

# Eat like you train: high & low

Research has shown that you can improve fitness by periodising your nutrition with your training, matching your diet to your daily workload. *Anita Bean* investigates

**P**eriodised training is a familiar concept to most cyclists, but far fewer apply the principles of periodisation to their nutrition — and they may be missing a trick. A cyclist's day-to-day food intake should be adjusted to reflect the demands of their training, according to the research.

You don't do the same training session day in day out, week in week out, or all year round. If you're serious about your training, you vary your rides, altering the intensity and duration, doing high-intensity intervals or climbs in some sessions, long steady rides in others, to achieve different training adaptations.

That's the principle underlying periodisation: you work on one specific element of fitness (e.g. aerobic endurance, speed, strength, power) at a time before moving on to the next 'phase'.

The ultimate goal of training periodisation is to achieve peak performance at the most important points in the season. The same applies to nutrition. To achieve your goals and be the best rider you can be, you need to build

your nutrition plan around these training cycles and tailor your diet to suit these changes in training duration and intensity. As your training load changes, so should your fuel in tandem with it.

'Nutrition periodisation' means matching your nutrition intake to the requirements of your training goals on an annual, weekly and daily basis. The idea is to adjust the amount of carbohydrate you eat in line with your training volume. It's about eating the right foods at the right time.

There are several benefits to be gained from matching your nutrition intake to your training sessions. First, by ▶

## Nutrition for the microcycle

Each training week includes harder and easier sessions, and your nutritional intake should reflect this. By eating an appropriate amount of carbs before high-intensity sessions, you'll be able to train harder and maximise your performance in those sessions. Conversely, rest days and lighter sessions won't require the same intake, so you can reduce carbs and total calories on these days. This is especially useful if you're trying to drop a few pounds while still having enough energy to train on harder days.



## How to periodise your nutritional intake

### Base training phase

This is when you do more longer, low-intensity rides. The goal of this phase is to build endurance fitness and develop metabolic flexibility. You won't need as much carbohydrate as in your subsequent 'build' phase, so this is the training phase when you can 'train low' in some of your sessions. If you need to achieve body composition goals (drop body fat or increase muscle), this is the time to do it.

There are a number of different ways you can 'train low'. You may choose to eat a low-carbohydrate, high-fat diet full-time, which means you'll be training low for all sessions. This method may improve fat adaptation but the downside is that you'll struggle with high-intensity sessions. At exercise intensities above about 65 per cent VO<sub>2</sub>max, carbohydrate becomes the principal fuel source. "Low-carb eating alongside a heavy training schedule may also reduce immune function and increases the risk of illness," warns Dr James Morton.

The most practical protocol is to train after an overnight fast and before breakfast. However, this should be a low-intensity session, such as a steady aerobic ride. Alternatively, if you want to train low in the evening, cut carbs at lunchtime — keeping to mainly high-protein foods and vegetables — and then eat carbs after your evening session.

Some cyclists use a 'train high, sleep low' protocol. A high-intensity session is performed in the evening to deplete muscle glycogen, followed by an overnight fast so muscle glycogen stores are not replenished. The next morning a low-intensity training session is done on an empty stomach. After this, glycogen stores are replenished with high-carbohydrate meals and snacks for the rest of day. Thus, high-intensity sessions are done with high carbohydrate availability, whereas low-intensity sessions are done with low carbohydrate availability.

Alternatively, when training twice a day, you can do your first (high-intensity) session with high carbohydrate availability and the second (low-intensity) session with low carbohydrate availability. Cut carbs after the first session and then eat a high-carbohydrate meal after the second session.

### Build phase (pre-competition)

This is where the intensity ramps up and you

switch from long aerobic rides to shorter harder sessions, usually targeting speed and power. As carbs are the main fuel for high intensity exercise, make sure you're well fuelled with carbs before important training sessions. You'll need to eat bigger portions of porridge, pasta and potatoes and add sugars (like bananas, dried fruit, sports drinks, energy bars and gels) before, during and immediately after your session.

A lack of carbs before tackling a big hill or a sprint interval session means you won't be able to generate the power and speed you want. However, you can still include a few 'train low' sessions in your 'microcycle' (see below). Essentially this phase is all about having enough energy to get the most out of your training.

### Competition phase

In the lead-up to an important race, there's usually a taper period where you do less volume and more short higher-intensity sessions. You'll be burning fewer calories overall, so you'll need to adjust your food intake if you want to avoid weight gain.

If you'll be racing longer than 90 minutes, you'll probably benefit from some form of carbohydrate loading, which involves upping carbs (7 to 10g/kg body weight/day) and cutting fat for the last three days before the race.

"On race days, carbs are king, and numerous studies have shown that performance is significantly improved when you consume carbs during high-intensity exercise," explains Morton. "Carbs are also periodised during multi-stage races. Tour de France riders eat more carbs, upwards of eight grams per kilo of body weight per day, on the long climbs and hard stages. Post-race they ensure they eat extra carbs to refuel properly before the next stage. If they don't eat enough carbs, they can't generate maximum power."

### Rest/off-season

When racing is over and you're taking a well-earned rest from training, periodisation is still important. You'll be burning considerably fewer calories, so you'll need to adjust carbs (as well as keeping a check on fat and alcohol) if you want to avoid excessive weight gain. Some coaches advise gaining no more than eight per cent of your competition weight during the off-season.

## Dividing the toils

The longest cycle within a periodised programme is called a macrocycle and usually spans a year. The year is broken down into two to six shorter training cycles called mesocycles, each spanning several weeks. Each mesocycle emphasises a particular training goal, such as aerobic endurance, strength or speed and involves a gradual increase in intensity. Each mesocycle is divided into week-long microcycles, consisting of your day-to-day training sessions.

### Microcycle sample diet plan

This plan shows you how to tailor your diet to your training sessions in a 48-hour period.

#### DAY 1 (HIGH-INTENSITY SESSION)

**Breakfast:** Porridge, bananas, honey

**Snack:** Fruit, nuts

**Lunch:** Rice, chicken, vegetables

**Snack:** Fruit, toast, honey

**Evening training (high-intensity intervals):** sports drink, bananas, gels or dried fruit

**Post-training:** Protein shake

**Dinner:** Grilled fish, salad

#### DAY 2 (LOW-INTENSITY SESSION)

**Breakfast (optional):** Eggs

**Morning training (long steady ride):** Water; coffee or caffeine (optional)

**Post-training:**

Carbohydrate and protein recovery drink

Toast, honey, yogurt, fruit

**Lunch:** Pasta, fish, salad

**Snack:** Fruit, nuts, granola bar

**Dinner:** Sweet potato, chicken, vegetables

eating sufficient carbohydrate before your toughest sessions, you'll help maximise your performance in those sessions. Second, by doing your long low-intensity rides with low glycogen stores, you can 'train' your muscles to burn more fat as fuel while sparing carbohydrate. In other words, you can become a better fat-burner. Third, by limiting your carbs and calories on rest days, it should be easier to lose unwanted pounds or at least avoid weight gain.

### Stark contrast

Already, many elite cyclists plan short periods of low-carbohydrate intake, or 'training low', into their programmes. "Essentially, certain low-intensity sessions are performed with low glycogen stores, and high-intensity sessions with high glycogen stores," explains Dr James Morton, Team Sky's head of nutrition and reader in Exercise Metabolism and Nutrition at Liverpool John Moores University. "The idea is that by restricting carbs around certain training sessions you can actually enhance training adaptations. This increases the number of mitochondria in muscles, improves your ability to burn fat for fuel and, potentially, increases metabolic flexibility [muscles' ability to switch between burning fat and carbohydrate], as well as your body composition and performance."

This innovative approach to training is, of course, in contrast to the traditional advice that every training session should always be done with high carbohydrate availability, i.e. high glycogen levels and with carbs consumed throughout. The advantage of periodising your carb intake is that you get the dual benefits of 'training low' — namely mitochondrial

adaptations — as well as the performance benefits of fully fuelled high-intensity training. Varying your intake is also preferable to chronic low-carbohydrate diets, which we now know can hamper your ability to do high-intensity training (see 'Does cutting carbs make you faster?', *CW* December 10, 2015).

By periodising your carbohydrate intake, you 'train low' only during certain sessions. High-intensity sessions are done with high carbohydrate availability, so your muscles retain the ability to burn carbohydrate. It's win-win — at least in theory.

The downside to training low is that doing harder work on the bike feels more difficult. "You can get round this, at least partly, by taking caffeine before and during your 'train low' sessions," Morton says. Studies show that caffeine taken at the dosage 1-3mg per kilo of body weight (equivalent to 70-210mg for a 70kg cyclist) can reduce perceived exertion and boost performance.

Alternatively, you can practise 'carbohydrate mouth-rinsing' — swilling a carbohydrate drink around your mouth before spitting it out — during your training session. The carbs stimulate oral sensors that activate the brain's pleasure and reward centres and override the perception of effort and fatigue, so you are able to continue cycling despite not actually consuming the carbs.

A 2015 study at Liverpool John Moores University found that athletes who 'trained low' with a carbohydrate mouth rinse plus caffeine during a high-intensity interval set were able to keep going 13 minutes longer than



Peak performance: varied training helps

## “Swilling carbs can activate sensors that override perceptions of effort and fatigue”

those who just had a mouth rinse but not caffeine, and 29 minutes longer than those who did neither, i.e. used only a placebo.

### Does it work?

Several studies have shown that 'training low' enhances metabolic adaptations in muscles: more mitochondria, increased levels of fat-burning enzymes and increased use of fat for fuel during endurance exercise. In 2005, Danish

## Case study: Dafydd Snelling 'Periodised eating has made me faster and lighter'



Dafydd Snelling, 40, explains how matching his food intake to his training load has boosted his training and racing

"I do quite a variety of training sessions. Some days I do a long steady cycle as my commute to work — that's a 20-mile round trip; other days I'll incorporate lots of hills. I'll also add in some low-intensity gym sessions, plus some high-intensity runs and off-road rides at weekends.

"I like to tailor my eating to how I train, although this is also guided by my appetite. I wear a Fitbit, so I've got a pretty good idea of how many calories I burn in each session. On days when I work at a high level of intensity, I often burn 900-1,500 calories in a session. That's when I eat a lot more carbs — big bowls of porridge, extra sandwiches,

pasta, bagels, bread and crumpets. I'll have a pre-ride bagel and fuel with home-made muesli bars on my bike. Afterwards I drink a pint of milk followed by a big pasta meal.

"When I'm doing low-intensity sessions, I eat fewer carbs during the day and step up my protein. I have lots of milk, protein shakes and chicken and snack on Mini Babybels. I probably drink two or three pints of milk on those days. This helps stop me feeling hungry and prevents muscle loss.

"I like to think that periodising my nutrition has helped my performance. I've improved my times in velathons and duathlons. I feel fitter generally and have more energy for my hard training sessions. Eating this way has also helped to keep my weight down — I haven't gained any weight on this regime, and being light is quite an advantage in my events."

researchers studied a group of novices who completed half their training in a muscle glycogen-depleted state, and recorded increased endurance adaptation and performance, compared with when they completed every session in a glycogen-loaded state.

A 2008 study at RMIT University, Australia, found that cyclists who performed some of their sessions with low glycogen availability had higher levels of fat-burning mitochondrial enzymes; and a 2010 study at the University of Birmingham found that fat oxidation during steady-state cycling was higher in cyclists when they 'trained low' than when they trained with high glycogen levels.

### Efficiency

Perhaps the best evidence for carbohydrate periodisation comes from a study by French, Australian and UK researchers, earlier this year.

This multi-national project found that triathletes who employed a carbohydrate periodisation strategy, doing high-intensity evening sessions with high carbohydrate availability, and fasted low-intensity morning sessions with low carbohydrate availability ('train high, sleep low') for three weeks, improved their cycling efficiency (power output per calorie) by 11 per cent, 10km running performance by 2.9 per cent, time to exhaustion during high-intensity exercise by 12.5 per cent, and also cut their body fat compared with those who did all their training with high carb availability.

Indeed, these results suggest that periodisation of carbohydrate around selected training sessions leads not only to favourable enhanced metabolic adaptations but also to improved performance and body composition. ■