Newsletter

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Essentials of Carbohydrate Replenishment During Exercise

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As I've described in a previous article on this site, 60-70 percent of an athlete's diet should be comprised of carbohydrate calories where the sport involves repeated bouts of all-out effort and for long distance events. For these events. For these events carbohydrate energy represents the predominant energy source for maximum sustained power. Carbohydrate depletion during these events is known to hasten the onset of fatigue and to hinder performance capabilities. As a result athletes should be aware of effective carbohydrate repletion techniques as a means of optimizing their performance. Prior to exercise a carbohydrate rich meal should be consumed 3-4 hours before the game or training session. Thirty minutes prior to exercise 10-20 grams of fructose sugar mixed with 20-25 ounces of water can also maximize carbohydrate availability and utilization, enhancing performance.

Consuming carbohydrates during prolonged exercise events has also been shown to improve performance. Numerous studies have demonstrated increased exercise time to fatigue, power output during exercise and improved sprint performance following prolonged exercise when carbohydrate is ingested during exercise. Carbohydrates ingested during intensive or prolonged exercise are able to maintain blood sugar more effectively, thereby providing an immediate source of carbohydrate energy to the exercising muscle. As a result this strategy spares the rapid breakdown of liver carbohydrate, which is then able to provide blood sugar for a longer period of time during the event. Indeed, a recent report has observed a 59% reduction in liver carbohydrate (glucose) production during prolonged exercise when carbohydrate is ingested. This strategy enables the liver to deliver carbohydrate through the bloodstream as blood sugar, thus the exercising muscle uses up its own carbohydrate stores (glycogen) at a slower rate. Slowing the depletion rate of muscle carbohydrate stores allows the muscle to work at higher levels of power for a longer period of time; hence performance improves.

During prolonged exercise the muscle breaks down carbohydrates as a source of energy at a rate of 1-1.5 grams per minute. Based on a number of studies it appears that athletes need to ingest carbohydrates at a rate that will supply them with carbohydrates at approximately 1 gram per minute. This can be achieved by the ingestion of 600 to 1,000 ml/hour of solutions (drinks) containing 6-10% carbohydrate. This simply means that for every 100 ml water in a sports drink there should be no more than 6-10 grams of carbohydrate. Any more carbohydrate than this will slow down the rate of gastric emptying and water absorption into the bloodstream. Gastric emptying means the rate at which carbohydrates and fluids pass through the stomach into the small intestine where the maximum amount of absorption into the bloodstream occurs.

Soft drinks for instance, contain at least 12 grams of carbohydrate per 100 ml of water and, therefore, are not good sports enhancement beverages.

The popular carbohydrate sports enhancement drinks in the marketplace all meet the 6-10% carbohydrate criteria as I have explained it.

As for the type of carbohydrate that is best to include in a sports enhancement drink during competition, there is little difference between maltodextrines (glucose polymers) glucose and sucrose in their metabolic and performance effects during exercise. However, maltodextrin solutions tend to be less sweet, and therefore more palatable, than solutions of only simple sugars. In contrast, fructose ingestion during prolonged exercise does not improve performance. Fructose is the beverage of choice 30 minutes prior to exercise, but not during exercise.

As a general guide as to how to practically apply this information, let me summarize this information in the following way. During a strenuous exercise event that will last for more than 60 minutes, consider drinking 5-8 ounces of a carbohydrate based sports enhancement drink every 10 – 15 minutes. This will not only provide the right concentration and type of carbohydrates to stave off carbohydrate depletion your liver, bloodstream and exercising muscles, but also provides an optimal strategy to prevent dehydration. Most of these drinks (i.e. Gatorade) also provide sufficient sodium and/or potassium to prevent hyponatremia which is a loss of sufficient sodium (from sweating) to result in a life-threatening condition involving brain swelling and other complications. As a rule usually a minimum of 3 to 4 hours of continuous sweating is required to develop hyponatremia, but it remains a nutritional concern for certain types of sporting events.

In conclusion the use of carbohydrate sports drinks is a proven method to enhance athletic performance in events lasting at least 60-90 minutes, which requires repeated bouts of explosive power and in long distance events where maintaining optimal speed is critical to the outcome. Consuming 5-8 ounces of these drinks every 10-15 minutes is the best way to deliver the optimal amount of carbohydrate to the exercising muscle during intense and prolonged activity. By the way, colder fluids are absorbed faster than fluids at room temperature. Thus, colder beverages are a better choice for optimal carbohydrate and fluid replenishment.

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