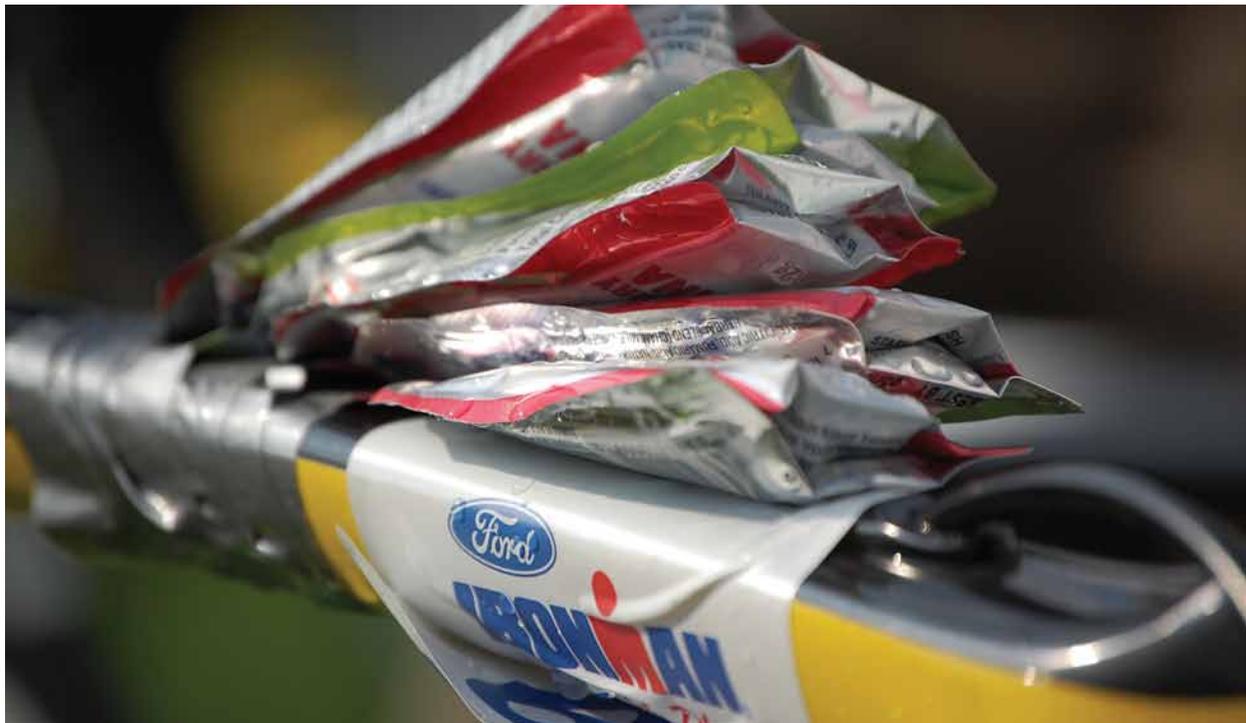

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Race-Day Fueling

Endurance athletes have always considered fueling for an event. CrossFit Endurance coach Max Wunderle explains what standard CrossFitters need to know as they prepare to compete.

By Max Wunderle

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Courtesy of Max Wunderle

The beauty of the CrossFit methodology lies in the constant sharing of ideas and the breaking down of sport-specific protocols, and these same principles can be applied in areas that have historically been celebrated in some fitness circles and ignored in others. Such an area is “in-competition” fueling.

While such a topic demands the attention of endurance athletes and can mean the difference between a podium finish and a DNF, it’s largely ignored in non-endurance activities.

Nutrition Protocol

The concept of race-day nutrition is a cornerstone of the endurance community. First, there are three elements to competition fueling—nutrition, hydration and electrolyte management. Let's start with nutrition.

If, however, the CrossFit athlete will be engaging in multiple WODs over the course of one, two or three days, we will want to see a larger portion of carbohydrate consumed to top off our glycogen stores.

Sports drinks, gels, bars, Fig Newtons, bananas, sweet potatoes, peanut-butter-and-jelly sandwiches and even pizza have all been used as sources of nutrition for various endurance events lasting over four hours. At a minimum, we will want to clarify our needs from a caloric standpoint.

Muscles store carbohydrate as glycogen (long-term stored energy). This glycogen energy source is tapped

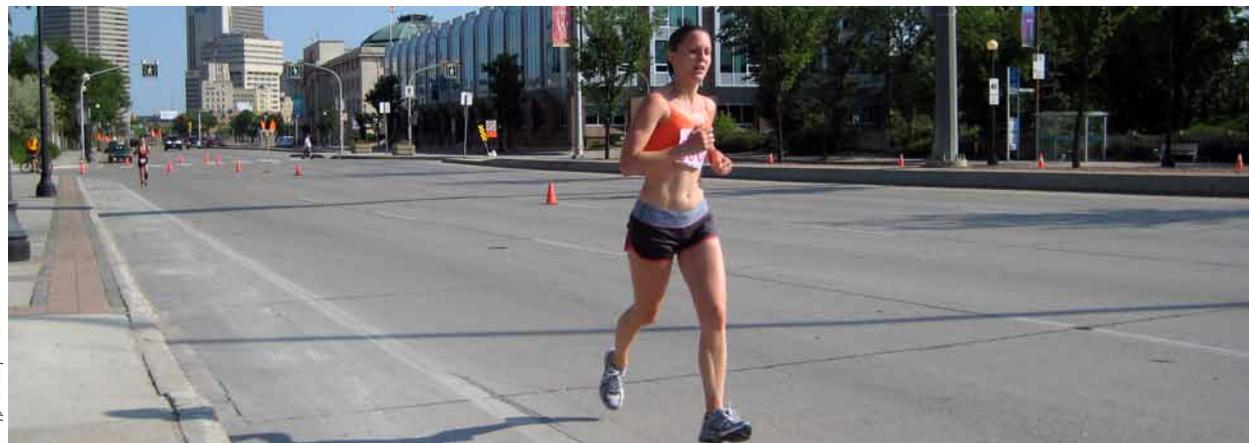
out at about 2,000 calories for a trained triathlete. Why is this important? Because this fuel source is only good for about 1.5-2 hours of high-intensity performance. So, for those of you with plans on racing events that will end in about 1.5 hours, race-day nutrition isn't as critical as for those competing in events lasting more than 2 hours. In a situation like the CrossFit Games, the replenishment of calories becomes the burden, not fueling during competition.

Pre-Competition Nutrition—CrossFitter

From an everyday perspective, fueling can remain as it is achieved in a Paleo or Zone protocol. If, however, the CrossFit athlete will be engaging in multiple WODs over the course of one, two or three days, we will want to see a larger portion of carbohydrate consumed to top off our glycogen stores. Sweet potatoes are a good choice for athletes following either a Zone or Paleo protocol. From a quantity standpoint, the athlete should look to eat approximately two additional blocks of carbohydrate during the breakfast and lunch before the first day of competition. Dinner is less relevant as complex carbohydrates will not process for about 18 hours. If a competition is multiple days, the lunch and breakfast protocols can be followed for dinner as well.

Pre-Competition Nutrition—CrossFit Endurance

Assuming an event will last three hours or more, the same protocol as shown above is appropriate. The goal is the same: consuming a measured ratio of macronutrients with a carbohydrate bias to top off one's glycogen stores.



Staff/CrossFit Journal

When preparing for a multi-WOD day, CrossFitters can borrow some fueling wisdom from endurance athletes.

In-Competition Nutrition—CrossFitter

As virtually all WODs are less than 1 hour, no additional nutrition consumption is needed.

In-Competition Nutrition—CrossFit Endurance

Now that you are aware of how much energy your body can store (approximately 2,000 calories), we need to identify how many calories are being burnt and how to replace those calories to perform between three and 17 hours. Caloric burn rates can vary anywhere between 400-750 calories per hour depending on the specific individual and effort being given.

The second part of our equation is identifying how many calories our bodies can process and turn into energy in that same time period. This again can vary between 300-550 calories per hour. Confirming this number is very personal and should be established during training rides or runs. Success begins by starting with about 300 calories per hour (for a 140-170 lb. male) and monitoring your energy levels both during and after exercise. The following information can be reviewed to see how the body demands more protein and fat as the time of an event increases (we will review hydration and electrolyte protocols later in this piece):

90 Minutes-4 Hours

Glycogen is depleted.

Fueling transitions to glucose/carbohydrate.

Isotonics or gel/water should be the source of calories.

Target should be 300 calories per hour/20 oz. of water.

Electrolytes begin to have larger role.

4-12 Hours

Intensity trends lower.

Fueling moves from glucose to fat.

Carbohydrate loading must continue to fuel fat burning.

Electrolytes must be replaced at 500-2,000 milligrams per hour.

12-18 Hours

Carbohydrate contributes 50 percent of energy vs. 80 percent at lower levels.

Protein is now needed to provide approximately 10 percent of calories.

Fat now bears a 20-35 percent burden of total calories.



Courtesy of Max Wunderle

The body can only store so much energy. For lengthy events, you're going to need to find a source of fuel to keep your body moving.

Electrolyte and water prescription remains the same as in the 4-12 hour period.

Total consumption is 300-600 calories per hour and breakdown is 60-70 percent carbohydrates, 20-30 percent fat, 10-15 percent protein.

Potassium should be replaced once every 3-4 hrs (via electrolytes or bananas).

(Source: *The Paleo Diet for Athletes* by Dr. Loren Cordain—2005)

Post-Competition Nutrition—CrossFitter

In this recovery scenario, a blend of carbohydrate and protein to the tune of 3:1 or 4:1 is ideal. This ratio ensures a quick channeling of carbohydrate to the muscles to replenish glycogen and includes much-needed protein for muscle repair. From a Paleo Diet perspective, many athletes will explore sweet potatoes and bananas for carbohydrate sources, then go “off the reservation” with a scoop of whey protein. These items can be mixed with coconut water to taste. The other end of the 3:1 spectrum is chocolate milk. Further fueling past the recovery period will feature a return to a normal Paleo or Zone protocol with appropriate quantities of all three macronutrients—protein, carbohydrate and fat.

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Post-Competition Nutrition—CrossFit Endurance

The post-competition protocol for a CrossFit Endurance athlete is identical to that of the CrossFitter.



Courtesy of Max Wunderle

**Use caution when fueling during events.
Mistakes can be costly.**

Caution

Finally, here are a couple of “watch outs” and thoughts around deviating from this program. For those of you thinking you can simply down all your calories at the beginning of each hour, think again. If you flood your digestive tract with too many calories, you will force your heart to pump a disproportionate amount of blood to your stomach. This takes vital blood away from the muscles you need to compete. At the other end of the spectrum, training at 90-95 percent max of your maximum heart rate (or rate of perceived exertion) will disallow proper digestion as your body will flow a disproportionate amount of blood to your muscles and away from your stomach. This is the cause of so many “reversals” (or vomiting), which cause so many longer-distance athletes to lose vital nutrition and consequently DNF.

For those procrastinators trying to catch up in your race by loading up on nutrition missed at previous occasions, you will likely meet the same end as those trying to “forward buy” their nutrition.

So, measured, methodical introduction of calories and measured, methodical use of those calories (60-80 percent of max heart rate or RPE) will ensure your fuel is processed and used as economically and efficiently as possible.

Hydration Protocol

Pre-Competition Hydration—CrossFitter

Everyday and pre-competition water protocols are very easy to prescribe. Simply take your weight in pounds, divide by two and drink that number of ounces of water each day. So, a 150-lb. athlete should target consuming 75 oz. of water per day. Should that athlete then train for an hour, that target number would rise by about 16 oz. per hour of training.



Staff/CrossFit Journal

In-competition hydration needs can be calculated with a formula, but heat and humidity can change that equation significantly.

Pre-Competition Hydration—CrossFit Endurance

The pre-competition hydration protocol for an endurance athlete is identical to the CrossFitter's.

In-Competition Hydration—CrossFitter

Much like the scenario with nutrition, most CrossFit activities are less than 60 minutes. Therefore, no hydration is needed outside of drinking for comfort.

In-Competition Hydration—CrossFit Endurance

From an endurance-hydration perspective, minimum target consumption of water should be about 16 oz.

Electrolytes are vital to optimal body function. If optimal levels of electrolytes are not maintained, athletes can fall into a state called “hyponatremia.”

per hour. This number, however, can sway wildly in more aggressive conditions. For example, if a 170-lb. male is competing/training in a relatively low-humidity environment at 73-76 degrees, the 16-20 oz. per hour target is quite sufficient to ensure optimal hydration levels. Conversely, as the temperature goes up, say 85 degrees with increased levels of humidity, the target consumption levels of water can be as high as 32 oz. per hour. To experiment with various activities and temperature environments, please visit the [Gatorade hydration calculator](#). This is a very good tool for targeting water consumption, not Gatorade consumption.

Post-Competition Hydration—CrossFitter

No significant protocol changes are necessary. Returning to the half-body-weight-in-ounces prescription will successfully rehydrate the athlete.

Post-Competition Hydration—CrossFit Endurance

Identical to the CrossFitter.

Electrolyte	Role	Target Dose Per 8 oz. of Water	Daily Performance Target
Sodium	Muscle contraction Nerve transmission	150-250 mg	1,500-4,500 mg
Chloride	Peak muscle function	45-75 mg	45-75 mg
Potassium	Muscle contraction Nerve transmission Glycogen formation	50-80 mg	2,500-4,000 mg
Magnesium	Muscle relaxation ATP production	20-30 mg	400-800 mg
Calcium	Bone health Nerve transmission Muscle contraction	10-15 mg	1,200-1,600 mg

Table 1: Electrolytes and Recommended Intake Levels

Electrolyte Management

This segment will seek to break down and simplify the third category of performance fueling. On race day (and in any efforts lasting longer than 1.5-2 hours) and in the days leading up to a competition, attention to electrolyte levels can be vital.

In essence, electrolytes are vital to optimal body function. If optimal levels of electrolytes are not maintained, athletes can fall into a state called “hyponatremia,” a condition that is defined by low sodium levels in the blood. Symptoms of this state are weakness, cramping, nausea, fatigue and vomiting. Ultimately, this condition can even cause death, as it has in several marathons over the past three years. In each case of death (Chicago and Boston marathons), the athletes in question consumed gluttonous amounts of water that effectively diluted their electrolyte levels and brought on hyponatremia.

Conversely, and just as deadly, is hypernatremia, a condition caused by an elevated level of sodium in the blood. While over-consumption of electrolytes can be a driver of this condition, it is more commonly associated with dehydration, as the increased level of sodium is more often caused by a lack of water ingestion.

The biggest challenge for those who follow a diet with very low levels of sodium is understanding how to ingest electrolytes or define the appropriate amounts to ingest. The chart above and guidelines below should help one define his or her own protocol.

Pre-Competition Electrolytes—CrossFitter

At a minimum, the ingestion of incremental salt in the day before competition is mandatory. This can be done via soup at lunch and dinner the day before competition or through consumption of electrolyte supplements like Saltstick (see next page). Such a protocol can be very personal (note the target ranges in the chart above) and should be practiced in training before race day. An experiment with several bowls of soup prior to a 45-minute aerobic WOD should help define personal success.

Pre-Competition Electrolytes—CrossFit Endurance

The same pre-competition protocol can be followed by a CrossFit Endurance athlete.

In-Competition Electrolytes—CrossFitter

Much like the scenario with nutrition and hydration, most CrossFit activities are less than 60 minutes. Therefore no in-competition electrolyte consumption is needed.

In-Competition Electrolytes—CrossFit Endurance

To best identify your needs around electrolytes, we simply need to understand the amount of fluid being lost in any given hour of exercise. To do this, weigh yourself (without workout clothes on) before your session, then do the same afterwards. If you consumed fluids during the session, simply subtract that weight (roughly 16 oz. of fluid per pound) from your post-workout result. Once you know the amount of fluid you are shedding per hour,

Electrolyte	Average Sweat (per 11 oz./315 ml)	SaltStick Caps (per capsule)
Sodium (mg)	220	215
Potassium (mg)	63	63
Magnesium (mg)	8	11
Calcium (mg)	16	22

Table 2: Comparison of Electrolyte Loss in Sweat and Electrolyte Content of SaltStick Supplement

Source: Maughan, Shirreffs. *Fluid and electrolyte loss and replacement in exercise.* **Oxford Textbook of Sports Medicine.** 2nd Edition. Harris, Williams, Stanish, Micheli, eds. New York: Oxford University Press, 1998. pp. 97-113.

you can then estimate losses of various electrolytes as below. I've also included an electrolyte breakdown of the leading electrolyte supplement, [Saltstick](#).

Now that you know your sweat rate, you can plan your training and racing activities appropriately. As an example, if you are sweating about 22 oz. per hour, you now know that you need to replace about 440 milligrams of sodium every hour to retain optimal performance. Before jumping into an electrolyte-/sodium-replacement supplement, you must back out the electrolytes present in your calorie source (gels, bars, etc.). So, if you are using GU Energy gels, each pouch contains about 55 milligrams of sodium. Based on consuming three gels per hour, your nutrition source will be doubling as a sodium replacement source as well but will come up short by about 275 milligrams. Therefore, the use of an electrolyte-replacement capsule like Saltstick (one to two capsules per hour) will be needed.

Post-Competition Electrolytes—CrossFitter

If there is no immediate sense of urgency in the athlete's condition (no dizziness, cramping, vomiting, nausea, headaches, etc.), no incremental attention to electrolyte ingestion is needed past your normal post-competition protocol (recovery drink/nutrition). If, however, there are signs of the maladies listed, immediate medical attention should be sourced, with the athlete potentially in need of a saline IV drip to quickly administer needed electrolytes and water.



Julian Mason/Creative Commons

By calculating the electrolytes lost through sweat, you can decide how you will replace them with tablets, gels or beverages during a long competition.

Post-Competition Hydration—CrossFit Endurance

The same protocol can be followed.

The Complete Approach

In summary, we believe there are three major areas in performance fitness: training, recovery and nutrition. It goes without saying that all three must be respected appropriately. This “three-legged stool” will not provide a firm foundation if only one or two of its legs are given requisite attention. Ensure your athletes are educated and executing the proper protocols to make sure their race-day fueling strategies are as committed as their training and recovery protocols.



About the Author

Max Wunderle is a CrossFit Endurance head coach and a former elite marathon swimmer and world-class Ironman Triathlon athlete. His resume includes becoming the second-youngest person to ever swim around Manhattan Island (28.5 miles at the age of 17), as well as ending 2008 as the No. 2-ranked Ironman triathlete in the United States (35-39 age group). Max is the founder of [TriMax Fitness](#) and co-founder of [Ironworks Athletics](#).



Courtesy of Max Wunderle