

Marathon nutrition guide

An overview of the scientific literature
and its application



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Marathon - Nutrition guide

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Although nutrition is without doubt one of the most important aspects of race preparation, athletes typically spend far more time thinking about training than about nutrition. In a marathon, nutrition can mean the difference between winning a race and not even finishing a race. Athletes who did not have a great run often blame nutrition: they ran out of energy, became dehydrated or experienced stomach problems. They ingested too much, or ingested too little. They tried new products they had not used in training, and so on. This guide will give you the knowledge you need for a successful nutrition strategy. You can use the CORE Nutrition Planning tool (www.fuelthecore.com) to get a detailed personalized nutrition plan.

Carbohydrates are the performance fuel

The body uses two main fuels: carbohydrate and fat. Fat is the primary fuel for less intense exercise (low to moderate intensity: often referred to as aerobic) while carbohydrates are the primary fuel for intense exercise moderate to high intensity). Carbohydrate can deliver energy much faster to the muscles than fats. Thus, carbohydrates are the performance fuel, and fat is like “diesel” important for longer distances at lower pace.

The body has stores of both fuels, but unfortunately the stores for carbohydrate are much smaller than those of fat. Even the leanest athlete has sufficient fat to sustain the longest races at moderate intensity (thousands of grams of fat). The typical athlete will also have 500-800g of carbohydrates stored in muscle glycogen and liver glycogen (a small fraction versus fat stores); this is enough to fuel 2-3 hours of intense exercise.

Most marathon runners are familiar with “hitting the wall”; this is the point in the marathon when carbohydrate stores become depleted, usually around 20 miles or 32 km. At this point the runner has only fat for fuel and intense performance cannot be maintained (unless carbohydrates are consumed). There are a few simple strategies that can delay or completely prevent this from happening. These

strategies are making sure that you start the race with optimal muscle glycogen stores and liver glycogen stores and fueling during the race (using drinks, gels and/or solid foods).

Carb-loading

In order to start a race with optimal glycogen stores it is important to eat carbohydrate-rich in the day or days before the race (usually while also reducing training, which uses glycogen stores). Traditionally consuming additional carbohydrates has been called carbo-loading. Consuming a little more carbohydrate than normal at the expense of some protein and fat will ensure that you are filling up your muscle glycogen stores, without gaining weight. Carbo-loading seems to get confused sometimes with overeating (eating as much as possible). Good sources of carbohydrate include pasta, rice, potato and bread. Extreme supercompensation diets such as those used in the 1970s are not necessary.

Breakfast

When you wake up in the morning the liver is virtually depleted of glycogen; the body uses up the liver glycogen through the night. Because the liver provides carbohydrate to maintain your blood sugar and prevent hypoglycemia (low blood sugar) during your race, it is essential to make sure you replenish liver glycogen. This is why breakfast is so important; breakfast replenishes liver glycogen stores. A good pre-race breakfast includes 100-200 grams of carbohydrate in the 3-4 hours before the start of your race. Some athletes find it difficult to eat before a race; they could benefit by getting their carbohydrates from drinks. Athletes who experience stomach problems frequently should avoid breakfasts that are high in fiber, fat and protein. Individuals very prone to developing gastro-intestinal problems may also want to avoid milk products (or use lactose free products)

Good carbohydrate sources for race day

Refined grains (white rice)
cooked cereals
corn/rice based cereals
white bread, bagels (no seeded breads)
pancakes
cooked veggies (no seeds)
cooked potatoes
ripe bananas

cooked fruits, applesauce/fruit blends
lean meat
rice cakes
honey
syrup
pulp-free juice

Nutrition just before the start

In the 15-30 minutes before the start you can continue to top up liver glycogen stores. We recommend 20-30g (80-120 kcal) of carbohydrate with 90-180ml (3-6 fl oz) of water. Because food and drink will sit in the stomach for a while and absorption takes time, most of the carbohydrate you ingest at this time will become available during the first part of the run. So, anything that is ingested shortly before the start is part of your nutrition during exercise. What foods are best is a matter of personal preference, but gels and chews are very commonly used. Make sure you also practice this in training.

Nutrition during the race

Marathon nutrition requires a bit of planning. It is important to study what is available on course and develop a plan that takes into account foods and drinks you will collect on course versus foods and drinks you will have to bring yourself. During longer races your target carbohydrate intake should be higher than during shorter races. In races over 2 hours, athletes can benefit from an intake of roughly 60 grams of carbohydrate per hour. Do not try this for the first time in your marathon! You should transition from your current fueling levels towards 60g/h during training. Your gut will get used to this very quickly. Again, what foods and drinks are best is a matter of personal preference. The target of 60g/h can be achieved with many different combinations of water, sports drink, gels, chews, bars, and regular foods.

General

It is important to realize that any foods (bars, gels, chews or other) need to be ingested with sufficient water to make sure gastric emptying is fast and no stomach problems develop

Here are some tips:

- Take foods just before a feed station where you know water will be available.
- Then drink a couple of cups of water

Carbohydrate from solid foods

Solid foods usually provide more carbohydrates per unit of weight and are therefore a very effective energy source to carry. Bars typically deliver 30-60g of carbohydrate and come in many different flavors and with varying levels of fat, fiber and protein. It is recommended to select energy bars that are low in fat, fiber and protein as these ingredients will slow down gastric emptying and may contribute to stomach problems. Solid food is great in preventing an empty feeling in the stomach that many athletes experience during later stages of a race. One drawback of bars, however, is that they can be difficult to chew while racing. A second drawback is that bars generally contain more carbohydrates than should be consumed at one instance; this means a bar would need to be carried for some period while being consumed in smaller bites. For these reason, some athletes prefer to get their carbohydrates from gels or chews.

Gels

Gels are a compact form of energy. A small volume of fluid with a relatively large amount of carbohydrates. Gels typically deliver 20-25 grams of carbohydrates and come in many different flavors. Gels may be caffeinated or non-caffeinated. The exact number of gels you need depends on your pace, the duration of exercise (race or training) and the amount of carbohydrates you get from other sources.

Chews

Chews are the middle ground between bars and gels. They are more solid than gels and are usually easier to consume than bars: easier to chew and come in single bite pieces. Chews generally are 6-10g per piece, so 3 pieces typically is close to a gel.

Carbohydrate drinks

Carbohydrate drinks typically contain carbohydrates in concentrations of 6-7%. This means that the drink contains 60-70 grams of carbohydrates per liter of fluid. A regular sports bottle of 600ml (20 oz.) will therefore deliver roughly 35 grams of carbohydrate. A sports drink also contains some sodium (and other electrolytes) which can be beneficial for the absorption of fluid (as we will see under hydration).

Caffeine and performance

Many athletes use caffeine before or during a race to boost their performance. This practice is indeed supported by scientific evidence although there may be individual differences in tolerance and perception. Studies have demonstrated that relatively small amounts of caffeine are required to give optimal effects (3mg per kilogram body weight; 200mg for a 70kg person).

Because caffeine absorption takes 30-90 minutes, timing of caffeine is important. Studies have shown that caffeine ingested late in a race can still provide benefits. What works best is going to be highly individual and best established by trial and error. There are many different ways to deliver caffeine: gels, colas, energy drinks, and coffee. The caffeine consumption for a race should conform to a person's normal intake of caffeine. It is generally recommended not to exceed a daily intake of 400 mg caffeine from all sources.

Figure Caffeine sources

Caffeinated gels	25-50mg per gel
Cola drinks	40-50 mg per 355 ml can
Energy drinks	50-100 mg per 250 can
Espresso	80-100 mg per cup

Dehydration

Another cause of fatigue during a marathon is dehydration. In order to make sure body temperature stays within acceptable limits and we don't overheat, we sweat. The faster we run, the more heat is produced and the more we need to sweat to stay cool. In hot conditions it is even more important because sweating may be the only way we can cool down our bodies. When we lose too much sweat and become dehydrated, it becomes harder to maintain our body temperature. Some degree of dehydration is unlikely to be a problem but once you start to lose 3% of your body weight or more, performance may be affected.

In order to prevent dehydration, it is important to start a race hydrated and maintain proper hydration throughout the race.

Before the race, drink at least 500ml the ~2 hours before the start; excess water will be eliminated through urine. Double check your urine color is pale.

During the race, your target for fluid intake should be such that you lose no more than 3% body weight. This will always mean consuming fluid at a rate that is below your sweat rate (the longer the race, the closer to your sweat rate consumption will need to be). Drink to thirst is a recommendation that works fine for the slower athlete. If you are going a bit faster it is better to go in with a plan.

It is wise to use the early parts of a race when the gastrointestinal tract is working fine to absorb both carbohydrate and fluid. Later in the race, even though you may be thirsty, the gut may not absorb as much. Don't drink excessively, and use common sense. The goal should be to lose a little weight (1-2 kg) at the finish line. Athletes who want to be a little more prepared can work out how much they will sweat in the conditions of the race and use this to guide their drinking. If you want

to find out how to best measure your sweat rate visit <http://bit.ly/sweatrater>. Don't drink excessively, and use common sense. All athletes definitely need to avoid weight gain, which clearly would be a sign of drinking too much, and that could lead to a dangerous condition called hyponatremia.

Don't forget that good hydration starts before the race, and hydrate well in the days leading to your race.

If certain symptoms have arrived, there are some possible remedies during the race. It is important to note that when bloating occurs and fluids seem to accumulate in the stomach there is no point ingesting more fluids. Reducing the intensity a little and giving the stomach some time to pass fluid on to the intestine for absorption and relieve bloating.

Training

One of the most important aspects of preparation is "training your race nutrition". Nutritional preparation should not start when you are walking around at the expo the day before your marathon! It should start at least 6-10 weeks before the race and is important during your entire preparation phase. Training will always involve a mix of hard and easy; same is true for nutrition. On easy days where quality of training is not so important and where you may purposely want to train your body to use fat as a fuel, you will consume little or no carbohydrate ("training low"). On other days that are hard, where quality is important and where you want to train your body to perform just like you will in a race, it is a good idea to follow your race plan.

If you want a more personalized and more detailed nutrition plan, please visit www.fuelthecore.com.

Top tips

- Don't experiment with new products on race day.
- Use the same nutrition products for at least 6 weeks prior to the race.
- Don't be afraid to listen to your gut and when fluids are not emptying from your stomach reduce the intensity temporarily. You will benefit from this later in the race.
- Hydration during the race is important, but make also sure you don't start the race dehydrated
- Plan your breakfast on race day well in advance and make sure it is available for you on race day. Don't just show up for breakfast in a hotel on race day without checking.

Reading list

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