

## **A Three part Series: Loading, Fueling, and Replenishing Carbohydrate for the Endurance Athlete**

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This is the second article in a three part series on Carbohydrate as an ergogenic aid to endurance athletes.

In the last article we discussed the importance of fueling while exercising. In this article we will focus on the importance of a high carbohydrate meal post-exercise.

How quickly an athlete can reestablish muscle glycogen from an exhausting bout of exercise is an important factor for performing optimally in tomorrow's training session. Although a normal diet, high in carbohydrate (65-80% of total diet) has been shown to restore muscle glycogen levels to normal over a 24 hour period, most endurance athletes do not have the luxury to wait 24 hours between training sessions for their muscle glycogen levels to be topped off. This is why your post-exercise carbohydrate meal becomes vital to your weekly training plan.

Glycogen depletion can occur at exercise intensity of 60 to 80% of  $Vo_{2max}$  in less than two hours. If the exercise intensity is high, e.g. 90% of  $Vo_{2max}$  during a speed workout, depletion can occur within a one hour session. The key factor to remember in post-exercise meal planning is the longer the duration and/or the greater the intensity of your event the farther your body will fall behind in its absorption and utilization of carbohydrates, even at a high ingestion rate (see related July article). This can leave your mind and muscles void of the needed energy to sustain tomorrow's workout.

After a prolonged bout of exercise greater than 90 minutes, the body's cells recognize the need for the replacement of muscle glycogen; creating a window of opportunity for muscle cells to replenish the glycogen that was expended during exercise. This window of opportunity is the best chance that an athlete has to top off their energy stores making tomorrow's workout a valuable training session. Numerous exercise physiologists have identified the first 15 minutes post-exercise as the most critical minutes. Consuming 1 gram of carbohydrate per kg body weight every 30 minutes up to two hours post exercise has shown to have the greatest rate of glycogen resynthesis. For example an athlete that weighs 150lbs will need to

consume 68 grams of carbohydrate or 275 kcal of carbohydrate as often as every 30 minutes up to two hours post exercise.

If the exercise bout has been moderate in intensity and duration, and ingestion of carbohydrate has been optimal during exercise, then a more moderate ingestion of carbohydrate would be recommended, e.g. one feeding of 68 grams in the first 30 minutes post-exercise. It has also been noted, foods that are high on the glycemic-index have the greatest absorption rate. These types of food are starchy in nature: potatoes, bagels, white rice and crackers. A liquid diet of yogurt, chocolate milk, soymilk or sport recovery drink are also excellent replenishing choices, if solid foods are not appealing immediately following exercise.

It is also worthy to note that during prolonged endurance events protein may become a source of energy, i.e. protein is converted to glucose once our muscle glycogen stores have been depleted. The amount of protein utilized as an energy source has been estimated as high as 20% in ultra-events. In order to stop the degradations of muscle tissue post-exercise, adding 6-15g of protein to your post meal will aid glycogen resynthesis and support muscle repair and regeneration.

A couple of excellent post exercise meals for a 150lb athlete would be, a plain bagel with 1oz light cream cheese providing 80gr carbohydrate and 18gr protein or 1 quart of low-fat chocolate milk providing 104gr carbohydrate and 32gr protein.

If rapid repletion of muscle glycogen is important for your next training session then planning a high carbohydrate post-exercise meal within minutes of your workout will give you that added advantage to your training plan that you may be missing.