Studies Are (Again) Showing How Badly Athletes Need Carbs

You may know that you need carbs to perform well, but not always for the reasons you think. Here's the new science on why going carb-light can actually be hurting your performance.

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In the endurance world, there can be a disconnect between what sports nutrition science shows is the best way to fuel athletic pursuits and how athletes actually choose to eat. No better example of this exists than the convoluted understanding of carbs. Even though decades of research has demonstrated the importance of this macronutrient for performance, more athletes have begun to question just how essential they are in the quantities recommended. This can partly be chalked up to the fact that carbs are heavily demonized in various segments of society, portrayed as a player in so many of our ills. An additional evolution of carb misinformation sees more athletes experimenting with higher-fat (and lower-carb) eating plans under the guise of becoming "fat-adapted."

But what you need to know is that for the most part, the science has never wavered: Endurance athletes need carbohydrates, and lots of them. Carbohydrate is the preferred substrate during high-intensity endurance exercise, with most of that hailing from glycogen stored in the muscles and the remainder from glucose in the bloodstream. Low-carb diets have rarely proven effective, most often resulting in performance decline during training and endurance events. (In some extreme exercise cases like ultramarathon running, where athletes tend to move at a lower intensity for much longer, the pitfalls of working out with fewer carbs in the tank can be less pronounced.)

And now we have a batch of new science that shows that there are more reasons than ever to dial up the carbs if you are a hard-charging athlete. The ways that carbohydrates can keep an athlete healthy and performing like a champ are more diverse than we thought. Here's the latest pro-carb science, and what it means for you as an endurance athlete.

1. Carbs keep you healthy

Relative Energy Deficiency in Sport (RED-S) has become an ever-growing nutrition concern among athletes and sports dietitians. Essentially, this is a condition related to low energy availability (a lack of calories) in an athlete's diet. When overall calorie intake does not match calorie output, it can lead to detriments in performance and health, such as a drop in immune and hormone functioning.

Recently, research revealed that RED-S is not simply caused by a lack of overall energy, but more precisely by a lack of calories from carbohydrates in the diet. Published in the journal *Medicine and Science in Sports and Exercise*, 28 elite male race walkers were recruited to complete two, six-day diet and training phases. The first phase was a baseline phase, in which all participants consumed a high-carbohydrate, high-energy-availability diet. In other words, they ate adequate calories and carbohydrates to support their training. In the second phase, athletes were split into three groups. One group continued to follow a high-carb, high-calorie diet, the other followed a calorie-matched low-carb, higher-fat diet, and the other followed a low-energy-availability diet. During both phases, athletes completed a 25K race walk, exercising at about 75% of their VO2 max. The researchers collected blood samples before and after exercise during both phases to measure immune, inflammatory, and iron markers.

Bottom line:

The results were telling, and should give hard-charging endurance athletes permission to eat their bread and feel good about it. Although the phases were very short, the negative effects of a low-carb diet on athletes' iron levels, immune, and stress responses to exercise were noticeable. In contrast, there were no apparent changes to the athlete's health who followed the other two protocols, even those who followed a low-energy-availability diet. This led the investigators to conclude that restriction of carbs, rather than overall calories, may have greater negative impacts on an athlete's health. If you consume enough total calories, but not enough of those hail from carbs you're still at risk for developing RED-S.

2. Carbs are good for your gut

In a concept known as diet periodization, some athletes employ a low-carbohydrate diet during periods of lower-intensity training. The goal with this is to enhance certain metabolic adaptations before switching to a higher carb diet before a competition to maximize energy stores, thereby improving the potential for better performance. But being too stingy with your carbs during training **could alter the makeup of your gut microbiome**, causing a detrimental impact on endurance performance.

In a randomized control trial published in the journal *mSystems*, researchers from the United Kingdom assigned highly trained runners with similar dietary and physical activity habits to one of two highly controlled calorie-matched diets: higher protein (40% protein, 30% carbohydrate, and 30% fat) or higher carb (10% protein, 60% carbohydrate, and 30% fat macronutrient). The objective was to measure any changes in gut microorganism composition. Enough calories were provided to assure that the athletes were not in a calorie deficit. Participants attended the laboratory on four separate occasions to undertake physical performance testing (a 10K steady state run at 70% VO2max, followed by 5-minute rest, then a maximum effort at 95% VO2max effort until exhaustion) and provide samples for microbiota analysis. Importantly, participants were requested to maintain their normal training regimes throughout the study.

Perhaps somewhat predictably, the short-term higher carb diet resulted in greater performance on the endurance tests than did the lower carb, higher protein diet – eating more carbs improved time-trial performance by 6.5%, whereas going bigger on protein led to a reduction in performance by 23.3%. But what is interesting is that **the drop in performance on the lower carb diet was accompanied by a significantly reduced diversity and altered composition of the gut microbiome among the study participants.** The greatest athletic performance during dietary modification was observed in participants with more gut microbial stability and less substantial shifts in community composition. Those were the people eating more carbs.

So one needs to wonder if the performance decline associated with going low-carb can in part be attributed to the impact this eating style has on the microbiome – the absence of beneficial micro-critters. Optimal gut microbiota is vital for a host physiological functions, which may impact physical performance outcomes. The increased gut stress following dietary manipulation by athletes may reduce performance by disturbing microbial stasis in the gut. It's still too soon to know if this altered microbial make-up in the digestive tract resulting from eating too few carbs to support training needs is counterproductive to performing like a champ or the impact a longer-term higher protein, lower-carb diet have on the microbiome.

Bottom line:

The take-home message here is that athletes undertaking dietary periodization should be aware of the potential negative impacts of drastic changes to diet composition on the gut microbiome and, in turn, what this instability can have on exercise performance.

3. Carbs make you stronger

There are a plethora of reasons it's a good idea for triathletes to work strength training into their fitness program. And it turns out that carbohydrates can help here, too. A *Sports Medicine* review of 21 randomized controlled studies that included 226 young adults found that taking carbohydrates before or during lifting weights increased training volume, and caused higher peak blood lactic acid and sugar levels. These are indirect measures of the intensity of workouts. Taking carbohydrates during resistance exercises was more effective in training sessions lasting more than 45 minutes and containing at least eight to 10 sets. Consuming carbs did not prolong or improve workouts in sessions lasting less than 45 minutes, which is (for the most part) expected for endurance activities. Also, the use of carbs was most effective in sessions in which people trained vigorously (i.e., lifting to, or close to, failure) while consuming little to no food beforehand. A dose of 0.3 grams of carbohydrates per kilogram of body weight was the minimal amount to show a benefit.

When you lift weights, your muscles use predominantly carbohydrates and fats as sources of energy. They need oxygen to convert food into energy. The limiting factor for how intensely you can pump iron is the time it takes to transport oxygen from your bloodstream into your muscles. Since the sugars from carbohydrates take less oxygen than fats to produce energy, sugar (glucose) becomes the primary fuel from food to power your muscles for intense efforts. You have only a limited amount of carbs stored in your body, mostly in your liver and muscles. When you start to run low on these stores you will likely need to scale down the intensity of your workout. Being able to push more weight for longer will result in a stronger, more injury-resistant athlete.

Bottom line:

We can surmise from these findings that it's a good idea to include some carbs in any meal or snack consumed before a weight training session and if you plan on going long sneak in a bit of fast-digesting carbs such as a gel or sports drink during the workout.

4. Carbs equal faster recovery

If your training program involves frequent workouts without a great deal of recovery time in between, you better be pounding back the carbohydrates—they're required to boost energy stores in the muscle fibers you need most.

In a new study published in *Medicine & Science in Sports & Exercise*, athletes completed an exhausting interval workout on exercise bikes to deplete glycogen (i.e., stored carbohydrate) in their leg muscles. Afterward, they rested for five hours while consuming high-carb recovery bars and drinks, or placebo versions that were lower in carbs. Then, they did more fitness tests: six sets of five-second all-out sprints, plus a two-minute test at a fixed intensity to measure ratings of perceived exertion. Muscle biopsies were taken at various times to reveal the level of stored carbs in the participant's thigh muscles. As designed, the interval workout drained the leg muscles of their carbohydrate. The high-carb feeding partly restored those lost carbohydrates, whereas the low-carb feeding also replenished some of those stores, but to a lesser extent. Their sprinting suffered after the exhausting interval workout, but after a 5-hour recovery period, it had partly recovered—but not as much in the low-carb group as in the high-carb group. The perceived exertion during the fixed intensity test was higher when the people took in fewer carbs.

All of this may not sound too surprising, but there are some interesting nuances at play here. The investigators found that in the low-carb trial, 19 percent of individual slow-twitch fibers and 4 percent of fast-twitch were depleted to less than 20 percent of their initial carb levels. For the high-carb trial, neither type of muscle fibers were depleted to this level. Also, intramyofibrillar glycogen, the glycogen that is stored in a specific area within muscle fibers and what has been previously linked to optimizing muscular contraction, was higher when more carbs were consumed.

Bottom line:

When you do intense efforts it's ideal to have all your muscle fibers firing, and this requires enough carbs to be stored in various muscle fibers (fast- and slow-twitch) and the right places within those fibers (intramyofibrilliar). Going bigger on carbs is how you get there, especially if you're training offers little time for a full recovery. More carbs will get the energy stored where it should, even if your muscles are still partially depleted.

The bottom line on carbs

These scientific findings are additions to the ever-growing list of reasons why endurance athletes like triathletes should not restrict carbohydrate intake. If you're concerned about both your health and performance, make sure you're eating enough of them to support your training. If you're not sure what an adequate amount of carbs looks like for you, talk to a sports dietitian, who can help you understand what an optimal plate of pasta should look like for you.