

Nutrition Requirements for the Triathlete

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Performance Nutrition and Weight management
Fall 2014



Swimming, biking, and running oh my! A triathlon consists of a sequence of endurance events including swimming, cycling and running. Various types of triathlons exist pertaining to distance, such as Sprint, Olympic, Half Ironman and Ironman. A Sprint triathlon consists of 0.3-0.5 mile swim, 12.4-13 mile cycle and a 3.1 mile run. An Olympic distance triathlon involves a 0.9 mile swim, 24.9 mile cycle and 6.2 mile run. A Half Ironman is made up of a 1.2 mile swim, 55.9 mile cycle and a 13 mile run. A full Ironman entails a 2.4 mile swim, 111.8 mile cycle, and a 26.2 mile run. Each type differs greatly in distance, however, each involves endurance. In this chapter, the classification of an endurance event will include the Olympic Distance, the Half-Ironman, and the full Ironman Triathlons. Each distance has its own challenges in regards to fueling before and during the event.

In order to maximize performance, nutritional requirements must be followed. Such requirements ensure that the athlete maintains a desired pace while maintaining health. Nutritional requirements involve consuming adequate fluids and electrolytes before and during competition as well as carbohydrate ingestion before and during. Consuming these imperative nutrients are especially important in endurance events such as triathlons. This chapter will focus on these important aspects of triathlons pertaining to nutrition.









CARBOHYDRATES

Why are carbohydrates important during exercise?

Many people know that it is important to eat specific types of foods for sporting events but what many people fail to realize is the reason why. Typically, people are aware that eating spaghetti is beneficial to their overall performance but why is this so and what alternatives are available? This next section will address the importance of different substrates pertaining to triathlons and helpful examples of meals and snacks will be provided.

Carbohydrates Days Prior to Triathlon

Carbohydrate loading is common among endurance athletes of all types. Carb loading increases the stores of muscle glycogen in a muscle, which in effect, allows longer exercise, and an increase in overall performance (Andrews et al. 2003). Researchers recommend that endurance athletes consume 10-12 grams of carbohydrate per every 1 gram of body mass in the days leading up to an event (Bentley et al. 2008). This amount assures that the athlete's muscle glycogen stores are built up enough to be advantageous to performance during the triathlon. While optimizing carbohydrate intake is crucial to a triathlete's performance, emphasis must still be placed on the other important food groups as well. One should not solely consume carbohydrates but rather find a balance between that and other foods containing proteins and fats. This chart shows which foods are high in carbohydrates and

Breakfast: ✓ 3 cups of low fibre breakfast cereal with 1 ½ cups of reduced-fat milk ✓ 1 medium banana ✓ 250 mL orange juice	
Snack: ✓ Toasted muffin with honey ✓ 500 mL sports drink	
Lunch: ✓ 2 sandwiches (4 slices of bread) with filling as desired ✓ 200g tub of low-fat fruit yoghurt ✓ 375 mL can of soft drink	
Snack: ✓ Banana smoothie made with low-fat milk, banana and honey ✓ Cereal bar	
Dinner: ✓ 1 cup of pasta sauce with 2 cups of cooked pasta ✓ 3 slices of garlic bread ✓ 2 glasses of cordial	
Late snack: ✓ Toasted muffin with jam ✓ 500 mL sports drink	

explains whether or not they are nutrient dense. [Food Sources High in Carbohydrates](#). Utilizing this chart could prove beneficial to a triathlete in meal planning before a triathlon.

The following list contains the 5 best sources of carbohydrates for athletes according to USTriathlon.org.

1. Sweet Potatoes
2. Oats
3. Wild Rice
4. Banana
5. Chickpeas



Carbohydrates the day of Triathlon

Not only is it imperative that athletes participating in triathlons eat sufficient meals and snacks the days leading up to a triathlon, but it is equally as important to maintain good eating the morning of an event. This is often overlooked by triathletes but is crucial for success and the health of a triathlete nonetheless.

Fatigue is a big reason for which people participating in triathlons either fail or do not meet their goals. Fatigue can be caused by the depletion of muscle glycogen which results in less

efficient performance (Williams, 2013). Therefore in order to avoid fatigue, one must consume adequate carbohydrates the day of a triathlon. The amount of carbohydrates that one should eat hours before a triathlon can be determined by considering one's body weight; this recommendation is 4-5g/kg (Williams, 2013). These foods at this time may be consumed in any form, but Amber Peterson from Ask the Athlete recommends that a meal should be eaten rather than sports drinks and sports bars. She stated that it is important to stick to a meal that you would have on any other day for familiarity. The recommended amount of carbohydrates within one hour of the triathlon that can be consumed is 1-2g/kg (Williams, 2013). Finally, it is not recommended that one eat immediately before a triathlon begins. According to Amber Peterson, drinking a sports drink such as Gatorade right before could be beneficial in order to "get in some Calories" but it is not a smart idea to eat at that point in time considering the difficulty to swim on a full stomach. Overall, as long as one follows the general recommendations for eating before a triathlon, they should find greater success than if they did not.

While eating healthy is important the day of a triathlon, one must be careful in what they decide to consume in order to avoid any unwanted problems. Such problems may arise from the ingestion of highly fibrous foods such as beans and from whole grain products such as multi grain and whole wheat breads. By avoiding these foods, one may also lessen the chances of having gastrointestinal problems.

Carbohydrate Requirements during the Triathlon

During a long distance triathlon, it is crucial for each athlete to consume enough carbohydrates to keep energy levels up. The carbohydrate requirements of an athlete throughout the triathlon depend on the gender, height and weight of that individual. It is recommended that an athlete consume 1-1.5 grams/ kg body weight/ hour of the event (Clark, et. al., 1992). This normally equates to 200-600 kcals/hour depending on the size of the athlete and their experience. The nature of the carbohydrate that is consumed depends on the athlete. It is recommended to consume a carbohydrate high in glucose and very low in fiber. This will decrease the instance of gastrointestinal distress during the race. The less gastrointestinal stress an athlete has the better that athlete will perform (Pfeiffer, et. al., 2012).

When fueling with carbohydrate through the triathlon, the athlete's goal is to minimize the time spent consuming the nutrient in order to minimize their time. Many competitive athletes plan and practice their intake before the race so they can consume the carbohydrate while running or biking (Cox, et. al., 2010). This is done through a variety of ways depending on what types of foods that athlete is comfortable eating while exercising. Some athletes utilize gel shots or blocks. Others bring granola bars, bread or a sport's drink. Consuming a variety of solid and liquid carbohydrates is a good idea for the athlete to have a good fueling plan (Dolan, et. al., 2011). It is recommended to consume the real solid food carbohydrates towards the beginning of the race. Then toward the end of the race the athlete should rely more on liquid carbohydrates because as an athlete continues to exercise; their gastrointestinal tract is less tolerable of solid foods (Frentsos, 1997).

Ask the Athlete

Amber Peterson, a well-rounded athlete, ran her first endurance triathlon in July of 2014. The triathlon was called The Superior Man but was equivalent in distance to that of a half Ironman. Much was learned from this first triathlon from preparation to recovery. Amber shares her insight regarding this experience.

Q: What, if anything, did you do regarding fueling and hydration the week up to the Superior Man?

A: I carb loaded and sodium loaded for the week leading up to the race, still focusing on eating healthy while shoving food down my gullet. Also, I drank a lot of water to make sure that I was properly hydrated.

Q: What did you eat the morning of the race?

A: That morning I stuck to my normal routine of a cup of Greek yogurt, fruit, and granola with green tea. This is my typical routine and I didn't want to change it on race day.

Q: As the race got closer, did you eat and drink more?

A: Yes. I didn't want to eat too much right before the race so I drank some Gatorade before the race to keep hydrated and to keep some Calories in. About 30 minutes before starting, I took a honey gel with water.

Q: Did you pre-plan food to consume during the race?

A: I had a pouch already loaded and ready with potato chips (mostly for the salt), Gatorade chews for carbs, a cut up honey waffle, and a cut up PowerAde granola bar. I had researched ahead of time how many carbs I should be consuming while biking, and this fell within my guidelines in conjunction with all of the Gatorade I was prepared to consume on the bike.

Q: At what point in the race did you first begin eating and drinking?

A: Immediately after the swim and during my first transition, I drank some water and took a few bites of a power bar. From my research, I learned it is best to get your nutrition while on the bike. Makes sense right? Can't eat while you swim and it is definitely necessary to keep eating down to a minimum on the run.

Q: What else did you consume during the bike portion?

A: During the bike, I had my 30 ounce Gatorade jug and a pre-filled water and electrolyte mix in a water bottle on my bike. I also grabbed a water and a large Gatorade container from the volunteers. I consumed almost all of it.

Q: What was the most challenging aspect pertaining to nutrition?

A: It was difficult to remember to eat and drink on the bike, as weird as it sounds. Being consumed with my task and being focused took away from my food attention.

Q: What was your goal for food and fluid consumption during the span of the race?

A: I aimed to consume 50-100 Calories and 4 ounces of fluid every 15 minutes. I think I did okay on this.

Q: Tell me about what you consumed during the running portion of the race.

A: After the bike and in transition two, I drank more water and ate more of my power bar. I then headed out on the run with 20 ounces of Gatorade on a hydration belt and numerous honey gels. I aimed to take the gels, some of which containing caffeine, every 45 minutes or as needed and to drink about 4 ounces of fluid every 15 minutes. I also thought it would be a good idea to stop at almost every water station.

Q: Did you have any cramping during any portions of the race?



A: I started to cramp up a little in my quads during the last ten miles of the bike. From previous experience (from training, sprint triathlons, long bike rides, and marathons), I knew this would continue into my run so I drank more water and Gatorade. I did fairly well up to mile 9 on the run, then I ran into some serious cramping issues that slowed me down the last 4.1 miles. There were a few electrolyte pills that an employee from a running specialty store gave me during my ultra-cramping. They did not seem to work. I probably needed to take them earlier. Overall, I need to get a handle on my cramping. I felt like I consumed a ton of electrolytes, but maybe that wasn't enough.

Q: What did you do after the race?

A: After I finished, I immediately went for protein in the form of whey powder and a protein bar. Once I got home I took a nap and right after that I ate a decent amount of food and drank a bunch of water in an attempt to make up for the 5000-6000 calories that I burned.

Q: Is there anything that you might change if you choose to run this race again?

A: I think it would be helpful to acquire more bottle holders on my bike as I went through much more fluid than I ever could have imagined and could have used even more.

Q: Do you plan on running this triathlon again?

A: Yes. I just can't conceive of not doing another one because I learned so much in the way of nutrition.

Q: What advice would you give to someone who wants to participate in a half ironman?

A: I would tell them to remember that a triathlon really has 5 disciplines: swim, bike, run, transitions, and most importantly nutrition.

Ask the Athlete

Kim Togstad started her endurance career running half marathons and marathons. She decided that she wanted to do more than just run. She started to run triathlons and now has successfully finished two Half-Ironman triathlons and an Ironman triathlon (on 9-7-14). This is her insider advice for nutrition fueling for a triathlon!

Q: What did you do regarding fueling and hydration in the week leading up to the triathlon?
I tried to eat and drink as normally as possible but avoid foods that had the potential of causing an upset stomach (spicy, high in fiber, etc...).

Q: What did you eat the morning of the race?

Generally if there are several hours (3 or more) between waking up and the race I try to eat something like an egg and cheese burrito. This goes against most of the advice that you would find online, in magazines, etc... but I have found that for me that I need something that will keep me full up until the start of the race. However, for Ironman I was nervous and eating wasn't sitting very well. But I knew it was important so I worked on eating 2 hardboiled eggs, a banana, and peanut butter.

Q: As the race got closer, did you eat and drink more?

There wasn't enough food to keep me full. At times I felt like it was non-stop eating, especially during the peak training weeks. A single bike workout would burn 5000 calories which is equivalent of 4 days of eating for a sedentary person. However, as I moved past peak and into taper the eating had to taper as well.

Q: How much did you have to plan for food to consume during the race?

Nutrition planning for an endurance race like Ironman is just as important as the swim, bike, and run training. I did a TON of reading about fueling such as the number of calories to take per hour on the bike vs. the run, what was the best way of getting calories (solid vs liquid), what

brands worked best, etc... There was a lot of trial and error along the way and there were some bike rides where I got so hungry I had to stop and eat because it would get hard to function.

Q: At what point in the race did you first begin eating and drinking?

Right after the swim in T1 I had a peanut butter sandwich and a Coke in my transition bag.

Q: What did you consume during the bike portion?

The plan was to consume 250-300 calories every hour and to take in something every 15 minutes. I had an alarm set on my bike Garmin to beep every 15 minutes to remind me to eat or drink something. This is what I had on my bike:

- Water bottle #1 - water (take as needed outside of the 15 minute interval)
- Water bottle #2 – Hammer Perpetuem mixed with 3 scoops of mix
- Water bottle # 3 – Powerbar Perform. This stuff is kind of gross but it's what they were serving on the course so it was important to get used to it.
- Bento Box – Cliff Bloks and Cliff Bars cut in pieces. Endurolyte tablets.
- Taped to bar – Hammer Gels

Endurolyte tablets are like a liquid Gatorade. Another option that a lot of people used were Salt Sticks.

Q: What was the most challenging aspect pertaining to nutrition?

Training- keeping enough on hand. It was an unexpected expense.

Race Day – I was nauseous for most of the bike ride which happened to a lot of participants. The Cliff Bloks that I have used for years made it worse and the Gels made it better. However, I only had 3 of those for emergency purposes.

Q: What was your goal for food and fluid consumption during the span of the race?

The goal is to take enough in on the bike to maintain energy levels while at the same time take in the right kind of fuel to not have tummy issues on the run.

For the bike take in 250 – 300 calories per hour and for the run take in around 200 calories. It was important to start fueling right away and not wait until hunger, thirst, or weakness set in .

Q: What did you consume during the running portion of the race?

Another peanut butter sandwich and coke in transition. On the course I carried Bloks for the first half but they still didn't sit well and I dropped them at the half-way point. At the water stops, which were every mile, I would grab potato chips or pretzels, water, or cola. They had a mango flavored Perform which was awful so I took a chance and didn't drink it after the first water stop. Cola is wonderful. Calories, sugar, caffeine, and carbonation work wonders. At sunset most of the water stops started serving chicken broth. I had read blogs that strongly encouraged drinking the broth and it was excellent advice. Everything got better after the broth.

Q: What did you do after the race?

I had no appetite and almost got sick at the sight of pizza. I think after a while I ate a small sandwich. The day after the race I ate everything I could get my hands on.

Q: Is there anything that you might change if you choose to run this race again?

Make sure there is beer back at the hotel for after the race. Actually, my grandma told me that doctors used to prescribe beer for morning sickness. I have found that it helps with a post-race upset stomach.

Also, I would have a backup option for food on the bike. There is a special needs stop at mile 56 where you can reload supplies if needed.

Q: Do you plan on running the ironman triathlon again?

Yep! Going back to Wisconsin in 2016.

Q: What advice would you give to someone who wants to participate in a half ironman or ironman event?

- Don't overlook the importance of fueling before, during, and after training.
- Practice it every time you train so it becomes a habit.
- Learn to eat on the bike.
- If you take gels, learn how to tape them onto the top tube of your bike for easy access
And opening
- On race day follow your fueling plan. There was a sign early in the bike course that said "if you aren't following your fueling plan, what are you waiting for?" A friend of mine forgot to eat on the bike and bonked hard and I passed him like he was standing still at mile 56. His excuse was that the group he bikes with never stops to eat so he didn't think about it. Huh? And then before the run he quickly drank a Coke and vomited.
- Research what they are serving on the course and try to work it into your training.

[CLICK HERE](#) for an intense Ironman Rivalry

FLUIDS

Why is water important in everyday life and how does this relate to triathlons?

It is well known that water is essential for life. The body is 50 to 75% water, depending on various factors such as age and body fat (Howley, Powers, 2012). When the water loss from the body exceeds 2% of all body water, negative effects occur pertaining to aerobic performance, and even larger losses may lead to death (Howley, Powers, 2012). It is recommended that men consume about 13 cups of water a day while women should consume about 9 cups. This is a general recommendation that varies based on the size and age of the individual (Harms, 2014).

An athlete in training needs to be sure to replenish fuel both during and after the exercise. The amount of water the athlete needs to consume depends on the intensity, duration and weather of the activity. The higher the intensity and duration, the more an athlete will sweat so one needs more water. If the exercise bout is greater than 60-90 minutes, the athlete should hydrate with a fluid that has electrolytes. This will decrease the chance that an athlete will get hyponatremia which is low blood sodium and is caused by an athlete (typically a petite female athlete). Consuming water with no electrolytes. This causes an electrolyte imbalance within the blood and leads to nausea, vomiting, headache, confusion or even a coma. A greater volume water is also needed in hot weather environments because of the increase in sweat volume (Clark, et. al., 1992). Water is a vital nutrient for the body both in everyday life and during exercise.

Fluid Requirements Prior to Exercise

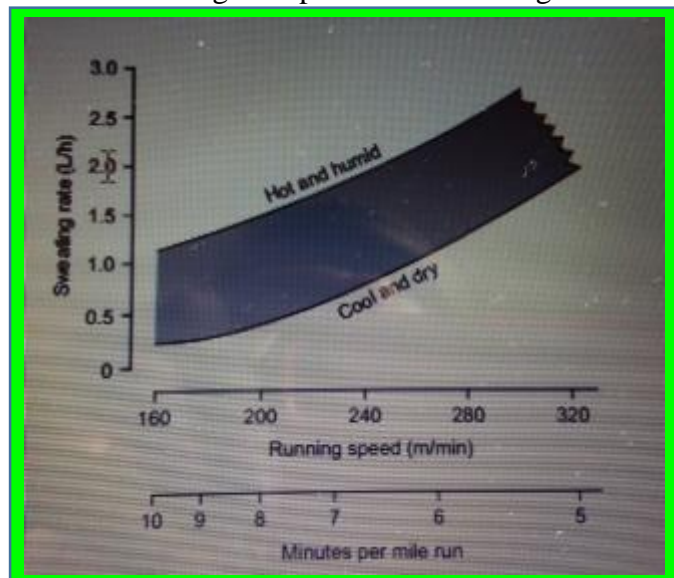
It is crucial for an athlete to be well hydrated before the onset of exercise. This will increase the athlete's energy levels during the event. The body is also able to withstand a longer event at a faster pace if well hydrated. The key to optimal hydration is to drink water consistently throughout the day versus drinking all the recommended intake within a day. This decreases the chances of a sodium imbalance from the overconsumption of water. It is recommended that an athlete intake 5-7 mL of fluid/ kg of body weight at four hours before the event. Each athlete is

different as to the amount of liquid their stomach can tolerate before exercise; this can be experimentally determined through training runs. It is important not to overdrink before the race for it could lead to hyponatremia. The athlete should consume beverages only used during training runs. The rule that triathletes use on race day is to not try anything new to alleviate stomach issues (Rehrer, 2001).

Before the race, an athlete should weigh themselves. The after the race, it is recommended that athlete drink two cups of water for every pound lost. Hydrating well after the race increases the athlete's recovery period and health status.

Fluid Requirements during Triathlon

Clearly, people recognize the fact that fluids are necessary during exercise but why is this so? Studies confirm that fluids during exercise reduce the heart rate, body temperature, and perceived exertion responses to exercise. With more fluid intake, these responses are decreased (Howley, Powers, 2012). In order to maintain a desired level of hydration and thus prevent dehydration, the intake of fluids must be equivalent to the amount of fluid loss (Clark, 1992). In endurance events, as much as 3L/hr of fluids can be lost through the process of sweating which solidifies the need to replace as one loses (Rehrer, 2001). Since consuming fluids proves to be so essential during triathlons, how does one know how much to drink and how often. According to researchers, thirst is not a good indicator of fluid needs during exercise because by the time that one becomes thirsty, they have already fallen behind on the amount of fluids in which they should have been consuming (Rehrer, 2001). Thirst does not occur until about 1-2% of body weight is already lost (Williams et al. 2013). In order to determine the amount of fluid that one needs, practice trials should be performed which involve assessing body weight changes. For every pound lost during exercise, it is recommended that at least 2 cups of fluid are needed (Williams et al. 2013). According to the ACSM guidelines, athletes should consume .4-.8 liters of fluid per hour (Williams et al. 2013). Every athlete is different, therefore requiring various amounts of fluids, which is why self-monitoring is essential.



Not only are fluids necessary however, electrolytes are too and they go hand in hand. Electrolytes are present in many forms from sports drinks such as Powerade and Gatorade to electrolyte pills designed for athletes. Electrolytes such as sodium, chloride, and potassium are present in these drinks and pills and help to prevent cramping of the muscles in athletes. Most athletes lose between 800 and 4000 mg of sodium per hour (Rehrer, 2001). The recommendations for electrolytes during endurance

triathlons advise that the sodium concentration of beverages be around 30-50 mmol/L (1.7-2.9g/L NaCl) (Rehrer, 2001).

One important note regarding fluid and electrolyte consumption is that athletes should familiarize themselves with beverages before they compete in a triathlon. This assures that any gastrointestinal problems caused by unfamiliar products are avoided (Pfeiffer et al. 2012). Prior to a triathlon, the athlete must research what products will be offered out on the course so that they can train with those same beverages and become used to them. The same goes with the beverages that he/she decides to provide for themselves along the course. For example, if an athlete learns that Gatorade will be the sponsored beverage along the course, then that is the beverage that they should practice with in order to maximize results while minimizing problems.

CONCLUSION

In review, endurance triathlons require an immense amount of dedication which must not be limited to simply training. Dedication must also be guided towards proper fueling and hydrating before and during a race. Each athlete's fueling needs are dependent on their weight and gender therefore effecting the amounts that are necessary to consume. This ensures that the proper energy balance will be maintained, thus maximizing results and minimizing injuries. Since this is the end of the chapter, it is only fitting to see an inspirational Ironman athlete complete an Ironman. [CLICK HERE!!](#)

Literature Review:

The literary review for this paper includes the following sources and how they pertain to multiple influences on success in a triathlon. These categories focus on the influence of carbohydrates and fluid and electrolyte balance.

The majority of the sources used in the writing of this chapter focused on the role that carbohydrates play in endurance training and performance. The maintenance of energy balance correlates to the intake of carbohydrates before and during an endurance event (Kimber, 2002) and (Frentsos, 1997). Both of these articles discuss specific amounts of carbohydrate kilocalories needed in order to optimize performance. Along with the energy balance, much emphasis is placed on the pre-event ingestion of foods high in carbohydrates. Higher carbohydrate ingestion before an event allows greater glycogen synthesis to occur resulting in greater benefits to metabolism during exercise (Ormsbee, et al., 2014). The ingestion before an event does not solely impact a person's ability to perform; training is also necessary. (Atkinson, 2011). One study performed, focused on the intake of carbohydrates during the cycling portion of a triathlon and how timing of carbohydrate ingestion can affect one's overall performance and metabolism (McGwaley, 2012). Maximizing performance by eating/drinking during the cycling portion is very important much like another article which states that consuming a high amount of carbohydrate during intense running results in a great energy increase (Achten, 2004). Summarizing, carbohydrates are necessary to maintain energy level during triathlons for success in each event.

The literature resources that are used in the fluid and electrolyte balance portion of this chapter emphasize the importance of water and sodium intake to maximize performance during a distance triathlon. A balance between both fluids and electrolytes is crucial for the continued

contraction of the skeletal muscle system. The amounts of the two that are needed are correlated with the rate of sweating, which varies with differing temperature and humidity (Reher, 2001). According to Reher, if large amounts of fluids are consumed it is important for the beverage to have a salt concentration of 1.7-2.9 g NaCl/L water. The recommended water ingestion for an endurance athlete is about 250-500 mL/15 min of exercise. An athlete should practice drinking water and electrolytes during training runs to prepare their body for racing consumption. For a competitor to consume any new beverage (a beverage different from the ones utilized for training runs) on race day is strongly discouraged (Clark, et.al, 1992). An athlete competing in an endurance triathlon should consider their fluid and electrolyte balance both during the event and throughout training.

There are various factors that influence a person's success in a triathlon. These factors include the effects of consuming fluid and electrolytes and carbohydrates in the performance during a triathlon.

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