Recovery Nutrition - Sleep, Eat, Train, Recover, Repeat

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Improvements in human performance through structured exercise is predicated on proper recovery. Proper nutrition is an essential piece of the recovery process but is often overlooked, poorly executed or applied inappropriately.

Proper nutrition during the recovery period can bridge the gap when complete physical recovery between exercise bouts may not be possible such as the following situations:

- When athletes train twice or more daily
- When athletes train for prolonged periods of time
- When athletes train and compete in programs that involve multiple events
- When athletes are seeking to build or maintain muscle mass

Nutrition during the recovery period helps the body adapt to the physiological stresses of training and prepare to train again when

Situation	Recommended Carbohydrate Intake
Daily refuelling needs for training programs less than 60-90 min per day or low intensity exercise	Daily intake of 5-7 g/kg BM
Daily refuelling for training programs greater than 90-120 min per day	Daily intake of 7-10 g/kg BM
Daily refuelling for athletes undertaking extreme exercise program - 6-8 hours per day (cycling tour)	Daily intake of 10-12+ g/kg BM
Carbohydrate loading for endurance and ultra-endurance events	Daily intake of 7-10 g/kg BM
Pre-event meal	Meal eaten 1-4 hours pre-competition 1-4 g/kg BM
Carbohydrate intake during training sessions and competition events greater than 1 hour	1 g/min or 30-60 g/hour
Rapid recovery after training session or multi-day competition, especially when there is less than 8 h until next session	Intake of 1-1.5 g/kg BM for every hour in the early stages of recovery after exercise, contributing to a total intake of 6-10 g/kg BM over 24 hours

Source: Australian Institute of Sport http://www.ausport.gov.au/ais/nutrition/factsheets/basics/carbohydrate__how_much

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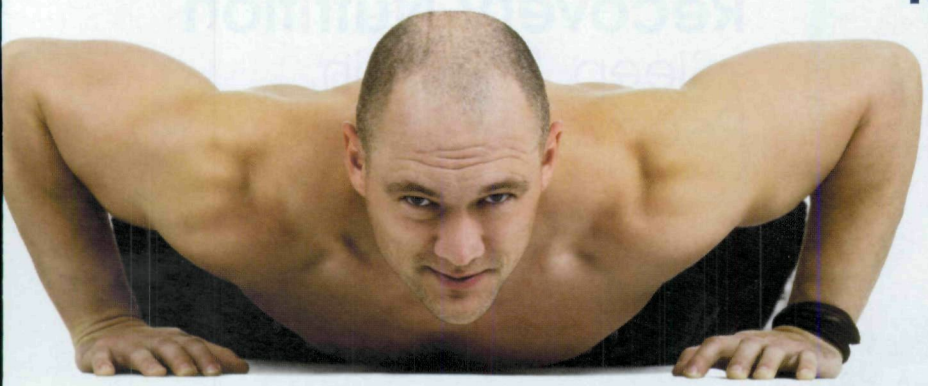


extended rest is not possible. By timing meals and snacks in the recovery period, it allows the athlete's body to accelerate the normal recovery of fuel. Recovery nutrition encompasses a complex range of processes that include:

- Restoring muscle and liver glycogen (carbohydrate) stores
- Replacing fluid and electrolytes lost in sweat
- Making new muscle protein
- Boosting the immune system to be able to handle physiological stresses of training

When planning recovery nutrition, there are several factors to consider including:

- How much energy was used in training?
- What was the extent of muscle damage?
- Were sweat losses significant?

By assessing these questions it can guide athletes to understand how to plan their recovery nutrition adequately.

Energy Usage and Muscle Glycogen

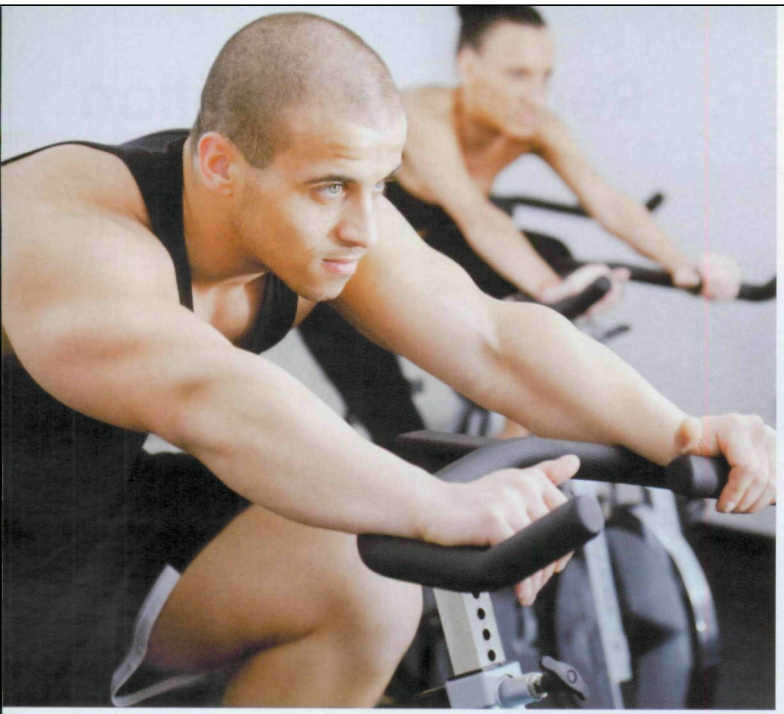
One of the main factors that makes it difficult to continuously train hard is muscle glycogen depletion. When steps are not taken to replace glycogen stores in a timely manner, athletes may struggle with fatigue and burnout earlier than expected in a training cycle. Restoring muscle glycogen is essential for athletes who regularly do training which depletes glycogen including aerobic endurance training of longer than 90 minutes and/or high intensity anaerobic training of shorter duration. Because glycogen from muscles fuels activities of moderate to high intensity, it is essential for most types of training and competing. To achieve muscle glycogen recovery, athletes must consume carbohydrates in sufficient quantities in both their daily training diet as well as in the post-exercise recovery period. Simply eating a high-carbohydrate post-workout snack will not suffice if their diet is too low in overall carbohydrates to support their training volume. The chart on page 20 can guide your understanding of daily carbohydrate needs.

Food	Approximate Amount of Carbohydrates per Serving (grams)
Fruits, medium size	15
Sports drink, 1 cup	15
Juice, 1 cup	28
Breads, 1 slice average	15
Milk, 1 cup	15
Chocolate milk, 1 cup	25
Grains (e.g. pasta), 1/2 cup cooked	15

Encourage athletes to become familiar with their daily carbohydrate needs but also to become familiar with the carbohydrate content of their favourite foods by reading nutrition labels and selecting appropriate portions. A few examples are provided above but for a more comprehensive list, see the Coaches Association of Canada sport nutrition resource *Energize with Carbohydrates* (www.coach.ca).

The Recovery Window

There is substantial evidence that supports eating a recovery snack within the first 15-30 minutes after training to enhance muscle glycogen recovery. This is frequently referred to as the "window of opportunity" for refuelling. The amount of carbohydrate recommended is between 1-1.5g/kg body weight. For example, a 140lb (64kg) athlete should aim for 60-90g of carbohydrate which could come from a smoothie with a large banana, 1 cup of plain yogurt and 1 cup of orange juice. These snacks or meals should be repeated every 2 hours until normal meal patterns resume but the total intake should be included in the athlete's daily carbohydrate needs as outlined above. Taking in this quantity of carbohydrates and calories within the immediate window may not be necessary if the duration of activity was short, low-intensity



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or skill based and thus doesn't lead to a high expenditure of energy and carbohydrate depletion. For example, for a long-distance runner, an easy 5km recovery run or for a basketball player, a practice that focuses on free throw accuracy may not require aggressive recovery nutrition.

Sufficient carbohydrate intake after exercise may also help enhance the immune system. Intense training may suppress the immune system, which can place athletes at higher risk for illness and infection. Having adequate carbohydrate intake before, during and after training is thought to promote a healthy immune system by reducing stress hormone responses to exercise and supplying glucose to white blood cells.

Muscle Repair and Building

Athlete training is a cycle of muscle breakdown followed by repair. Muscle breakdown occurs during the training when muscle tissue is damaged. Muscle repair occurs during the recovery phase which is highlighted by the increase in the anabolic (building) processes. This cycle can occur in both strength and endurance training. Consuming amino acids in the form of protein-rich foods in the recovery period can enhance muscle protein rebuilding. Athletes should consume 10g to 20g of high quality protein within the first hour after exercise. This should be combined with carbohydrate not only for the reasons mentioned previously, but also to stimulate insulin secretion which can help enhance the rebuilding process further. While many athletes feel protein is the most important part of recovery nutrition, it is relatively small compared to carbohydrate needs. While supplements can be used, obtaining 10 to 20g of protein from food is simple and likely to provide greater overall nutrition.

The type and timing of protein for recovery has been the focus of recent research. It appears that animal proteins, which contain all the essential amino acids (e.g. milk), may be more beneficial than incomplete proteins1. However, for vegetarians and/or vegans there are still plenty of good options such as soy, hemp and meat and alternatives like nuts and nut butters.

Research from the University of Western Ontario indicates that timing of protein consumption may be important and that consuming protein before, during as well as after training where anabolic muscle building is the goal may be most beneficial[2]. The protein amounts still remain relatively small and easy to get from food sources.

It is worthwhile noting that protein supplements and recovery beverages are a potential source of banned substances and athletes should take care to ensure any supplements they used are tested by third party companies such as NSF or HFL to reduce risks. For example, Infinit Nutrition has a partnership with two Canadian Sports Centres to provide athletes with lab-tested options for sport supplements including recovery beverages. While real food can supply sufficient nutrition for recovery, there is a demand for athletes to have portable options for travel and off-site training and powdered mixes that only require water are a popular option.

Recovery Snack Examples

Smoothie: 1 cup fruit juice, 1 cup plain yogurt and 1 large banana = 74g carbs, 16g protein

2 cups chocolate milk (or fortified soy beverage) and a large banana = 84g carbs, 18g protein

Sandwich: 2 slices whole-grain bread, 1 tbsp peanut butter, 1 tbsp jam = 51g carbs, 10g protein

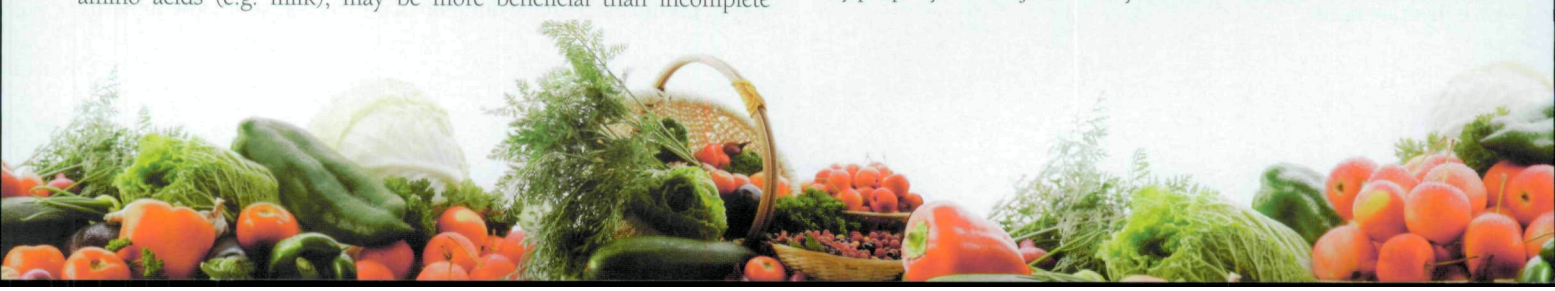
Trail mix: 1/2 cup raisins, 1/4 cup dry-roasted soy nuts, 1 cup Cheerios = 65g carbs, 13g protein

Smoothie: 1 cup vanilla soy beverage, 1 cup each blueberries and mango (frozen) = 62g carbs, 10g protein

Rehydration

Maintaining optimal hydration when training at high volume or high intensity can be a challenge for many athletes. Using a scale can be helpful to determine pre and post-training weights and ensure adequate fluid is consumed to rehydrate. For every 1 pound weight loss during training, the athlete should consume 3 cups of fluid (for every 1kg loss this translates to 1.5L). Athletes should avoid losing more than 2% of their body weight in training by consuming adequate fluids.

Water alone will not suffice to replace lost electrolytes and rehydrate the body properly. The major electrolyte lost in sweat is sodium and athletes



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should take this into consideration when planning recovery hydration, particularly if they sweat heavily or know themselves to be salty sweaters. Sodium concentration in sweat varies widely between individuals but can be clinically measured by laboratory testing or through practical evaluations such as looking for white streaks on dark clothing or salt lines on the skin after training. For every 1kg body weight loss, the sodium losses can range from as little as 300mg to 3500mg, which for someone at the top end of the range could present a major deficit. Sodium can be replaced by beverages such as vegetable juice, milk and sports drinks. It can also be replaced by consuming a high-sodium food, such as cottage cheese, or canned fish as part of the recovery snack. With concern over sodium excess in the general population, it's important for athletes to realize they may not need to be on a low sodium diet, but rather may need to add salt to their recovery nutrition. Not replacing sodium will affect the body's ability to retain fluids consumed in the post-exercise period and can result in high urine output. Muscle cramping can also be attributed to dehydration and/or sodium depletion. Although cramps are not well understood, for some athletes salt deficit is a component of this problem. Sodium will also promote thirst and help the athletes be able to take in enough liquid to replace sweat losses.

Other nutrients

Glutamine and antioxidants (Vitamins C, E and zinc) are frequently added to commercial recovery products and purported to aid in recovery. While there is not likely any harm from these additions, there is insufficient consistent evidence to show improved recovery and immune boosting benefits from the addition of these nutrients to recovery nutrition. Further research in this area is needed.

Putting the Pieces Together

Athletes have varying energy requirements. For an athlete who needs a high-calorie diet to support their training volume, adding in recovery snacks can aide in maintaining their energy intake. On the other hand, an athlete who is energy-restricted (due to a lower training volume or body composition goals), will need to plan their recovery nutrition as part of their overall nutrition plan. Using real food instead of supplements is the best option because the food will be more satiating and can also provide other nutrients like calcium, iron and fibre.

For the athletes who have a reduced appetite after training, the liquid options work well. Consideration over refrigeration is necessary to avoid food safety risks. Foods that should be kept refrigerated should not be kept outside for longer than two hours (less in hot temperatures). A cooler bag is an option as well as products that don't require refrigeration.

References

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3. Australian Institute of Sport. *Recovery Nutrition, 2009*. www.ausport.gov.au. Retrieved June 22, 2010.