

Why we need carbohydrate for exercise

Carbohydrate plays a crucial role in exercise by providing fuel to produce adenosine triphosphate (ATP) for working muscles. Carbohydrate is unique in that it can be stored in muscles and liver as glycogen for an internal source to fuel exercise, and can also be consumed during exercise to be utilized during endurance activities. With limited stores of carbohydrate in the body—about 500 grams in muscle, 80 grams in liver, and 5 grams in the blood—active individuals need a carbohydrate-rich diet for optimal exercise performance.¹

Carbohydrates are not only needed for exercise, but also for the brain and central nervous system. Under normal circumstances, glucose is the only fuel the brain uses to produce ATP and, at rest, about 60% of the glucose found in the blood is metabolized by the brain. That is why it is crucial to maintain normal blood sugar concentration during rest and during exercise.

Consuming carbohydrate supports high-quality training. Intake of carbohydrate is not a one-size-fits-all approach; the goal is to have enough carbohydrate available to support exercise. That means that active individuals need different amounts of carbohydrate depending on exercise intensity and duration. A person training for a triathlon needs more carbohydrate than a person who walks a couple of miles every day.



Carbohydrate intakes to support exercise

Active individuals need to consume 50-65% of their total daily calorie intake as carbohydrates. The recommended² carbohydrate intake is to consume:

- 3-5 g/kg/BW/day* or 1.36-2.27 g/lb/BW/day for low intensity or skill-based sports
- 5-7 g/kg/BW/day or 2.27-3.18 g/lb/BW/day for moderate-intensity exercise for approximately 60 min/day
- 6-10 g/kg/BW/day or 2.72-4.54 g/lb/BW/day for high-intensity endurance exercise for 1-3 h/day
- 8-12 g/kg/BW/day or 3.63-5.45 g/lb/BW/day for extreme commitment and multiple training session > 4-5 h/day
(*g/kg/BW/day = grams of carbohydrate per kilogram of bodyweight each day)

Intake should be individualized to meet the demands of the training or competition. Daily carbohydrate intake depends on training and exercise goals and the concept of carbohydrate availability is used to describe having enough carbohydrate when needed, and less when exercise training is reduced. Therefore, the timing of carbohydrate intake throughout the day should be adjusted up or down.

Carbohydrate-rich foods

The concept of carbohydrate quality is often used to encourage the consumption of foods that are naturally rich in both carbohydrate and nutrients. Grains (breads, pasta, cereals, rice, etc.), fruits, and vegetables, including potatoes, beans and peas, as well as some dairy products (milk, yogurt, and kefir) provide carbohydrate along with micro-nutrients that are commonly under-consumed in a typical American diet. The Dietary Guidelines for Americans identifies under-consumed or “gap” nutrients as dietary fiber, choline, potassium, magnesium, calcium, and vitamins A, D, E, and C.

Low carbohydrate intake hurts exercise performance

There are some who advocate for a low-carbohydrate diet for exercise, but research shows that it can hurt, not help, performance. Researchers at the Australian Institute of Sport recruited elite race walkers in a real-life race performance setting to study the effects of a ketogenic low carbohydrate, high fat diet versus a diet with high carbohydrate availability. After three weeks of intense training, the ketogenic diet impaired performance and reduced race speed. In contrast the high carbohydrate diet supported performance.³

The bottom line is that for anyone engaged in regular exercise, adequate carbohydrate intake is required to sustain the capacity for exercise and high-intensity activity. When glycogen stores in muscle reach a critically low level, exercise intensity markedly decreases and performance is impaired. When liver glycogen stores are depleted, blood glucose declines, creating a low blood sugar or hypoglycemia that impairs both physical and mental function.

A high-carbohydrate diet remains the evidence-based recommendation for athletes who exercise or engage in hours of physical activity on a daily basis.



References

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- ³ Burke LM, Ross ML, Garvican-Lewis LA, et. Al. Low carbohydrate, high fat diet impairs exercise economy and negates the performance benefit from intensified training in elite race walkers. *J Physiol*. 2017;595:2785-2807. <https://physoc.onlinelibrary.wiley.com/doi/abs/10.1113/JP273230>