INTEGRATED SPORT & SPINE CLINIC OF MADISON

Eating for the Athlete

Athletes have known for decades they are supposed to eat carbs to make sure that they will have enough energy to not just complete, but perform well throughout their events. However this carb loading is often taken to the extreme with the majority of the athlete's calories at every meal coming from carbohydrates. Not only does excessive carbohydrate consumption produce excess body fat, a diet of this type is bound to be deficient in many vitamins and minerals. As carbohydrates are pretty much devoid of important nutrients and actually contain phytic acid which has been shown to decrease your body's ability to absorb nutrients from other foods.

Your initial thought is correct, you do need carbohydrates as an athlete, and they are the best way to replenish the substance glycogen in the body. Glycogen is used as fuel by our body during every form of exercise. While carbs are important to have immediately before, during, and just after exercise they do not need to dominate every meal all the time. There are five stages, each have their own needs for carbs and other nutrients.

- Stage I: Before exercise
- Stage II: During exercise
- Stage III: 30 minutes following exercise
- Stage IV: Short term recovery
- Stage V: Long term recovery

Before we detail the different stages we will look at two important concepts for you to understand heading into it, muscle fuel sources and the glycemic index.

The fuels that your body uses to power muscles during activity are primarily fats and carbohydrates. Carbohydrates being used are in the form of glycogen. Glycogen is composed of several chains of glucose and is stored in muscle fibers as well as in your liver. During marathon length endurance or relatively low intensity events, your body is using fat as of 80% of your fuel and carbohydrates as 20% of fuel. As your intensity reaches about 65% your body is using fats and carbohydrates in a 50/50 split. The fat is not coming from stored belly or thigh fat at this point but fat stored in the muscle known as intramuscular triglycerides (IMT). As intensity increases to 85% IMT is only supplying 25% of the fuel and the other 75% coming from glycogen [1,2]. It has also been shown that IMT can play a greater role in fueling your efforts when the availability of glycogen stores is not at optimal levels. So it can be seen that maximizing your IMT stores will be beneficial to increasing your endurance performance as they are used at every level of exercise intensity to some degree. Having IMT stores will allow you to use your carbohydrates more efficiently. Luckily, following a diet outlined below will allow you to maximize both glycogen and IMT stores.

Glycemic index is a measure of how much certain foods raise your blood sugar in comparison to glucose which is the simplest form of sugar. Foods that have a high glycemic index will be followed by a fast release of insulin to remove this influx of sugar from the blood and start storing it in muscles as glycogen and converting it to body fat. This influx of insulin will leave you with a lower blood sugar compared to

when you began. Consumption of high glycemic index foods will actually cause you to "crash" about a half hour after taking them because of your body's response with insulin. Foods with low glycemic index will have a much slower effect on your blood sugar. This will allow you to maintain an even, more constant blood sugar. This is important to understand as we move forward and plan when and how to consume your carbohydrates. The glycemic index has a flaw; it measures each food in a quantity of 50 grams of carbohydrates. For a milk chocolate bar with a GI of 43 this only takes 3 ounces and for the watermelon with a GI of 72 it takes 1.5 pounds [3,4]. So to compensate for this you can multiply the GI by the amount of carbohydrates in a typical serving which gives you a glycemic load. Glycemic load is a much more real world example of how a food affects your blood sugar. For a good source of glycemic index and load numbers go to www.glycemicindex.com for almost any food.

Stage I: Eating before exercise

Eating properly before your workout or competition goes a long way in helping to boost your performance during your effort. You should try and eat approximately two hours before your workout. This timing will allow you to fully digest your meal or snack so that you have all of the nutrients available for your workout. Eating and proper hydration prior to your workout will make it easier to recover following your workout.

For every hour prior to your workout equals 200-300 calories which should be included in your meal (i.e. 2 hours is 400-600 calories and 3 hours is 600-900 calories for your meal). The meal should be mostly carbs and some protein as the protein will lower the glycemic index of your food forcing a continuous release of glucose to your blood instead of a quick burst [8,5]. The larger the amount of time between your meal and workout the lower your glycemic index should be so you can maintain a more even blood sugar level [8]. Fruit is a good way to get your carbs in as they will release the spike of insulin following your meal. This meal should also be low in grains as they take a long time to digest and can "sit heavy" during your workout. The protein in this meal will also prolong the time to fatigue in your workout and prevent your body from turning on your muscle mass for fuel.

For the hour leading up to your workout you should only take in water. Being properly hydrated is shown to increase your time to fatigue and not consuming any food during this time period won't allow a large influx of insulin to lower blood sugar and bring on early fatigue.

If your workout is going to be 60 minutes or longer you should take in a small quantity of high glycemic carbs within 10 minutes of starting your workout. These high glycemic carbs will enter your blood sugar quickly and will be used as energy before the body has time to react with insulin [6,7,8].

Some simple pre exercise meals include:

- Hard Boiled eggs and fruit that is low in fiber (bananas, peaches, cantaloupe, honeydew, watermelon)
- Applesauce mixed with protein powder
- Smoothie: blended fruit from list above, fruit juice, protein powder

- Sports bar with protein: only to be used as a last resort due to high sugar content. Be sure to drink lots of water with this option.

Stage II: Eating during exercise and competition

Eating during exercise is a learned skill. It is something that you want to try during training to figure out what foods work well and agree with you. Trying something new on competition day is potentially disastrous. Eating is a term used loosely and means mostly fluids and carbohydrate gels.

Hydration is of supreme importance during exercise and competition. Being well hydrated will improve your performance and also help prevent your body from using your own muscle to provide energy for your workout [9,10]. Your primary fluid will depend on where you choose to get your carbohydrates from. If you want to use gel packs then you should be drinking water. When you take a gel packet you will need to follow with water to help your stomach digest the concentrated carbohydrates without pulling fluid from your muscles. Some benefits of gels are that they can have added protein and caffeine which are both shown to improve performance and prevent fatigue. However, some people find gels hard to stomach and difficult to take while on the move. If you are going to just use carbohydrate sports drink, this will replace your carbohydrate and electrolyte loss but usually contains no protein. Sports drinks are much easier to use on the move and are a one step process. It is also important to remember as both the intensity of your exercise and the temperature rise your need for fluids will increase.

During 2-90 minute events solid food is not necessary due to the relative high intensity and short duration of the event. The focus here is on preventing dehydration. This is done with proper hydration leading up to the event and also during the event. For events lasting more than 15 minutes you should try and consume 4 ounces of water every 10-15 minutes. Sports drinks can also be beneficial in this type of event but are not necessary.

For events that last 90 minutes to 4 hours you need to be taking active steps to prevent glycogen depletion and dehydration. To prevent this your goals are to take in adequate carbohydrates and also fluids. You should start replacing electrolytes from the beginning of the event to prevent a carbohydrate deficit during the event [11,12,14]. Sports drinks are the easiest way to accomplish this goal. A drink with a carbohydrate to protein ration of 4:1 will provide you with the best results of preventing fatigue and protecting muscle tissue [12,13,15]. Your goal is to consume 200-300 calories for every hour in equally spaced intervals [14,16]. You can also get your carbohydrates from a gel packet. If you choose this option, you must take it with 6 ounces of water to provide enough for digestion. If you don't take the gel with water your body will pull fluids from your blood to digest the gel and that is fluid that should be given to your muscles.

Events in the range of 4-12 hours require a well thought out nutritional plan. While these types of events are very difficult to complete, they are done at a relatively low intensity. In an event of this duration your body will use mostly fat after the first two hours to power you through the event. However, your body needs available carbohydrates to burn fat efficiently. Carbohydrates must be taken from the beginning to prevent a deficit from occurring [11,12,14]. For an event of this duration your goal is to consume 300-600 calories per hour [14,16] in equally spaced intervals mostly from a liquid source. As you

get closer to the 12 hour mark you will want to consider high glycemic foods. These foods should also be taken with water to aid digestion. Use of solid foods should be well practiced before your event.

Stage III: Eating 30 minutes post exercise/competition

In the thirty minutes following your efforts, your body is capable of using protein to repair tissue and carbohydrates to be stored as glycogen to speed your recovery from exercise. Your body is two to three times more capable of using these nutrients during this 30 minutes window than it is in the following hours [17-21]. You should take in high glycemic index foods to get glucose into your blood stream quickly to replace your used glycogen stores [17,18]. This is sometimes easier to do with a liquid meal such as a protein shake. A protein shake will not only provide you with protein, but will also provide the required carbohydrates. You have two other goals during this time period: rehydrating and electrolyte replacement. To obtain proper rehydration weigh yourself before and after work out and drink 16 ounces of fluids for every pound of weight lost and then half that amount again. During your rehydration you can have one bottle's worth of electrolyte enhanced sports drink to replace your lost electrolytes [22,23].

Stage IV: Short term post exercise

This stage should be completed following long duration low intensity exercise or high intensity short duration exercises. This stage should last for as long as the duration of your exercise. At this time you should focus on high glycemic index starchy vegetables such as potatoes, sweet potatoes, yams, and raisins that will quickly supply you with glycogen [20,21]. You should also take in some lean protein from an animal source during this time to help repair and limit muscle damage from your workout [21]. Do not forget about rehydrating during this time period as you will not have completed your 16 ounces per pound lost in the first 30 minutes [22,23]. Try and make this meal one of your big three if possible but if that doesn't work make the size of the snack proportional to the length or duration of your workout.

Stage V: Long term post exercise

Stage five lasts from the time you finish stage four until your next stage one begins prior to your next workout. During this stage you are to follow the diet outlined in the Supplement and Nutrition Guide. There is no need for increased carbohydrates during this time as your intake of lean protein, fruits, and vegetables will maintain your glycogen levels between workouts. The food intake during this time is more nutrient dense compared to grains and carbohydrates allowing you a more complete and quicker recovery from your workout.

The protein from free range grass fed animals, wild game, seafood, and wild fish will provide you with adequate amino acids to rebuild muscle tissue that has been damaged during exercise. To do this you should try and consume 0.6-1.0 grams of protein per pound of body weight per day. The higher intensity and longer duration of your workouts the closer to 1 gram you should be. If you are a non-endurance athlete and you are trying to gain muscle mass, you will want to raise the amount of protein to 2 grams. Trying to consume this level of protein from plant sources only would require a huge amount of plants making animal sources the best source of protein to accomplish this goal. For example, for someone

needing 135 grams of protein you could eat 4 ounces of cod, 6 ounces of turkey breast, and 4 ounces of chicken at 454 calories. Conversely to get that amount of protein from plant sources would require 1 cup of tofu, 1 cup kidney beans, 6 slices whole wheat bread, 1 cup navy beans, 1.5 cups corn, 1 cup red beans, 1 cub brown rice, 2 bagels, and 2 tablespoons of peanut butter at a staggering 2,300 calories. This style of diet is also shown to decrease the levels of inflammation caused by exercise.

Eating leading up to competition is obsessed about by some athletes. If your event is something that you have been training for months to complete and you have lessened your training the week leading up to the event, you may want to consider proportionally decreasing the amount of calories that you take in to avoid weight gain. You may gain a few pounds but that will be mostly water weight which will actually help you come time to compete. You may also want to eat more carbohydrates this week; such as fruits and starchy vegetables like potatoes, sweet potatoes and yams. These foods will help you to fill all of your glycogen storage sites before the big day. By topping off your glycogen with these types of foods you can skip the pasta party and all of the extra calories that come with it. The day before your event you should decrease the amount of fiber that you take in to allow for quicker digestion of foods that you eat in preparation for competition. Also, if your event lasts longer than 4 hours you will want to add a light amount of salt to your food to help with the sodium lost during competition.

If you are competing in a tournament or competition that will last all day requiring you to compete several times in that day, you need to have your day's nutrition planned out and with you when you show up. If you have less than one hour between events, then stick with a carbohydrate enhanced sports drink. If you have more than one hour, you can eat a small meal that won't sit heavy in your stomach. It would ideally include some fruits, veggies and some pieces of meat. This will allow you to replenish lost calories and some glycogen. Do not plan on being able to find food that will suit your needs once you get to the event. Concession stand food will not supply you will the proper nutrients to help you perform at your best.

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