

Excerpt from *Sport Nutrition for Coaches*

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EATING TIMED FOR TOP PERFORMANCE

Too often, eating is an afterthought for many athletes. The reality is that when one eats is as important as what is consumed, and the proper timing of meals can go a long way toward optimizing performance. This download focuses on strategies to help your athletes develop a fueling plan for before, during, and after workouts and competition.

Pre-Exercise Eating

Regular pre-exercise eating and hydration (see chapter 4 in *Sport Nutrition for Coaches*) are recommended so athletes take in what they need daily to keep muscles fueled and hydrated, optimize performance, and ensure adequate recovery. During exercise, athletes rely mostly on the glycogen stored in the muscles and liver and on fat stores. Although a pre-exercise meal is not immediately available for energy, it can contribute when exercise or athletic events go on continuously for more than an hour.

The other goal of the pre-exercise meal is to lessen the feeling of hunger, which can distract an athlete. A hungry athlete cannot focus fully on the task at hand. A pre-exercise meal containing carbohydrate will elevate blood glucose and serve as an additional fuel substrate during exercise for the muscles.

Athletes in sports such as soccer, hockey, track and field, and short-distance swimming must consume enough carbohydrate to fill muscle and liver glycogen stores. Because these sports involve high-intensity bursts of activity that require carbohydrate as the primary fuel, carbohydrate needs are higher. A pre-exercise meal that contains a significant amount

of carbohydrate (200 grams) improves endurance but may also be beneficial for athletes who are exercising after an extended period of time without food, such as athletes who have early-morning practice or competition. A carbohydrate-dense morning meal will restore liver glycogen stores that are low after an overnight fast and can increase suboptimal muscle glycogen stores to improve performance. There is never a reason for athletes to stop consuming carbohydrate, because they will never be able to perform at their best without it.

Another issue in planning the pre-exercise meal is preventing gastrointestinal distress. Low-fiber foods that empty more rapidly and cause less bloating than high-fiber foods are recommended. Consuming a high-fiber food such as a large bowl of raisin bran is probably not a great idea before exercising. If athletes are concerned that they will experience gastrointestinal upset by competing after a pre-event meal, they can try liquid meals. Carnation Instant Breakfast, Boost, a smoothie, or low-fat chocolate milk can provide necessary nutrients that leave the stomach more quickly. For lactose-intolerant athletes or those with milk allergies, a soy-based smoothie, soy milk, or shakes such as Amazishake can be used. The closer the meal is consumed prior to the practice or competition, the smaller the meal should be. More food in the stomach means more blood being diverted to the gut, which can be uncomfortable. Athletes who compete in morning events, such as track athletes in all-day meets or swimmers or rowers who have to be in or on the water at 6 a.m., are probably not going to wake up several hours ahead of time to eat, so liquid meals present a viable alternative. Gelatin, yogurt, and puddings can be used by athletes who complain of being too tired to chew! Two concepts that often come up when discussing pre-exercise nutrition are carbohydrate loading and the glycemic index of foods. Let's examine those briefly now.

Carbohydrate Loading

You may be familiar with the concept of carbohydrate loading, where over a seven-day period leading up to competition the athlete depletes muscle glycogen stores through exhaustive exercise and simultaneously decreases carbohydrate intake, so that when a large amount of carbohydrate is consumed the muscles can supersaturate with glycogen. The rationale for this type of nutrient manipulation is to prevent fatigue associated with glycogen depletion. The downside of this method is a feeling of stiffness and heaviness in the muscles, which is very uncomfortable for the athlete and potentially impairs performance in short-term events.

A better way of achieving these results is to have athletes eat a little more carbohydrate as part of every meal in the three days leading up to competition. In addition, they should decrease exercise during the taper period because the rest will encourage glycogen resynthesis. Carbohydrate loading does not have to be accomplished by wolfing down a pound of jelly beans. It can be done by eating or drinking the following:

- A slightly larger bowl of cereal at breakfast
- A bagel instead of bread at lunch
- A larger serving of rice, pasta, or potato at dinner



- Carbohydrate-containing juice, lemonade, and sports drinks
- Carbohydrate supplements such as gels

If your athletes choose to consume carbohydrate supplements, make sure these athletes consume water simultaneously to prevent any digestive issues.

Glycemic Index of Foods

Athletes might ask you whether there are some carbohydrate-containing foods that should be preferentially consumed prior to exercise. This is based in part on the glycemic index of foods, or the ability of a food to affect blood glucose. There are three categories: high glycemic index, moderate glycemic index, and low glycemic index carbohydrate-rich foods.

Ingesting low glycemic index foods before competition may result in sustained availability of carbohydrates during exercise and prevent an insulin surge and subsequent decrease in blood glucose. This may be most useful for the athlete who experiences hypoglycemia during competition or fatigues early. However, some athletes may find these foods to be unappealing or too heavy prior to exercise.

Another option is to have the athlete wait to consume carbohydrates a few minutes before exercise and preferably to consume a liquid form, such as sports gels, sports drinks, or gelatin. The reason is that once exercise begins, there is an increase in the hormones epinephrine, norepinephrine, and growth hormone, which inhibit insulin's release and the blood glucose-lowering effect of insulin. This way the athlete will not have the surge and drop in blood glucose.

For your athletes who are not sensitive to changes in blood glucose, consuming foods from the high glycemic index list one hour before exercise may be advantageous. This is probably best for the athlete who has a morning practice or event after an overnight fast. Starting the day with a corn-, wheat-, or rice-based cereal, a bagel or toast with jam, or a sports drink will fuel the athlete who has a one- to two-hour practice or endurance event early in the day.

Pre-Event Eating

It would be great if athletes had three to five days to rest and fuel optimally prior to competition. Reality dictates that for many sports, tournaments or invitations consist of all-day activity or back-to-back days, and practices are two per day. If the body is given 24 to 36 hours to fuel before events, performance can be maintained at a high level.

When it comes to pre-event eating, tell your athletes to stick with familiar foods. If they have never eaten a food before, they don't know how their body is going to react. Nothing puts a damper on sport performance like a digestive issue. Caution your athletes to steer clear of the following foods if they have never used them before:

- Caffeine in large doses: Energy drinks can be loaded with caffeine.
- Carbonated beverages: They can cause bloating.
- High-fiber cereals (e.g., bran): These cereals take too long to empty from the digestive tract.
- Dried beans: Beans may cause bloating, gas, and a feeling of heaviness, so your athletes will need to experiment with the amount consumed to determine tolerance levels.

- Cabbage family vegetables, such as broccoli, cabbage, and coleslaw: These can cause gas and bloating and do not provide enough calories for activity.
- Fatty foods, such as pepperoni, salami, hot dogs, sausage, and bacon: These foods can take too long to empty from the stomach.
- Fried foods, such as fried chicken and French fries: These can take too long to empty from the stomach.
- Dried fruit, such as raisins, apricots, and dried plums: In large quantities, they can have a laxative effect (but a small amount may work well).
- Juices: They are high in fructose, which is used by the liver as a fuel source and takes too long to convert into available muscle fuel.

Eating the right foods and staying properly hydrated before an event can make the difference between winning and losing. The timing of meals is also important. Here are some recommendations for pre-event eating, on the night before and the day of the event, including the time of day the event is held.

Night Before an Event

The night before an event, have your athletes consume the following:

- An additional two glasses of fluid or a bowl of soup in the early evening.
- An evening meal that's about two thirds carbohydrate. Here are some examples:
- Pasta with marinara sauce (if tolerated), olive oil and garlic, or a small amount of margarine and Parmesan cheese and a slice or two of bread
- A turkey or ham hoagie
- Stir-fry with chicken or beef and vegetables over a lot of rice
- Fajitas with chicken or beef, lettuce, and salsa, and rice on the side
- Thick-crust plain or vegetable pizza

If the team is traveling and eating out, pick a restaurant with a varied enough menu to satisfy the majority of the team's food preferences. A buffet is always a good bet to satisfy the vegetarians as well as the meat eaters on your team.



If fast food is the option, suggest to the athletes that they choose from the following items:

- Grilled chicken sandwich and a baked potato
- Fajitas or soft tacos and rice
- Turkey, chicken, or ham and cheese hoagie with baked chips
- A burger or grilled chicken sandwich and a shake
- Bagel sandwiches and juice
- Wrap sandwiches and lemonade
- Low-fat shakes and smoothies

Athletes should eat something about one hour before bed and drink about 16 to 20 ounces (480-600 ml) of liquid to top off fluid requirements. When you travel, either provide snacks for the team or suggest that each athlete pack snacks. Better yet, arrange an evening meeting solely for the purpose of making sure that everyone on your team eats something before going to bed. Appoint a snack coach to make sure that every athlete brings her fluid bottle and snacks on the trip. If your athletes are at home or go out for an evening snack, they can choose perishable items such as these:

- Low-fat shake
- Soft-serve ice cream, sorbet, sherbet, or fruit ice
- A smoothie
- Chocolate milk
- Yogurt
- Pudding

Here are some items that travel well and can be packed in athletes' bags:

- Cereal bars
- Popcorn
- Cereal
- Bagel with peanut butter
- Crackers
- Pretzels
- Dried soup packets

Day of the Event

On the day of the event, ask your athletes to drink these amounts:

- 16 to 20 ounces (480-600 ml) of water two hours before the event
- Another 16 ounces (480 ml) of water or a sports drink 30 minutes before the event

Serve meals or ask athletes to eat meals such as the following, depending on how close the meal is to the event:

Four hours before an event

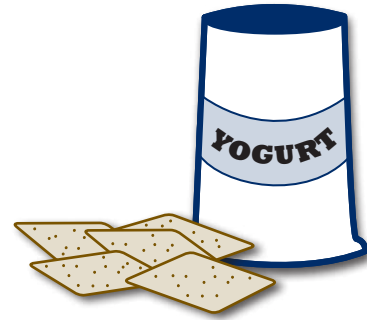
- Turkey, ham, tuna, or roast beef sandwich and soup
- An omelet
- Scrambled eggs and toast
- A grilled chicken sandwich or a turkey burger
- Yogurt and a bagel
- Spaghetti with sauce, olive oil and garlic, or a small amount of margarine

Two to three hours before an event

- Cereal and milk
- Bagel with a small amount of peanut butter or a slice of cheese
- English muffin with jelly and a small amount of margarine
- Waffles or pancakes with syrup
- High-carbohydrate sports bar such as Clif Bar, LaraBar, Odwalla Bar, or PowerBar

One hour before an event

- 8 ounces (230 g) yogurt
- 10 ounces (300 ml) fruit smoothie
- Handful of crackers
- Cereal bar or granola bar



Athletes who are traveling and have early-morning events should pack some snacks to eat when they wake up, to get some fuel into the body. Consider doing a bag check to see if your athletes have come prepared! If you can, work with your high school or college food service department to put together a list of portable snacks, such as these:

- Dry cereal
- Cereal bars
- Trail mix
- Granola bars
- Bagels
- Crackers
- Pretzels
- Sports bars

Time of Day of the Event

The optimal meal for a given event may depend on the time it is held. Here are suggestions for various times of the day.

For morning competitions

The athlete should be up two to three hours before the competition. He should eat and drink something with calories 60 to 90 minutes before the event, such as the following:

- A small muffin with a glass of milk
- A smoothie or breakfast shake and a slice of toast with jelly
- Cereal and milk
- One or two waffles with syrup
- The athlete should also consume 16 ounces (480ml) of fluid at this meal.

For midday events (1-2 p.m.)

Athletes have the opportunity to eat twice prior to competition, so encourage them to eat breakfast.

Meal at 8 a.m.

- Cereal
- Cereal bar and yogurt
- Smoothie and toast with jelly

- Waffles, French toast, or pancakes with syrup
- 16 ounces (480 ml) fluid

Meal at 10:30 to 11:00 a.m.

- A 6-inch (15 cm) hoagie with turkey, ham, cheese, roast beef, or light tuna or chicken salad
- An omelet with a bagel or a low-fat muffin
- A bowl of oatmeal with fruit
- 16 to 20 ounces (480-600 ml) fluid

Athletes who have nervous stomachs before events can choose a liquid meal as their second meal of the day, such as the following:

- A smoothie
- Yogurt
- High-carbohydrate sports drink
- Sports bar and 16 ounces (480 ml) fluid
- Soup with noodles and meat or poultry

Time of Day of the Event (continued)

For evening events (7 p.m. or later) on a weekday

- Athletes can eat breakfast, have lunch between noon and 1 p.m. (this should be the largest meal), and take a mid-afternoon snack around 3 to 4 p.m.

Lunch

- Pasta with marinara sauce and bread
- Baked chicken with rice, rolls, and vegetables
- Stir-fry with lots of rice
- A hoagie with pretzels or baked chips and fruit
- 16 to 20 ounces (480-600 ml) fluid

Mid-afternoon snack

- A peanut butter and jelly sandwich and milk
- Cereal and milk
- Sports bars
- Peanut butter crackers and milk
- 16 to 20 ounces (480-600 ml) fluid

For evening events (7 p.m. or later) on a weekend

- Athletes can eat brunch around 11 a.m. or noon, have a major meal around 4 p.m., and then have a snack around 6 p.m.

Major meal

- Pasta
- Chicken, potatoes, vegetables, rolls
- Stir-fry
- Fajitas
- 16 to 20 ounces (480-600 ml) fluid

Snack

- A few crackers
- A cereal bar
- A granola bar

- A handful of cereal
- 16 ounces (480 ml) fluid

For all-day events

Because turnaround time is minimal between events, the goal is to have athletes eat small amounts of easily digestible foods that are available all day, such as these:

- Dry cereal
- Cereal bars
- Pretzels
- Cut up fruit
- Yogurt
- Cheese sticks
- Trail mix, Chex mix, or mix of cereal, pretzels, and chocolate chips

You can also have the following foods available:

- Honey wands or sticks—These are made of crystallized honey and are sold at places like Sam's Club, Costco, and Trader Joe's. They are not messy or sticky and not overly sweet, so they are palatable.
- Gels (such as Gu or Clif Shot)—Gels come in foil packages and are single-serving portions of carbohydrate. They are available at sporting goods stores, supermarkets, and on-line but are fairly pricey.
- Gelatin—Use 4-ounce (112 g) containers of Jell-O, or find a parent who is willing to make gelatin cubes, which can be a refreshing source of carbohydrate on a hot day.
- Sugar cubes—Five or six cubes constitute a serving. They are available at grocery stores and are not overly sweet.

Offer liquids at every opportunity. Although athletes may think about the need to eat during all-day events, what about sports with breaks, such as soccer, basketball, hockey, and football? Most athletes do not eat a lot before they play, and meals are usually four to five hours before competition, so the athlete may feel strong at the beginning of competition but may tire quickly. Athletes need to consume 30 to 60 grams of carbohydrate per hour of exercise. This can be accomplished by consuming more than just water at breaks. A better choice is a sports drink or sports gels with water. As a longtime soccer mom, I have cut up my share of oranges for halftime, but most soccer players won't eat enough orange wedges to get adequate fuel or fluid. You can offer orange wedges with a sports drink, but because time is limited, I suggest gels, honey sticks, sugar cubes, or sports drinks instead.



Postexercise Eating

Your athletes will always have more training sessions in a week than competitions, so postexercise eating plays an essential role in helping the athlete recover quickly so that she can get out there and do it again the next day. Timing is the key factor in expediting recovery and assisting in muscle tissue repair. Athletes need to be reminded about the importance of fueling after exercise and making this a priority. Make sure that before they shower, text message, put on the i-Pod, or drive home from practice, they eat to replete! Cool-down is a perfect time to have your athletes stretch and eat something. This way, you know they've refueled!

Tell your athletes "within 15." You want them to eat or drink something containing calories within 15 minutes of completing exercise to optimally replete muscle and liver glycogen stores. If they don't, they will need up to 24 additional hours to recover, and they do not have that kind of time! Some athletes will tell you they are too tired to eat during this period of time and are not hungry anyway; they may tell you that they will eat when they are hungry, but that is too late. Your athletes need fuel the most when they want it the least!

Make food and beverages readily available to athletes so that refueling is not an afterthought. Your athletes need to bring a bottle of sports drink or a water bottle containing a powdered sports beverage to practice. They should also have nonperishable food in their bag such as granola or cereal bars, a small bag of cereal, some pretzels, trail mix, or a package of peanut butter crackers. At the high school level, parents and booster clubs can supply the postgame snacks. At the university level, handing a bottle of water or sports drink and a sports bar to athletes after workouts, or having food available and visible, can be a great reminder to refuel.

There has been some recent research on the benefit of chocolate milk as a recovery beverage (Karp et al. 2006). However, milk must be stored at a temperature of 40 degrees F or colder to prevent harmful bacteria from growing in the milk. If coolers are available, consider a sports shake, chocolate milk, smoothies, or yogurt for postexercise repletion.

When your athletes exercise in cold weather, consuming warm foods after exercise can expedite blood flow to the extremities. Hot cocoa, instant soup, or instant oatmeal can provide a warming, nourishing postexercise fuel. This can be helpful for skaters and ice hockey players or during cold-weather football and soccer practice. Consider getting the high school booster clubs involved; at the collegiate level, consider working with your food service department.

As a sports dietitian, I often am asked why athletes can't just have fruit or drink fruit juice after exercise. The carbohydrate in fruit is fructose, which takes longer to resynthesize muscle and liver glycogen than does glucose or sucrose. Your athletes can have fruit as long as they also consume another carbohydrate source to expedite muscle glycogen recovery. Orange juice and pretzels, or a banana with a granola bar, would be fine. The goal is to drink or eat at least 50 grams of carbohydrate as soon as possible after exercise.

For athletes who don't want something sweet, suggest Chex mix, Goldfish crackers, or pretzels—about a cup and a half of any of these. Should athletes consume protein with carbohydrate after exercise? Specific amino acids such as glutamine and arginine may hasten the body's ability to resynthesize glycogen after exercise (Ivy et al. 2002; Varnier et al. 1995; Yaspelkis and Ivy 1999). In addition, protein plus carbohydrate may assist in the repair and synthesis of muscle proteins after endurance exercise (Levenhagen et al. 2002). These studies suggest a more rapid recovery from exercise with some protein, but the amount required is small, about 15 grams, and the body still needs more carbohydrate than protein. Chocolate milk, trail mix, a peanut butter sandwich, or a high-carbohydrate sports bar would all work well.

Remind your athletes that they do not have to consume a full meal in the 15 minutes after exercise. They can wait until they are hungry to eat, but the meal should still have a significant amount of carbohydrate, so a steak, salad, or chicken wings alone is not going to cut it. Breads, pasta, or rice should be part of this meal to help the athlete to recover fully. It is not necessary for the athlete to consume huge quantities, because that may lead to unwanted weight gain. The most important consideration is for your athletes to eat a little something right after each bout of exercise.



Getting Athletes to Eat

The hardest thing about the timing of meals and snacks is getting athletes to buy into the concept that correct timing will benefit them. They need to be proactive, because they can't fuel for an event or practice if it has already occurred. As the coach, you must be proactive as well; make a rule that the athlete who is not fueled can't practice or compete. If you have students who help with the teams, designate one or more of these helpers as snack coaches to make sure all of your athletes have access to food and fluid during and after practice and competition. Make it a team effort, rewarding those who come to practice and competition fueled and

hydrated. In the college setting, work with the athletic director to set up a snack budget, or work with the food service to provide some portable items for the athletes, especially for travel.

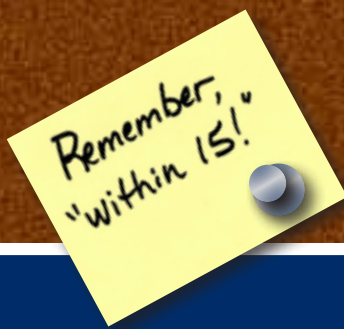
A season is not one event, and competition gets tougher as the season goes on. What your athletes eat throughout the season can make the difference between ending your season early and advancing to postseason play. Timing can be the deal-maker or -breaker, so remind athletes, make them accountable, and see that they eat and replete. You will get more out of your athletes if they do this consistently.



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About the Author



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In addition to working with these organizations, Bonci has been a featured speaker at several conferences, including the National Athletic Trainers' Association, the American Dietetic Association, and state coaches' meetings. She is a regular contributor to the *Training and Conditioning Journal* and to the *Runner's World* "Ask the Sports Dietitian" blog and has appeared on NBC's *The Today Show*.

In her spare time, Bonci enjoys running, weight training, and watching all levels of sporting events. She resides in Pittsburgh, Pennsylvania, with her husband, Frederick, and two sons, both of whom are athletes.

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