

## Carbohydrates

Carbohydrates are utilized for energy, both instant and sustained. When insufficient carbohydrates are taken in, the body must utilize proteins for energy even to the point of catabolizing muscle tissue for energy.

Digestive enzymes in the small intestines break down the carbohydrates into glucose. The glucose can be immediately utilized by the body or stored as glycogen in the muscles and liver. The muscles can store about 20 minutes of glycogen for energy. The bloodstream can hold about an hour of glucose for energy. If glucose levels are maximized and all glycogen storage locations are full then the excess glucose is converted to fat by the liver and stored in adipose tissue or fat cells. There is really no limit to the amount of fat that a body can store. According to studies at the University of Massachusetts, carbohydrates are generally converted to fat at the rate of 75% where 25% of the carbohydrates are used in the conversion process.

There are three types of carbohydrates Monosaccharides, Disaccharides and Polysaccharides.

Monosaccharides are simple sugars and are the basic unit of carbohydrate. Examples of Monosaccharides are glucose and fructose. Disaccharides are composed of two Monosaccharides. Examples of Disaccharides are table sugar (sucrose) which is composed of fructose and glucose also milk sugar (lactose) which is composed of glucose and galactose

Polysaccharides are composed of multiple Monosaccharides. Examples of Polysaccharides are starches (bread, fruit, grain, pasta, rice). These are also called complex carbohydrates.

Carbohydrates should comprise approximately 60% of the daily caloric intake. Therefore, for a 3000-calorie total daily intake, 1800 of those calories should be carbohydrates.

Fiber is a form of carbohydrate. Approximately 20 grams of dietary fiber is required in our diets. Fiber facilitates elimination and decreases appetite as a bulking agent. Fiber also inhibits the absorption of cholesterol into the blood stream. It has also been shown that fiber slows the absorption of sucrose into the bloodstream. This can be important in the treatment of type II diabetes. Too much fiber in the diet can restrict the absorption of necessary vitamins and minerals. Excess carbohydrates are converted into fat by the liver and stored in adipose tissue.

Sugar is absorbed into the bloodstream within minutes. Consuming large amounts of sugar prior to exercise can actually inhibit performance. This produces a drastic increase in blood sugar. This causes the pancreas to secrete large amounts of insulin to metabolize the sugar. All this insulin inhibits the metabolism of fat by the

muscles. Therefore, the muscles rely more on glycogen, which is in limited supply. The insulin reduces blood sugar level, which is already being reduced by the muscle utilization of glycogen stores for energy production. The blood sugar level reduces to a level, which may not only cause fatigue but dizziness as well. Therefore consumption of excess sugar prior to exercise reduces performance and endurance.

### **Carbohydrate Loading**

Carbohydrate loading is when an athlete depletes and then force-feeds carbohydrates over a period of several days. Carbohydrates are first depleted, for example on a long fast run, then large amounts of carbohydrates eaten. The theory is that the body will overcompensate and store extra glycogen.

### **Carbohydrate Stacking**

This technique requires the consumption of several different kinds of carbohydrates each assimilated by the body at different rates based on their glycemic value. Eating a high glycemic food provides immediate energy while a low glycemic food provides energy at a slower controlled rate. This technique provides greater endurance for athletes.

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