Nutritional needs of different athletes

**Nutrition for the Endurance Athlete  
The Marathoner's Diet for Optimal Performance**  
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You've run hundreds of miles and, in the process, burned countless calories training for a marathon. Our bodies are like cars that cannot run on empty and which will perform at their best when properly fueled. So how will you fuel your body so that you can ask it to run and run well? Read on...

Foods are made up of **carbohydrates, protein**, and **fat**. Marathon runners and athletes in general should eat a diet high in carbohydrates, moderate in protein, and low in fat. Another key nutrient that is a must for athletes is **water**. You should know **why these nutrients are important**, as well as **how much of them you should eat** and **how much water you need to drink before, during and after exercise**. If you follow these guidelines you can be sure that your body will be adequately and properly fueled, hydrated and ready to perform at its best!

**Carbohydrates and muscle glycogen**

**Why are carbohydrates important?**  
The body's preferred fuel for running (or any endurance sport) is muscle glycogen. Glycogen is the body's storage form of carbohydrate. If muscle glycogen breakdown exceeds its replacement, glycogen stores become depleted. The result is fatigue and inability to maintain training and racing intensity. In order to replenish and maintain glycogen stores, the marathoner's diet needs to be carbohydrate-rich.

**How much carbohydrate should I eat?**Carbohydrates should provide 60-70% of total calories. To figure out the amount that's right for you, multiply your weight in kilograms by 7, or multiply your weight in pounds by 3.2 - to give you the number of grams of carbohydrates you should consume per day.

The best sources of carbohydrate are grain products (preferably whole grains) such as bread, rice, cereal and pasta, as well as fruits, vegetables and lowfat dairy foods. Food labels tell you how many grams of total carbohydrate are in a serving of that food. Each day, the endurance athlete should try to eat at least 15 servings of grain products, at least 6 servings of fruits and 6 servings of vegetables, and at least 5 servings of lowfat dairy foods.  
In general,

* a serving of a **grain product**, such as a slice of bread or 1/2 cup cooked rice or pasta, and a serving of **fruit**, such as a piece of fruit or 3/4 cup fruit juice, each provides **15 grams carbohydrate**
* a serving of **dairy**, such as 1 cup of lowfat milk or yogurt or 1.5 ounces of cheese provides **12 grams carbohydrate**
* a serving of **vegetables**, such as 1 cup of leafy raw vegetables, 1/2 cup chopped vegetables, or 3/4 cup vegetable juice provides **5 grams carbohydrate**.

NOTE: **starchy vegetables** such as peas and corn, as well as **dried beans** such as lentils or garbanzo beans provide greater amounts of carbohydrates, about **15-20 grams per 1/2 cup serving**.

**Protein**

**Why is protein important?**Protein is needed for muscle growth and repair. Regular physical training tends to reduce muscle protein breakdown and protein loss from the body. While some protein breakdown may occur during exercise, protein build-up is enhanced during the recovery and the effectiveness of protein synthesis is increased. When muscle glycogen stores are high, protein contributes no more than 5% of the energy needed. However, when muscle glycogen stores are low, due to inadequate calorie and carbohydrate intake, protein is used for energy rather than for muscle growth and repair and may contribute as much as 10% of the energy needed for exercise. Such use of protein for fuel is expensive and inefficient.

**How much protein do I need to eat?**Endurance athletes need up to 50% more protein than sedentary adults. Protein should contribute 12-15% of total calories per day. To figure out the amount for you, multiply your weight in kilograms by 1.3, or multiply your weight in pounds by 0.6 to calculate the number of grams of protein you should consume per day.

Good sources of protein include lean meat, poultry, fish, eggs and dairy products which contain all of the essential amino acids and thus are complete proteins. Other good protein sources are tofu, nuts and dried beans. As with carbohydrates, food labels tell you how many grams of protein are in a serving. An endurance athlete should consume 3-5 servings per day. One serving of lean meat, fish or poultry is 3 ounces, roughly the size of a deck of playing cards.

In general,

* a 3 ounce serving of **lean meat, poultry or fish**, e.g. 1 medium pork chop, 1 small hamburger, 1/2 of a whole chicken breast, or a small fish fillet provides **21 grams of protein**
* a 1/2 cup of **cooked beans**, 1 ounce of **cheese**, 1 **egg**, 2 **egg whites**, 4 ounces of **tofu** or 2 tablespoons of **peanut butter** each provides **7 grams of protein**
* one cup of **lowfat milk or yogurt** provides **8 grams of protein**
* one serving of **grain products** (preferably whole grain) such as a slice of whole wheat bread provides **3 grams of protein**

**What are the consequences of eating a high protein diet?**When an athlete eats more protein than he needs, he either burns it for energy, or stores it as fat. Carbohydrates are a more efficient and less expensive source of energy. In addition, consuming too much protein increases the body's water requirement and may contribute to dehydration, because the kidneys require more water to eliminate the excess nitrogen load of a high protein intake. Also, a high protein, high fat diet after heavy training will cause incomplete replacement of muscle glycogen and impair performance. Such a diet is hard to digest and may lead to feeling sluggish. A high carbohydrate diet, on the other hand, is easy to digest and quickly restores muscle glycogen.

**Fat**

Exercise does not completely eliminate the health dangers associated with eating a high-fat diet, such as increased risk of heart disease, stroke and certain cancers.

**How much fat can I eat?**Endurance athletes as well as all people should consume less than 30% of total calories from fat and less than 10% from saturated fat. If, as an athlete, you eat 3000 calories per day, less than 1000 of those calories should be from fat.

High-fat foods include chocolate, fried foods, ice cream, bacon, hot dogs, and cookies. Food labels tell you grams of fat and percentage of calories from fat per serving. Choose foods with less than 30% of calories from fat.

**Will a high-fat diet impair my performance as an athlete?**Muscle glycogen is preferred over fat for fuel for high intensity exercise of long duration because fat breakdown cannot supply energy fast enough. In addition, fat takes longer to digest than carbohydrates and thus should be limited in pre-exercise meals.

### Four Critical Food Groups

* Carbohydrates
* Protein
* Fats
* Water

### Carbohydrates

Carbohydrate is the most important nutrition for runners. Your body's main source of energy for aerobic exercise comes from carbohydrate. Your body coverts the carbohydrates you eat into glucose. (glucose is a simple sugar). Glucose is then immediately used by your body for energy or is stored in the muscles as glycogen. Glycogen stores are utilized by marathon runners and help keep you from "bonking" or "hitting the wall". You've run out of carbohydrates if you have to slow dramatically to continue running. The trick is to store energy by eating carbohydrates on a continuous basis. Experienced marathon runners focused on meeting their nutrition needs eat the right carbohydrates in the right amounts at the right times! Experts recommend that your diet should consist of 50 to 60 percent carbohydrates. This amount will keep your muscles well-fueled so that you can meet both your nutrition and training goals.

However, carbohydrate is not available for prolonged time. Carbohydrates are stored in limited amounts only. During physical exercise carbohydrates need to be continuously replenished. During intermediate to high intensity level running (such as training) our body would be able to provide energy which it has stored in its muscles for about 45 minutes to one hour depending on the runners' conditioning. For optimal storage of the maximum amount of carbohydrates a marathon runner needs to start the taper period about two weeks before the actual marathon race. During the taper period the intake of carbohydrate might need to be 70 percent of your total calories.

### Protein

Protein is used for some extend as an energy source. But its most nutritional value is to repair muscle fibres and muscle tissue damaged during training. Protein should make up about 15 to 20 percent of your daily calorie intake. Runners, especially those running long distances, should consume .5 to .75 grams of protein per pound of body weight. Try to select protein sources that are low in fat and cholesterol. For example; low-fat dairy products, lean meats, poultry, whole grains,fish, and beans. Keep in mind that your protein needs are not as high as those of bodybuilders so you don’t have to overdo it.

### Fats

To get the greatest misunderstanding out of the way first, runners need to consume 20 to 25 percent of their total calories from fats. There is this old myth from the stone-age that fats increase your weight, clog up your blood vessels and what other bad things. However, with enough physical activity (which runners get plenty of) there are few to almost no negative effects. Actually, the opposite is true. Long distance runners train to build carbohydrate-economic muscles. This means that more fats are burned for energy before depleting the muscles of their carbohydrate storage.

Fats Provide the most concentrated and largest source of energy. Fat is required for normal growth, healthy skin, production of certain hormones, structural component of body cells, supply of fat-soluble vitamins A, D, E and K.

**Softball players**

**Daily Nutrition Needs**A softball player should focus primarily on consuming an adequate amount of energy throughout the day to fuel her training sessions and practice. In addition, focusing these efforts on the right balance of nutrients is important to maintain a healthy body.

Carbohydrates are the primary fuel for working muscles. However, not all athletes are created equally. The more aerobic your sport is, the more carbohydrates your body need to perform optimally. As was discussed above, a softball player relies very little on her aerobic energy system. Therefore, her carbohydrate needs are not as high as some other athletes. Using a range of 4 - 6 g/kg of carbohydrate will supply a softball player with enough carbohydrates to fuel her muscles during workouts and practice without providing too much. She should rely on whole wheat/grain products and high fiber fruits and vegetables to meet her daily carbohydrate needs.

Protein is necessary to help maintain, build, and repair damaged muscle. It can be used as an energy source, but is a less efficient source of fuel and is therefore not the preferred substrate. For a sport like softball that relies more heavily on the anaerobic/ATP-PC energy systems and who work on developing strength to help their game, the protein needs are slightly higher. Using a range of 1.5-1.8 g/kg of protein will provide her muscles with enough fuel for building and repairing muscle. The best sources of protein are lean meats, fish, poultry, and eggs. By including a good source of protein at each meal, the athlete can rest assured that she is meeting her needs.

Fat plays an important role in hormone production, body temperature regulation, protection of body organs, and in the absorption of fat soluble vitamins. The American Heart Association recommends getting no more than 30% of total calories from fat and this same guideline applies to athletes as well. Among athletes, it is important to focus the majority of their daily calorie intake on carbohydrates and fat, while stressing the important of including healthy fats in their diet as well. Polyunsaturated and monounsaturated fats have proven health benefits that even athletes should consider. Olive oil, canola, oil, nuts, and seeds are all excellent sources of healthy fats that athletes can include on a daily basis.

**Pre-Game Meal**   
Combined with appropriate nutrition on a daily basis, this meal is a good way to top off your energy stores and ensure that you are entering competition fully fueled and on top of your game. This meal should be eaten between 3-4 hours prior to the start of the game to allow for adequate digestion and absorption and so that the softball player doesn't feel burdened by a full stomach. This meal should include carbohydrate-rich foods balanced by a lean source of protein and minimal fat. Foods that can cause gas, heartburn, or other gastrointestinal (GI) upset should be limited or avoided all together. High fiber foods, spicy foods, fried foods, or milk-based foods are all examples of choices that might cause GI upset in some individuals. The following examples are appropriate pre-game meal ideas that provide the right balance of macronutrients:

* Grilled chicken sandwich with side salad, pretzels, and sports drink.
* Subway sandwich with deli meat, baked chips, and lemonade.
* Oatmeal, 2 pieces of toast with peanut butter, and orange juice.
* Pasta with sliced grilled chicken, steamed broccoli, topped with marinara sauce, and water.

As game time approaches, smaller carbohydrate-rich snacks are appropriate if the athlete feels the need. Bagels, pretzels, animal crackers, trail mix, granola bars, fresh fruit, nutria-grain bars, energy bars, sports drinks, and saltine or graham crackers are good examples of carbohydrate-rich snacks that the athlete can easily pack and bring with her to have on hand.

**Recovery**Nutrition It is easy for athletes to focus a lot of attention on pre-game or pre-practice meals, and forget the importance of recovery nutrition. Recovery nutrition is a newer concept that has more and more research to support its efficacy. Because the human body stores carbohydrate in the form of glycogen in very limited amounts, it is important to maximize the amount that can be stored, otherwise the athlete risks running out of fuel before the workout, practice, or game is over. The enzymes that are responsible for taking in fuel and storing it in the muscles are elevated during and after exercise. Immediately after exercise, there is a 30-45 minute window of opportunity where these enzymes are at their highest level and when a recovery snack should be included. The following chart outlines what research indicates is a good rule of thumb for determining what a recovery snack should be made up of.

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| --- | --- | --- |
| Carbohydrate | Protein | Fat |
| Body weight (lbs.) / 2 = Grams of carbohydrates that should be in your snack (this is the least amount to include). | The ratio of carbohydrates to protein in a recovery snack should be somewhere between 4:1 and 3:1. | Fat has a role in recovery nutrition; however, the actual amount should be minimal. |
| Example: A 150 lb. individual should have approximately 75 grams of carbohydrates. | Example: A 150 lb. individual should have somewhere between 18-25 grams of protein with ~75 grams of carbohydrates. | Example: Limit fat to < 7-8 grams. |

**Soccer players**

**Fueling Your Sport**

• The average distance covered in a soccer match is 5.6 miles (9 kilometers), so your need for calories is high in both training and competition.

• Your training schedule, the intensity of practice, and your age will determine your calorie needs. Adult male soccer players need 21.4 to 27.3 calories per pound of body weight per day (47 to 60 calories/kg/day). Adult female players need 20.5 to 22.7 calories per pound per day (45 to 50 calories/kg/day). A 160-pound male player needs 3,400 to 4,300 calories per day. A 140-pound female player needs 2,850 to 3,200 calories per day.

• Carbohydrate is the best fuel for soccer. Eating carbohydrates gives your muscles the energy they need. Thirty percent of all goals are scored in the last 15 minutes of the game, so choosing the right high carbohydrate foods and fluids can make the difference between winning and losing a match.

• Soccer is muscle-fuel depleting activity. Losing this fuel, especially in the legs, contributes to fatigue as the match wears on. To get enough fuel, competitive soccer players should eat 3.6 to 4.5 grams of carbohydrate per pound of body weight per day (8 to 10 g/kg/day). Good sources of carbohydrate include whole grain breads and cereals, fruits, and vegetables.

• Drinking 2 cups of a sport drink at the rate of 30 to 60 grams of carbohydrate per hour during a 90-minute game will delay fatigue and improve performance.

• Soccer players need to eat 0.6 to 0.8 grams of protein per pound of body weight per day (1.4 to 1.7 g/kg/day). Protein helps repair muscles and boosts your immune system. Protein is also used for fuel, but it doesn’t give you as much immediate energy as carbohydrate does.

Good sources of protein include fish, chicken, turkey, beef, low-fat milk, cheese, yogurt, eggs, nuts, and soy foods (tofu, soy nuts, soy burgers).

• Soccer players need 0.45 grams of fat per pound of body weight per day (1 g/kg/day). Choose heart-healthy fats, such as canola oil, olive oil, and nuts.

**What recommendations should be made to athletes for adequate nutrition?**

According to Kristine Clark, 50-60% of the diet should be made up of carbohydrate food sources, 15-20**%** protein choices and fat choices, less than 30%.

It is essential for athletes to eat a diet high in carbohydrate throughout the season for energy and to train and compete. Carbohydrates serve as the primary energy fuel for intensity exercise, such as the demands placed upon a soccer player during training and games. The reason for eating a high carbohydrate diet is because at rest, muscles burn mostly fat. During exercise, muscles burn fat and sugar. The harder the athlete exercises, the greater the percentage of sugar the muscle burns. Protein is not a major of source of energy during exercise, although it plays an important role in the health of the body, as does fat. The role of carbohydrates is an important concept for soccer players to understand, because the length of time a person can exercise is dependent of how much sugar, glycogen are stored in the muscle and how long it can be kept in the muscle. If carbohydrate intake is low, the formation of glycogen is low. Low carbohydrate diets have been found to compromise reserves for vigorous exercise and daily training. Athletes can increase their endurance by eating well-balanced, nutritionally sound meals. Skipping meals is damaging. The timing of meals can make a difference along with nutritious food choices. Carbohydrates are important because when exercising, an athlete draws on energy stored as carbohydrate in the muscles. Carbohydrates take the least amount of time to pass through the stomach. Sources of carbohydrates include…cereal, bread, pasta, rice, muffins, rolls and grain products. All fruits and vegetables are a source of carbohydrate along with yogurt, milk shakes and ice cream. Soccer Player's also need to eat adequate amounts of protein choices 15-20% and keep fat choices to less than 30%.

Other resources

<http://www.ext.colostate.edu/pubs/foodnut/09362.html>

<http://espn.go.com/trainingroom/s/nutrition/index.html>