

Recovery Nutrition for Athletes

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The ability of athletes to perform at peak levels can be limited by several things, one of them being how quickly their muscles recover and repair themselves after strenuous workouts, practices, and competitions. Although many factors contribute to recovery, nutrition may be the most important. However, it is often the most neglected and misunderstood component.

In the last decade, research coming out of leading laboratories has given us a greater understanding of how nutrition can enhance recovery and performance. Athletes who put the latest knowledge into practice will have a distinct advantage over their competitors who do not.

Window for Recovery

Workouts, practices, and competitions greatly deplete athletes' muscle glycogen stores and damage muscle cells, resulting in lingering muscle fatigue, soreness, and compromised function. Among other factors, the ability to perform at a high level several days per week is limited by how well the body recovers its glycogen stores and repairs muscle tissues after strenuous work.

It is now well established that the key to maximizing recovery is to consume carbohydrates and proteins immediately after exercise. Research indicates that the ideal recovery nutrition is a meal or liquid supplement containing high-glycemic carbohydrates and quality proteins in approximately a 4:1 ratio, that include 10 – 20% of the athlete's total daily caloric intake of these two macronutrients⁶.

Timing is essential, because the muscle cells are highly insulin receptive after exercise. Of course, insulin is the hormone that is responsible for transporting glucose and amino acids into the muscle cells and stimulating glycogen and muscle protein synthesis, it also greatly reduces muscle protein breakdown.

When high-glycemic carbohydrates and proteins are consumed immediately after exercise, these recovery processes occur much faster than at any other time. But this window of opportunity is only open for about 45 minutes^{5,7}. This is due in part to a rapid decline in the levels of plasma membrane glucose transporters, which increase during exercise. If you wait too long to eat or drink recovery nutrition, not only will your muscles no longer be insulin receptive, but they will in fact become insulin resistant and their recovery will be severely compromised.

In a Vanderbilt University study, researchers looked at the effect of a carbohydrate-protein supplement on protein synthesis following a one-hour workout⁷. Subjects were given the supplement immediately after exercise or three hours later. Protein synthesis was almost three times greater when the supplement was given immediately after the workout. Other studies have shown a similar pattern with respect to muscle glycogen replenishment⁵.

Still other studies have looked at the effect of proper recovery nutrition on performance in a subsequent workout. For example, in one study athletes performed a hard workout and were then fed either a regular sports drink or a carbohydrate-protein recovery drink during a one-hour recovery period⁹. After the one-hour recovery period, the subjects performed a second hard workout. Those that had taken the carbohydrate-protein recovery supplement outperformed the others by 20%. These results have clear implications for how athletes should approach nutrition at times when they are working out or competing more than once a day.

Maintaining Strength and Health

When proper recovery nutrition is administered on a daily basis, important long-term benefits begin to accrue to athletes. Specifically, they build more strength and muscle and experience fewer injuries.

This first of these benefits was demonstrated in a study published in the *Journal of Physiology*. Subjects were given a carbohydrate-protein supplement either immediately after exercise or two hours later while participating in a 12-week strength-training program. In subjects receiving a carbohydrate-protein mixture immediately after each exercise session, muscle size increased 8

percent and strength improved 15 percent. When the supplement was given two hours later, there was no muscle growth or improvement in strength³.

Until recently, no study had looked at the long-term health effects of regular post-exercise protein and carbohydrate consumption. But a new study led by researchers at Iowa State University did investigate these effects, and produced some very interesting results⁴.

Marine recruits representing six platoons were assigned to one of three treatment protocols during 54 days of basic training. Each day after exercise, subjects received either a non-caloric placebo, a control supplement containing carbohydrate and a little fat, or a supplement containing carbohydrate and protein plus a little fat. The investigators reported that, compared to the placebo and control groups, the carbohydrate-protein group had an average of 37% fewer muscle and joint injuries, almost certainly due to superior muscle recovery.

Several Ounces of Prevention

Exciting new research has even shown that consuming carbohydrate and protein during a workout can reduce muscle damage and improve performance in a subsequent workout. This means recovery nutrition can actually begin before the recovery period itself does.

In a study performed at James Madison University¹⁰, 15 male cyclists completed a stationary ride to exhaustion while drinking either a conventional carbohydrate sports drink or a sports drink containing carbohydrate and protein in a 4:1 ratio. The following day, the cyclists completed a second ride to exhaustion at a higher intensity, this time without drinking anything. Before they began the second ride, a blood sample was taken and its concentration of creatine phosphokinase (CPK), a biomarker of muscle damage, was measured.

On average, the subjects were able to cycle 29% longer in the first ride and 40% longer in the second ride when given the carbohydrate-protein drink than when given carbohydrate-only drink. In addition, the carbohydrate-protein drink was found to reduce CPK levels by an amazing 83%, indicating significantly less muscle damage.

An open question is whether the same type of supplement will have similar effects in anaerobic workouts such as weightlifting. To date there is no published research on this topic, but preliminary results from an ongoing study at the University of Texas indicate that with respect to muscle damage the answer is yes, a carbohydrate-protein supplement used during weightlifting will reduce muscle damage more than a conventional sports drink (J. Ivy, personal communication, August 13, 2004).

Although the exact mechanism by which protein consumed during exercise reduces muscle damage remains undetermined, two theories have been suggested. The protein in the sports drink may be used preferentially for energy during extended exercise, resulting in less breakdown of muscle protein⁸. The protein may also raise amino acid and insulin levels in the blood. Elevated levels of blood amino acids and insulin have been shown to reduce muscle protein breakdown^{1,2}.

The Bottom Line

The bottom line is that proper recovery nutrition has the potential to make a tremendous difference. Athletes who are serious about their performance should consume a high carbohydrate-moderate protein meal (with fluid) or recovery drink after every workout, practice, and competition. It is also best advised to consume carbohydrate and protein with fluid during exercise and/or immediately post exercise. If you do so, you will be rewarded with less muscle damage, faster glycogen replenishment, improved performance in subsequent exercise, greater strength gains, and fewer injuries.

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About the Author

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