Ultra endurance exercise is classified as prolonged exercise lasting longer than four hours in duration and most commonly involves running, skiing, cycling, or swimming (1). Events such as running the South African Comrades Marathon, swimming the English Channel, cycling the Tour de France, or the Hawaiian or South African Iron Man Races are examples of such events (6). The ability to maintain performance during prolonged endurance exercise is dependent on a number of factors, including meeting calorie needs, appropriate macronutrient intake, adequate water replacement, and electrolyte intake. In this two-part series, we will discuss how to best perform in endurance activities through optimal nutrition.

### Calories

Adequate energy intake is necessary to maintain an appropriate weight and body composition while meeting the needs of a physically demanding training and competition program. Typically, recommendations for endurance athletes are for between 37 – 41 Calories per kg (5) or 1.5 – 1.7 times resting energy expenditure. The best way to determine calorie needs is to evaluate the kind of exercise performed with regard to frequency, intensity, and duration and then add this to the daily energy requirements.

Women, in particular, need to be sure that their energy needs are met in order to maintain normal reproductive function and prevent amenorrhea, osteoporosis, and the female athlete triad. The estimated minimal level of body fat one should maintain in order to prevent adverse consequences to health and performance is 5% for men and 12% for women (5). Note that optimal levels may be higher for individuals and should be determined on a case by case basis with the athletes’ physician / RD team.

### Carbohydrate

#### Daily Needs and During Exercise Recommendations

Carbohydrate intake during prolonged exercise has been shown to improve time to exhaustion by providing a regular source of exogenous energy (3). The general recommendation is for athletes to consume 6 – 10 grams per kg of carbohydrate daily with 30 – 60 grams of carbohydrate during each hour of activity (5). More specifically, athletes can calculate their needs as 0.7 grams per kg of body weight per hour to individually determine their carbohydrate needs during exercise (5).

For ultra endurance athletes, some research supports the addition of liquid or solid carbohydrate, at a rate of 40 – 80 grams per hour during prolonged running events, and more than 90 g/h during prolonged cycling events (4). In addition, other research suggests the use of carbohydrate, in the form of glucose, maltose, fructose polymers, and branched chain starches with high glycemic indices in fluid replacement beverages at a concentration of 7.5 – 12%. This provides carbohydrates late in exercise as muscle and liver glycogen stores become depleted and the risk of hypoglycemia is increased (4).

### Post exercise

It is well established that the sooner and more frequent carbohydrate is consumed after exercise, the greater the rate of post-exercise muscle glycogen resynthesis. Recommendations are for carbohydrate intakes of 1.2 – 1.5 grams...

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**Training Table**

### Nutrition for Ultra Endurance Events: Energy and Macronutrient Guidelines

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of carbohydrate per kg of body weight per hour at 30 minutes intervals in order to maximize glycogen resynthesis during the first 4 – 5 hours following exercise (5).

Recent studies have shown that a carbohydrate-protein supplement is even more effective for the rapid replenishment of muscle glycogen than a carbohydrate supplement alone if quicker synthesis is necessary. Use of a protein-carbohydrate compound, however, has not been shown to be as effective in replenishing muscle glycogen stores as very large doses of carbohydrate provided at more frequent intervals (4).

**Protein**

Protein recommendations for endurance athletes are 1.2 – 1.4 grams per kg of body weight. Note that vegetarian athletes may need to take in an additional 10% in order to make up for the slightly lower digestibility of plant proteins (2).

**Fat**

Fat recommendations consistent with the Institutes of Medicine’s newly released guidelines of 20 – 35% of total calories should meet the needs of endurance athletes (5). Additionally, one gram per kg of body weight is another way for athletes to individualize these recommendations.

**Summary**

If ultra endurance is what you are after these are the sport nutrition guidelines to follow to maximize your performance. Part two of this article will cover fluid and electrolytes.

**References**


**About the Author**

Debra Wein is an adjunct faculty member at the University of Massachusetts, Simmons College and The Boston Conservatory, and chairs the Women’s Subcommittee of the Massachusetts’ Governor’s Committee on Physical Fitness and Sports. She is the President of The Sensible Nutrition Connection, Inc.(www.sensiblenutrition.com).