



# The Science of Soccer

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## TOURNAMENT NUTRITION Strategies for Peak Performance

When preparing for an upcoming tournament, one of the most important training issues is to focus on is your diet. Many athletes spend hours working on strength, fitness and technique. However they often fail to eat a diet that will prepare them from intense competition. Soccer requires tremendous energy expenditure. Therefore it is critical that muscle energy stores be maximized before the tournament begins and then be completely replenished after each match. This is best accomplished by following a proper dietary regimen – eating the right foods at the right time.

### How Much Energy is Expended?

Research studies show that nearly 83% of a soccer match is spent moving, jogging, running or sprinting. During a 70 minute match, youth players may run nearly four miles [1]. Soccer also places some unique energy demands on the player, such as repeatedly changing directions, running backwards as well as performing short sprints followed by brief periods of jogging. These activities can increase energy expenditure by as much as 40% compared to continuous running. In fact, top youth players can expend between 700-1000 calories (kcal) of energy per match, making soccer one of the most energy demanding youth sports [1-4].

The vast majority of the energy for a soccer match comes from glycogen that is stored in the muscle and liver. Glycogen is the body's storage form of carbohydrate (CHO). During exercise glycogen is broken down to glucose, a simple sugar, and then converted to energy. In muscle, this happens directly. In the liver, glucose is released into the blood where it is carried to the working muscles. Over the course of a match, muscle glycogen levels can drop dramatically. When this happens, the muscle relies on blood glucose (from the



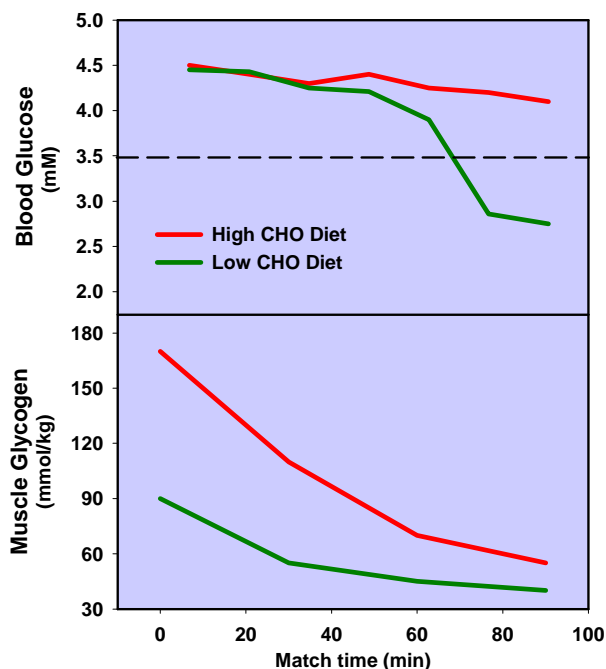
liver). Quite often, when muscle glycogen is depleted, blood glucose levels fall. Like muscle, the brain also uses glucose for energy. However, the brain does not store glycogen and uses blood glucose exclusively. Thus a drop in blood glucose during exercise can dramatically affect the central nervous system and lead to lethargy, a negative mood state, loss of motor skills and decreased muscular performance [5]. Thus, having an adequate store of CHO (muscle and liver glycogen) is critically important to insure that neither muscle function nor motivation is compromised during a match [5-7].

### How is Energy Replenished?

Muscle glycogen levels are replenished from the diet by eating foods and beverages that are rich in carbohydrates (CHO) and contain a small amount of protein. Research shows that following intense or prolonged exercise, a high CHO diet restores depleted muscle glycogen. On the other hand, a diet that is high in fat causes muscle glycogen stores to remain depleted. Fats tend to block digestion and absorption of CHO and prevent the muscle from rebuilding glycogen stores. Most importantly a high CHO diet allows the athlete to perform at a high level while meals high in fat result in rapid exhaustion and impaired performance. Thus, players should eat a high CHO diet every day, following hard training sessions and intense matches.

The graph on page two shows the changes in muscle glycogen and blood glucose that might occur over the course of a match in two athletes – one who ate a high CHO diet one who ate meals high in fat [8]. The athlete on the high fat diet begins the match with reduced muscle glycogen. As the match progresses, glycogen is quickly depleted and blood glucose levels drops below a level where performance is compromised (~3.5mM). The overall result is diminished performance, particularly during the later part of the match. On the other hand, the athlete who consumed a high CHO diet begins the match plenty of stored muscle glycogen and is able to maintain blood glucose throughout the duration of the match. For this player, performance is maintained throughout the match.

Research studies consistently show a close relationship between diet, muscle glycogen and the ability of an athlete to withstand exhaustion [9, 10]. In a variety of sports, athletes who eat a diet low in CHO do not perform as long as athletes who eat properly. In addition, their skill level and motivation to perform suffers. Thus a high CHO diet can prevent large decreases in both glycogen and blood glucose and help the athlete maintain peak performance.



## A Tournament Strategy

Athletes should develop a nutritional strategy for tournament time. Lay out a plan to make sure that you are able to eat the proper items at the right times. Insuring peak performance through nutrition starts well before the first match and continues throughout the duration of the tournament.

**Pre-Tournament Meals:** Begin preparation for a weekend tournament early in the week. On Thursday and Friday, eat lots of CHO, items like pasta, rice, breads and potatoes. Add to that some protein such as baked chicken, turkey, other lean meats and vegetables. The goal is to store as much muscle glycogen as possible before the tournament begins. Also, drink plenty of fluids (water, juice and milk) to avoid potential dehydration.

If you have an early match in Saturday morning, it is good to have a snack before going to bed Friday night. Eat a granola bar, yogurt, or a bagel and drink juice or a sports drink. At all costs, avoid fatty meats, fried foods, anything with a creamy sauce and soda.

**Pre-Match Meal:** During a tournament, the pre-match meal is most often breakfast. For breakfast, look for foods that are high in CHO. Items such as fruit, bagels, toast and yogurt are good choices. Pancakes or waffles are also excellent as is cereal with low fat milk. Scrambled or boiled eggs can be good if your first match isn't until mid morning (several hours after breakfast). Avoid foods such as muffins (unless they are low fat), donuts, sausage, bacon and coffee. Also steer clear of most "prepared" foods such as Pop-Tarts and breakfast sandwiches. Also don't add lots of butter, cream cheese, jelly or syrup to your bagels, toast or pancakes. Some is OK but don't get carried away.



Exactly how much you eat depends on the start time for your first match. If you are lucky enough to have a mid-morning start time, between 9:30 and 11:00, you should eat more. You can also eat a bit more protein, things like eggs and cereal. If you have an 8:00 match focus on the CHO rich foods.

**During the Match:** There are not many nutritional options for the player during the match that will affect performance. Your best bet is to drink water or a sports drink between periods or other breaks. The importance here is to maintain hydration not too provide energy. There is not much time for the small amount of energy consumed to be effective.

**Immediately After the Match:** This is one of the most important times during a tournament. At the end of a hard match, muscle glycogen levels are depleted and you need to replenish them as fast as possible. To do this, it is critically important to take in about 50-100g of CHO, with a bit of protein, within the *first 30 minutes* after the match. Drink a sports drink such as Gatorade and eat something like a banana, a bagel or an energy bar (not a protein bar). A 20oz Gatorade provides about 35g of CHO while a banana and bagel provide 30-40g of CHO and 1-8g of protein. Another option is to drink low-fat, chocolate milk (8oz provides 32g of CHO and 11g of protein). This should be done as soon after your cool-down as possible. Research studies consistently show that eating or drinking CHO (with some protein) soon after exercise is the most effective way to rapidly replenish muscle glycogen levels. Sometime it is difficult to eat following a match, particularly after a grueling loss or a match played in the heat. However, you must remember that this is a *critical time*. You have a short window of opportunity to get yourself ready for the next match.



**Between Matches:** Exactly what you eat between matches depends in large part on how much time you have before the start of the second match. If you only have an hour or two between games, you're limited to items such as fruits (bananas, oranges and apples) and CHO rich foods with small amounts of protein. Two excellent choices are peanut butter and jelly sandwiches or peanut butter on a bagel. Sports drinks such as Gatorade will replenish both fluids lost and depleted glycogen. Be sure to eat enough to replenish your energy stores but be careful not to overeat.

If you have several hours between matches, you should increase the protein content of your meal but still focus on CHO rich foods. You should also eat soon, within the first 60-90 min of your first match.



Your best options are lean meat sandwiches such as baked chicken or turkey, pasta (avoid cream sauces), baked potatoes and burritos. It is always best to pack your own lunch. That way you can insure that you have the right foods, items that are healthy and enjoyable, and can relax rather than waiting for your meal. However, if you must go the "fast-food" route, see the Science and Soccer article, "Eating on the Run" (January 2008) for some suggestions

**Between Match Days:** After the second match of the day, follow the post-match strategy of drinking a sports drink and eating a banana, bagel or energy bar within the first 30 min. Remember it is critically important to begin replenishing depleted muscle glycogen stores *as soon as possible*. Even though your next match may be the next day, it is important to begin replenishing glycogen right away.

For dinner between match days, look for restaurants that offer CHO rich foods with protein. Focus on pasta and rice dishes that include lean meats such as chicken, turkey and fish. Beef and pork are reasonable selections but be sure to order these with extra CHO-containing sides (baked potato, bread or rice). Italian and Mexican restaurants will often have pasta dishes, pizza, burritos, enchiladas and rice dishes all served with chicken or shrimp and plenty of vegetables. American and Asian restaurants have great choices as well.



Make sure that you avoid anything fried or greasy like french fries, fried chicken or chicken fried steak (also some pizzas can be quite greasy). Fatty meats such as ribs, sausage, and pepperoni should be avoided. Also do not include creamy sauces and condiments such as alfredo or pesto sauces, guacamole and most gravies.

Later in the evening, eat a snack. Something similar to what you may have eaten Friday night, a granola bar, yogurt, a banana, or a bagel. Or you might treat yourself to a fruit smoothie or a yogurt shake.

**The Next Day:** For the second day of a two day tournament follow the same strategy for day one.

## Summary

Nutrition is one of the most important aspects of pre-tournament preparation. Young athletes spend countless hours working on the technical, tactical and fitness training. Unfortunately diet is often overlooked. This is surprising since following a proper diet is simple and requires minimal effort. By eating plenty of CHO and adequate protein while avoiding fats and sugars, players can be nutritionally prepared for peak performance.

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