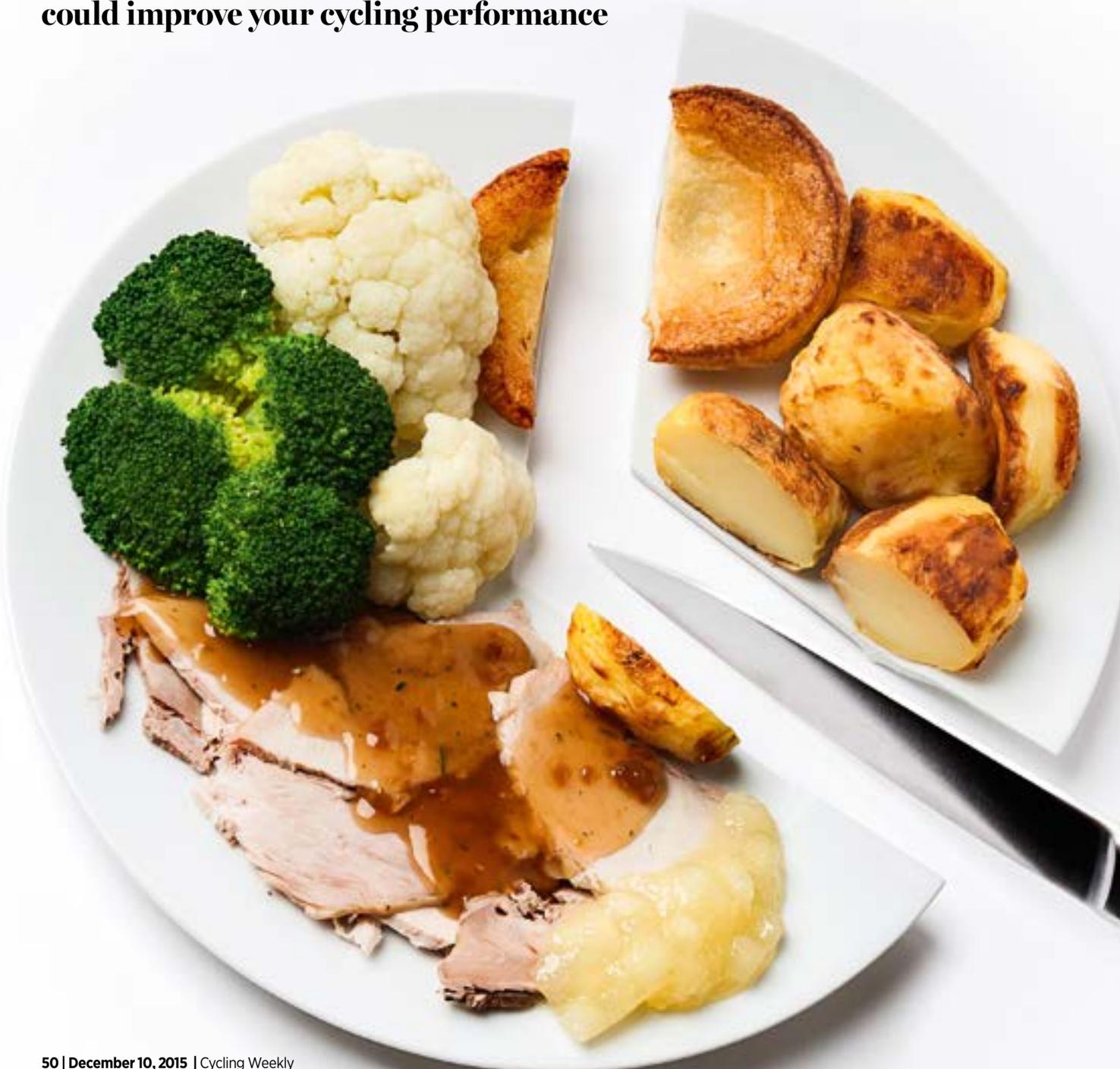


Could cutting carbs make you faster?

As carbohydrate comes under fire on multiple fronts, *David Bradford* assesses whether slashing your intake of bread, cakes and potatoes could improve your cycling performance



Carbohydrate has been getting an especially bad rap of late. Since the Atkins diet 'revolution' of the Seventies, the attacks on carbs have continued via the South Beach diet, the Paleo diet and, more recently, hipsters' bearded chins have been zealously wagging about 'clean eating' while celeb chefs and health commentators line up to vilify sugar as lethal poison. As cyclists, we had assumed that anti-carb doctrine didn't apply to us — we needed carbs to fuel our training, and they didn't make us fat because we burned them off. But now even some sports scientists are shifting their position and arguing in favour of carb restriction. What is the truth about sweet and starchy foods as training fuel? Could cutting down on bread, pasta and sugary snacks really make us faster?

The most radical case for consuming (much) less carbohydrate as a way to improve performance comes from American scientists Dr Jeff Volek and Dr Stephen Phinney, who together published the book *The Art and Science of Low-Carbohydrate Performance*. Volek and Phinney claim that restricting carb intake to a paltry 50g per day over the long term necessitates adaptations that make the body far better at burning fat. In fact, this ultra-low-carb diet causes blood glucose levels to fall and forces the body into a state of ketosis, where ketone bodies produced from fatty acids in the liver become the main source of energy. The key potential advantage of being better at burning fat is that the body's reserves are vast: even a lean athlete has more than 30,000kcal-worth to draw on — compared to just 2,000kcal-worth of carbohydrate. If you can burn fat fast enough, the theory goes, you'll never hit the wall.

Rocket fuel

The problem with this theory is that the maximum rate of fat burning occurs at around 60 per cent of VO₂ max, i.e. moderate, conversational pace. As the effort level increases to racing intensity — typically in excess of 80 per cent of VO₂ max — our reliance on fat plummets to

"Nutritional periodisation is the future"



James Morton, researcher at Liverpool John Moores University and lead nutritionist at Team Sky, sets out the case for day-to-day variation in carb intake

As you train and develop endurance, you build more mitochondria, the body's energy producing factories. What happens when you restrict carbohydrate is that you make more mitochondria, so the muscle becomes more endurance-trained — even though you've performed the same amount of work. In theory, this means you're in a position to oxidise carbohydrate and fat at a greater rate.

If you go on a low-carbohydrate diet all the time, your muscle learns only how to use fat. The problem is, at race-winning pace — in gears five and six, to use a driving analogy — you need to be using carbohydrate, because that's what makes you go fast.

below 30 per cent, while carbohydrate becomes our principal fuel source. This is basically because carbs are inherently more 'flammable' — they burn faster and more efficiently than fat. Think of it like this: fat is your body's bedrock of charcoal whereas carbohydrate is its canister of kerosene. When you need to burn at your brightest and fastest, you need to switch to carbs — and that's biologically non-negotiable.

Despite this fact, Volek and Phinney maintain that a tightly carb-restricted diet can enhance performance. I contacted Volek and asked him to explain how a diet containing minimal carbohydrate was meant to benefit racing cyclists who relied on carbs as their principal fuel source.

"Higher-intensity sports or events may require different fuelling requirements," he conceded. "Having said that, most sports involve some type of aerobic component in-between sprints. Moreover, the benefits of an LCHF [low-carb, high-fat] diet may extend beyond simply a fuelling mechanism. "Improved body composition, less

You need muscle that can switch between using carbohydrate and using fat. We're looking into how to periodise low-carbohydrate training alongside high-carbohydrate training, because we think you need to do both. We don't yet know exactly the pattern this periodisation should follow, but we think it's day-by-day depending on the intensity and duration of your training session on that particular day. The exact level would depend on the individual, based on how well they can tolerate restricted carbohydrate, i.e. maintain training intensity at the intended workload; on an easy day, a rider may find they are able to cope fine on a substantially reduced carb intake.

Working out the best form of periodisation is something we're trying to do in our research. We're beginning to rewrite the guidelines as we become more aware of the benefits of this approach. Nutritional periodisation is the future of sports nutrition.

inflammation and oxidative stress, faster recovery, and improved health parameters are all reasons an athlete may consider an LCHF diet, especially if they have some underlying insulin resistance."

The headline performance claim from Volek and Phinney's book is that athletes adapted to a very low-carb diet

may be able to double or even quadruple their maximum fat-burning rate to as much as 2g per minute (previous studies on those following a normal diet indicated an average maximum fat-burning rate of around 0.5g per minute). Clearly, if you are able to burn fat three times faster, it stands

to reason that you would spare more carbohydrate and, in a very long event such as a 100-mile-plus sportive, be able to sustain your goal pace for longer.

The major hitch for Volek and Phinney is that their claims of improved performance are as yet supported by very little hard evidence. "Only a single prolonged ketogenic [ultra-low-carb diet] athlete study measuring performance has been published," explains Dr Trent Stellingwerff, physiologist at the

“Cutting down on carbs left me deadbeat”



Sports physiologist Nick Tiller, 33, attempted to improve his own performance by consuming less carbohydrate, but it proved an energy restriction too far

After reading about the reported benefits of low-carb diets on performance, I decided to give it a try myself. In ultra-distance races, the ability to burn fat is key. I knew it was important to moderate rather than eliminate carbs altogether, so I usually started the day with a fasted-state training session followed by a breakfast of porridge with nuts or protein powder. For the rest of the day, the only carbs I ate were from fruit and vegetables, avoiding pasta, potatoes and rice, while maintaining protein intake.

However, I found myself becoming progressively more fatigued. The moderate-carb diet had worked OK while merely keeping active, but proved insufficient as soon as my mileage increased. Hard sessions were near-impossible while eating this way; I simply lacked the energy. I felt as though carrying on in this depleted state would have led to illness and injury.

Now I carefully manage my carbs depending on my energy demands; if I'm taking it easy, I focus on meat and veg, nuts and grains, whereas if I'm training long or hard, I'll include a carb-rich component such as pasta.

Canadian Sport Institute Pacific. In this study, conducted in 1983, athletes following the ultra-low-carb diet managed a ride for on average four minutes longer (151min versus 147min) before reaching exhaustion. However, this was largely because of one low-carb outlier who rode for 232min; three of the subjects on a normal diet rode for longer than 151 minutes.

“The entire thesis of ketogenesis and athlete performance is currently referenced from this single paper,” Stellingwerff reiterates. “These studies are difficult to undertake, but this one has a few flaws: it used only five subjects; the ‘performance’ test was a ride to exhaustion conducted at 64 per cent VO2 max, not a race-level effort, so irrelevant to competitive athletes.”

The other big problem for LCHF proponents is the evidence from ‘in the field’; that is, the knowledge that current elite athletes succeed on high-carb diets. The daily food intake of pro cyclists — as regularly profiled in this magazine — invariably contains lots of carb-rich foods such as porridge, pasta and energy products. To take a more extreme example, a 2004 study on a group of male elite Kenyan runners found that their diet consisted of 77 per cent carbohydrate and just 13 per cent fat — totally contrary to the proportions advocated by the LCHF brigade.

Additional noteworthy observations from this study were that 86 per cent of the athletes’ energy intake derived from

vegetable sources — mostly basic staples such as rice and maize in the form of ugali (a type of porridge); a whopping 20 per cent of total daily calories came from sugar (the NHS recommends five per cent added sugar); and meat accounted for just one per cent of energy intake. Of course, a Kenyan elite runner’s diet may not be ideal for an amateur cyclist, but the point is, it supports a very high level of performance — despite being somewhat rudimentary and very high in carbohydrate. Why would you want to follow a diet completely at odds with that of elite endurance athletes?

There is, in fact, one very good reason: to lose weight. The uncomfortable truth is that many of us eat more calories than we need, and often much of the excess comes in the form of carb-rich foods such as cakes, biscuits, bread, etc. The study on Kenyan runners mentioned above noted that, during the week-long assessment period, the athletes ate on average 620kcal per day less than they expended, resulting in weight loss of around 0.6kg. They may have been eating carb-dense foods, but they weren’t eating them in huge quantities. It may be the case that regularly slipping into a calorie deficit is how these whippet-thin athletes maintain the very low body weight — 59kg average among the study group — that is undoubtedly vital to their success.

Individual needs

So, what is the optimum amount of carbohydrate to consume? Unfortunately,



there is no definitive answer; it depends on many individual factors, including your energy expenditure (how hard you are training), your body’s sensitivity to carbohydrate (insulin control), the specific demands of your goal events, and your body composition aims. Professor Louise Burke, head of sports nutrition at the Australian Institute of Sport, recently published a comprehensive review of the literature on the effectiveness of LCHF diets for sports performance. She points out that adapting to a low-carb diet, though it may enhance the body’s ability to

burn fat, compromises the supply of glycogen and the ability to perform high-intensity exercise.

Burke draws attention to the fact that, in a sport like competitive cycling, an athlete needs to optimise multiple fuel systems to meet the demands of changes in pace.

“The terrain, pacing strategies, and tactical elements mean that brief but critical parts of the race that often determine the outcome, such as breakaways, surges, etc. are conducted at higher and often near-maximal pace.”

At this intense, do-or-die pace, it is necessary to burn carbohydrate as quickly and efficiently as possible; in terms of energy systems, you need to be

a master of all trades, as Burke explains: “For optimal competition performance, the athlete needs a combination of adequate fuel stores in relation to the demands of his or her event, as well as metabolic flexibility.”

That is the key term well worth repeating: metabolic flexibility, the ability to burn the right fuel at the right time, at the optimal rate. Burke is keen to move away from an us-versus-them dichotomy of high-carb versus low-carb towards a more nuanced understanding (see periodisation advice, p51). The body’s huge supply of fat, relative to carbohydrate, is not sufficient reason to shun the raft of research supporting the critical importance of carbohydrate to athletic performance.

“There should not be a choice of one fuel or the other,” concludes Burke. “This is not ‘black versus white’ but rather a desire to integrate and individualise the various dietary factors that can contribute to optimal sports performance.” ■

“Low-carb, high-fat worked for me”



Veteran cyclist and runner Stewart Pepper, 56, cut back dramatically on carbs two years ago, and hasn’t looked back

I became interested in the low-carb, high-fat diet after hearing a presentation by Professor Tim Noakes, who explained how LCHF had turned his health around after he was diagnosed as pre-diabetic. I was intrigued because my wife, Ali, is a type-1 diabetic, and I wondered if she could benefit in terms of insulin control. So together, in October 2013, we began to reduce our carb intake, and we haven’t looked back.

Nowadays we keep carby foodstuffs to a minimum: no potatoes, rice, pasta, bread, fruit juice or cereals. We replaced the missing components with nuts, dairy (full-fat yoghurt and cheese mainly), spiralized vegetables (courgette, celeriac), mash made from cauliflower or celeriac and non-flour bread; this means I eat less than 100g of carbs per day.

After making the transition, I was less hungry despite consuming less volume. There were no pronounced ill effects. In terms of training, I discovered that I could sustain the longer efforts well, especially at lower intensities. Race performances were just as good, and overall I am achieving similar age-grade performances.

I have noticed that, if I race on low-carb without pre-race or carb-loading at all, my ability to exercise at the higher intensities is compromised. Generally, on the low-carb routine, I am feeling leaner, healthier and mentally more alert. I notice a better regulation of hunger throughout the day as well as body weight and body ‘shape’. I am not bloated in the way I used to be and am consistently three or four pounds lighter.

Ali, meanwhile, has found that her blood sugar levels have remained remarkably stable and she has an HbA1c [glycated haemoglobin] reading that’s usually as good as a healthy non-diabetic. Her consultant has been really pleased with her.

Carb strategies: latest guidelines*

When?	How much? (carbohydrate in g; kg refers to body weight)	Why?
General, day-to-day	Periodise according to each day’s training intensity and volume. On easy days, benefit may accrue from reducing carb intake to as little as 2.5g/kg/day. Experiment cautiously to begin with.	Restricting carb intake while training has been shown to increase production of mitochondria, thus boosting metabolic efficiency.
Carb-loading in days leading up to and immediately before an event	In the 2-3 days prior to event, aim to consume up to 10-12g/kg/day. In the 1-4hr prior to event, aim to consume 1-4g/kg.	Likely to be effective in very challenging events of at least 90min, in which glocogen stores would otherwise run out.
Carb intake during an event	During events lasting 1-2.5hrs, consume 30-60g/hr; during events longer than 2.5hr, consume up to 90g/hr.	Likely to be effective in events lasting longer than 1hr 15min, in which glycogen stores may otherwise run low. Also likely to be effective in events lasting 45-75min by enhancing pacing strategy via effect on ‘reward centres’ in the brain.

*Source: ‘Re-examining high-fat diets for sports performance’, Louise M. Burke, Sports Med, Springerlink.com, 2015.