

# Sports nutrition

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**Sports Nutrition** is the study and practice of nutrition and diet with regards to a person's athletic performance. Nutrition is an important part of many sports training regimens, being most popular in strength sports (such as weight lifting and bodybuilding) and endurance sports (e.g. cycling, running, swimming, rowing). Sports Nutrition focuses its studies on the type, as well as the quantity of fluid and food taken by an athlete. In addition, it deals with the consumption of nutrients such as vitamins, minerals, supplements and organic substances that include carbohydrates, proteins and fats.

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## Supplements

Dietary supplements contain one or more dietary ingredients (including vitamins; minerals; herbs or other botanicals; amino acids; and other substances) or their constituents;is intended to be taken by mouth as a pill, capsule, tablet, or liquid.<sup>[1]</sup> All athletes consider taking dietary supplements

with hopes to find the "magic ingredient" to increase their athletic performance.<sup>[2]</sup> In the extreme case of performance-enhancing supplements, athletes, particularly bodybuilders may choose to use illegal substances such as anabolic steroids. These compounds which are related to the hormone testosterone, can quickly build mass and strength, but have many adverse effects such as high blood pressure and negative gender specific effects. Blood doping, another illegal ergogenic, was discovered in the 1940s when it was used by World War II pilots.<sup>[3]</sup> Blood doping also known as blood transfusions, increases oxygen delivery to exercising tissues and has been demonstrated to improve performance in endurance sports, such as long-distance cycling.<sup>[4]</sup> There are many other supplements out there and they include caffeine, creatine, iron, chromium and human growth hormones.<sup>[4]</sup>

In the 1940s, early results were found regarding consumption of dietary protein for athletes involved in muscle building and resistance, and strength training.<sup>[3]</sup> Dietary proteins main uses are for hormones, oxygen transport, cellular repair, enzymes and conversion to fuel.<sup>[5]</sup> The intake of protein is a part of the nutrient requirements for the normal athlete and is an important component of exercise training. In addition, it aids in performance and recovery. Dietary protein intake for well-trained athletes should occur before, during and after physical activity as it is advantageous in gaining muscle mass and strength.<sup>[6]</sup> However, if too much protein and amino acid supplements are consumed (especially by the average exerciser), it can be more harmful than beneficial; health risks include: "dehydration, gout, calcium loss, liver, and renal damage. Gastrointestinal side effects of over consumption include diarrhea, bloating, and water loss" (Lawerence). A bountiful protein diet must be paired with a healthy, well-rounded meal plan and regular resistance exercise. Characteristics of this particular diet include the type of exercise, intensity, duration and carbohydrate values of diet.<sup>[7]</sup> The most effective way to secure the natural nutrients required by your body for optimum health and physiological performance is by eating your vitamins, minerals, proteins, fats, sugars and carbohydrates, which can be procured from fresh fruits and vegetables, as nature intended them to be received.<sup>[3]</sup>

The supplement, Creatine, may be helpful for well-trained athletes to increase exercise performance and strength in relation with their dietary regimen.<sup>[7]</sup> The substance glutamine, found in whey protein supplements, is the most abundant free amino acid found in the human body.<sup>[8]</sup> It is considered that glutamine may have a possible role in stimulated anabolic processes such as muscle glycogen and protein synthesis, for well-trained and well-nourished athletes.<sup>[8]</sup> Other popular studies done on supplements include androstenedione, chromium, and ephedra. The findings show that there are no substantial benefits from the extra intake of these supplements, yet higher health risks and costs.<sup>[7]</sup>

High energy supplements have shown to increase the performance of physical activity in athletes. A study done at the University of Texas saw a 4.7% increase of performance in 83% of participants after drinking Red Bull Energy Drink which was more intense than the compared placebo. The energy drink most dominantly increased the epinephrine and norepinephrine (adrenaline and its precursor) levels and beta-endorphins in the blood than before consumption. Caffeine, carbohydrates and Vitamin B are factors that may have favored no change in perceived exertion, but an increase in performance.<sup>[9]</sup>

Caffeine has been around since the 1900s and became popularly used in the 1970s when its power of masking fatigue became highly recognized.<sup>[3]</sup> Similarly, the caffeine found in energy drinks and coffee shows an increased reaction performance and feelings of energy, focus and alertness in quickness and reaction anaerobic power tests. In other words, consuming an energy drink or any drink with caffeine increases short time/rapid exercise performance (like short full-speed sprints and heavy power weight lifting).<sup>[10]</sup> Caffeine is chemically similar to adenosine, a type of sugar that helps in the regulation of important body processes, including the firing of neurotransmitters. Caffeine takes the place of adenosine in your brain,

attaching itself to the same neural receptors affected by adenosine, and causing your neurons to fire more rapidly, hence caffeine's stimulating effects.  
[11]

Post-exercise nutrition is just as important, if not more important than pre-exercise nutrition as it pertains to the recovery of the body. Traditionally, sports drinks such as Gatorade and Powerade, are consumed during and after exercise because they effectively rehydrate the body by refueling the body with minerals and electrolytes. Electrolytes regulate our nerve and muscle function, our body's hydration, blood pH, blood pressure, and the rebuilding of damaged tissue.<sup>[12]</sup> Gatorade was founded in the 1960s, when the University of Florida, Gainesville Gators improved their performance with "Gator Aid." The drink was made of glucose and sucrose in water and was seen to improve the football players' performance. By the 1970s, many other sports drinks of its kind had been manufactured.<sup>[3]</sup>

Studies in 2008 have found cow's milk, especially skim milk and chocolate milk may be effective replacements for current sports drink , as milk leads to protein the synthesis which boosts net muscle protein balance. Milk contains many electrolytes, nutrients and other elements that help to make it an effective post-exercise beverage. It is true that chocolate milk has been a proven study that is just as effective of a recovery drink as Gatorade. Chocolate Milk includes key ingredients such as Vitamin D that helps replace fluids and electrolytes lost after the athlete has worked out.<sup>[13]</sup> A recovery drink is supposed to replenish the sugar lost, and build muscle again so that you are ready for the next workout. When compared to plain water or sports drinks, research suggests that chocolate milk is more effective at replacing fluids lost through sweat and maintaining normal body fluid levels. Athletes drinking chocolate milk following exercise-induced dehydration had fluid levels about 2 percent higher (on initial body mass) than those using other post-exercise recovery beverages. These results allowed for prolonged performance, especially in repeated bouts of exercise or training.<sup>[14]</sup>

## Factors influencing nutritional requirements

Differing conditions and objectives suggest the need for athletes to ensure that their sports nutritional approach is appropriate for their situation. Factors that may affect an athlete's nutritional needs include type of activity (aerobic vs. anaerobic), gender, weight, height, body mass index, workout or activity stage (pre-workout, intro-workout, recovery), and time of day (e.g. some nutrients are utilized by the body more effectively during sleep than while awake). Most culprits that get in the way of performance are fatigue, injury and soreness. A proper diet will reduce these disturbances in performance. The key to a proper diet is to get a variety of food, and to consume all the macro-nutrients, vitamins, and minerals needed. According to Eblere's article (2008), it is ideal to choose raw foods, for example unprocessed foods such as oranges instead of orange juice. Eating foods that are natural means the athlete is getting the most nutritional value out of the food. When foods are processed, the nutritional value is normally reduced.<sup>[15]</sup>

### Anaerobic exercise

During anaerobic exercise, the process of glycolysis breaks down the sugars from carbohydrates for energy without the use of oxygen. This type of exercise occurs in physical activity such as power sprints, strength resistances and quick explosive movement where the muscles are being used for power and speed, with short-time energy use. After this type of exercise, there is a need to refill glycogen storage sites in the body (the long simple sugar chains in the body that store energy), although they are not likely fully depleted.

To compensate for this glycogen reduction, athletes will often take in large amounts of carbohydrates, immediately following their exercise. Typically, high-glycemic-index carbohydrates are preferred for their ability to rapidly raise blood glucose levels. For the purpose of protein synthesis, protein or individual amino acids are ingested as well. Branched-chain amino acids are important since they are most responsible for the synthesis of protein. According to Lemon et al. (1995) female endurance runners have the hardest

time getting enough protein in their diet. Endurance athletes in general need more protein in their diet than the sedentary person. Research has shown that endurance athletes are recommended to have 1.2 to 1.4 g of protein per kg of body weight in order to repair damaged tissue. If the athlete consumes too few calories for the body's needs, lean tissue will be broken down for energy and repair. Protein deficiency can cause many problems such as early and extreme fatigue, particularly long recovery, and poor wound healing. Complete proteins such as meat, eggs, and soy provide the athlete with all essential amino acids for synthesizing new tissues. However, vegetarian and vegan athletes frequently combine legumes with a whole grain to provide the body with a complete protein across the day's food intake.<sup>[16]</sup> A popular combination being rice and beans.<sup>[17]</sup>

Spada's research on endurance sports nutrition (2000) and where the types of carbohydrates come from will be explained. He advises for carbohydrates to be unprocessed and/or whole grains for optimal performance while training. These carbohydrates offer the most fuel, nutritional value, and satiety. Fruits and vegetables contribute important carbohydrate foundation for an athlete's diet. They provide vitamins and minerals that are lost through exercise and later needed to be replenished. Both fruits and vegetables improve healing, aid in recovery, and reduce risks of cancer, high blood pressure, and constipation. Vegetables offer a little more nutritional value than fruits for the amount of calories, therefore an athlete should strive to eat more vegetables than fruits. Dark-colored vegetables usually have more nutritional value than pale colored ones.(add info) A general rule is the darker the color the more nutrient dense it is. Like all foods, it is very important to have a variety. To get the most nutritional value out of fruits and vegetables it is important to eat them in their natural, unprocessed form with no other nutrient (sugar) added.<sup>[18]</sup>

Often in the continuation of this anaerobic exercise, the product from this metabolic mechanism builds up in what is called lactic acid fermentation. Lactate is produced more quickly than it is being removed and it serves to regenerate  $\text{NAD}^+$  cells on where it's needed. During intense exercise when oxygen is not being used, a high amount of ATP is produced and pH levels

fall causing acidosis or more specifically lactic acidosis. Lactic acid build up can be treated by staying well-hydrated throughout and especially after the workout, having an efficient cool down routine and good post-workout stretching.<sup>[19]</sup>

Intense activity can cause significant and permanent damage to bodily tissues. In order to repair, vitamin E and other antioxidants are needed to protect muscle damage. Oxidation damage and muscle tissue breakdown happens during endurance running so athletes need to eat foods high in protein in order to repair these muscle tissues. It is important for female endurance runners to consume proper nutrients in their diet that will repair, fuel, and minimize fatigue and injury. To keep a female runner's body performing at its best, the ten nutrients need to be included in their diets.<sup>[20]</sup>

## See also

- Category:Dietary supplements
- Energy bar
- Protein
- Sports drink
- Multivitamin
- Bodybuilding
- Bodybuilding supplements
- High-protein diet
- Sports nutritionist

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## External links

- The International Society of Sports Nutrition (<http://www.sportsnutritionssociety.org/>)
- Journal of Sports Nutrition (<http://jn.nutrition.org/>)
- Tips to good hydration during physical activity ([http://www.europeanhydrationinstitute.org/physical\\_activity.html](http://www.europeanhydrationinstitute.org/physical_activity.html))
- Nutrition for Athletes of all ages, contains many good links. (<https://fnic.nal.usda.gov/lifecycle-nutrition/fitness-and-sports-nutrition/nutrition-athletes>)

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