochemistry.

Your body stores extra fuel in energy "banks." As you expend energy, you withdraw fuel from your bank. Your body's best bank - the one that provides the quickest service -- is the carbo bank. The central carbo bank is in the liver, which stores a lot of carbohydrate energy in the form of glycogen, long chains of glucose molecules linked together. Glycogen molecules are like stacks of money in the bank, ready to be withdrawn as needed. The carbo bank has branch offices located in the muscles throughout your body. The deposits in the branch offices are known as muscle glycogen. When muscles need energy during exercise, they quickly withdraw muscle glycogen from the bank, like having a cash machine right there at the shopping mall.

Of course, you have to put money in the bank before you can take it out. So it is with depositing fuel into your carbo bank. Before a high-energy competition, you'll want to be sure you have enough extra energy stored so that you can withdraw it as needed. Depositing energy stores before the big game is called carbo loading, which means you stock your carbo bank with extra fuel to burn on game day.

Best foods for carbo loading. Starches, such as grains and legumes, are the best foods for building up muscle glycogen. A steady insulin level is necessary for stocking the muscles with glycogen, which is why complex carbohydrates, those with a low glycemic index, promote better glycogen storage than simple sugars, such as glucose or sucrose. Eating an increased amount of complex carbohydrates for several days before a major competition will build up stores of muscle glycogen. Best carbohydrates for carbo loading are: fruits (such as apples and oranges), vegetables, legumes, and whole grains. Carbo loading does not mean overeating. It simply means increasing the percentage of carbohydrates in your diet to around seventy percent of your total daily calories for three days before the game. Immediately before (2-3 hours) or during a game it's best to eat foods with a high glycemic index, such as honey, bananas, raisins, carrots, and white rice. Corn flakes also have a high glycemic index.

Why not simply eat more complex carbs right before the game? Because of a biochemical quirk, stored muscle glycogen is a more readily available source of fuel than carbohydrates consumed right before the game. Muscle glycogen is like an automatic withdrawal system, releasing energy quickly as the muscles need it during exercise. The sugar consumed just before the game must go through some biochemical processing before it can be released for energy. That takes time, like depositing a check in the bank and then having to wait for the check to clear before withdrawing money. For maximal energy release, you load the muscles with glycogen for several days before the game.

Best foods for amateur athletes. Carbo loading is not necessary or advisable for every sport. It is mainly used by participants in endurance sports, those that require continuous exertion for longer than 90 minutes. For most amateur athletes, extreme carbohydrate loading is not necessary. Instead, sticking to a balanced diet (approximately 60-70 percent complex carbohydrates, 15-20 percent protein, and 20 percent fat) in the days before the game is sufficient. If you are involved in an important competition and you think carbo loading might help you, consult a

professional trainer or ask your coach about the right type of diet and training regimen for the week before your competition.