

The five supplements that REALLY work

Many sports supplements make bold claims about boosting performance but only a few are backed up by credible research. Nutritionist *Anita Bean* looks at the five that science shows are truly effective

Photos: Geoff Waugh



It's tempting to think supplements will give you an edge and help you win races. In truth, there are no 'magic bullets'. In any gym, supermarket, or health food shop you'll find a bewildering choice of pills, powders, drinks, bars and gels promising greater stamina and strength, quicker recovery and less body fat. The majority are more sizzle than substance and only a handful are supported by peer-reviewed research and may help you make marginal gains in your performance. We reveal five that have some solid science behind them.

Whey protein

Main gain: Muscle repair/recovery
When it comes to building muscle, whey

protein is by far the most researched supplement. A by-product of cheese manufacture, it provides all nine essential amino acids and is rapidly absorbed into the bloodstream, reaching muscles quickly. Also, its high content of leucine is both a trigger and an important substrate for muscle protein synthesis.

"The biggest benefits for cyclists lie in faster recovery, promotion of muscle synthesis and retention of muscle mass during periods of low energy intake," says James Morton, researcher at John Moores University and lead nutritionist for Team Sky. "Our cyclists consume a whey shake during long [five to six-hour] rides to prevent excessive muscle protein breakdown, as well as immediately afterwards."

In a 2011 New Zealand study, cyclists who consumed a whey supplement immediately after a two-hour endurance session recovered faster and performed significantly better in a subsequent session than those who consumed a placebo drink containing the same number of calories. Their sprint power improved by 2.5 per cent and their perceived tiredness dropped by 13 per cent.

"We have demonstrated that ingesting whey protein immediately after endurance exercise enhances the remodelling of contractile muscle proteins during the early recovery period," explains Oliver Witard, researcher at the University of Stirling. Stirling researchers also found that consuming extra protein improved cyclists' immune function, mood and

performance booster but there's a solid base of evidence to suggest that athletes who drink beetroot juice perform better than their rivals in events lasting between four and 30 minutes, thanks to its high content of nitrates.

"Beetroot juice may help improve cycling efficiency — in other words, it can reduce the energy required to cycle at a specific power output. This should translate into improved performance," explains Andy Jones, professor of applied physiology at the University of Exeter. "It can also help you sustain higher levels of power for longer."

The nitrates in beetroot juice are converted in the body into nitric oxide (NO), which when raised prior to exercise appears to help dilate blood vessels, aiding the delivery of oxygen and nutrients to muscles during exercise.

It's worth knowing that nitrate is also found in other vegetables, such as spinach, rocket, cabbage, endive, leeks and broccoli. But to consume the recommended amount of nitrate to enhance your performance, you would need to eat at least three to four whole beetroots or a large bowl of spinach a day. Concentrated beetroot juice is therefore a more practical form of consumption.

Researchers at the University of Exeter found that drinking 500ml beetroot juice a day for a week enabled volunteers to run 15 per cent longer before experiencing fatigue. A further study by the same researchers found that cyclists given 500ml beetroot juice 2.5 hours before a time trial improved their performance by 2.8 per cent in a 4km race and by 2.7 per cent in a 16.1km race.

A review of 17 studies by UK and Australian researchers concluded that beetroot or nitrate supplementation significantly improved endurance, as measured by time to exhaustion. Although time to exhaustion isn't a direct measure of performance, this level of improvement could translate into a one to two per cent reduction in race time.

It's important to note that the majority of studies showing a positive effect involved untrained or recreational athletes. Whether beetroot juice also benefits performance in elite cyclists is unclear.

For most athletes, Jones suggests consuming beetroot juice (such as one to two 70ml shots of Beet It) each day for three to five days before competition as well as two to three hours before the

time trial performance during a period of high-intensity training. In a trial involving 10 cyclists, those who consumed a post-training whey shake experienced fewer upper respiratory infections compared with those who consumed a carbohydrate drink.

The researchers found that 20g whey protein (an average scoop) is the optimal level for maximising muscle repair after training. This is a ballpark figure; if you weigh more than 80kg (the weight of the athletes in the study), then you may need more, and vice-versa.

Beetroot juice

Main gain: Improved endurance
It may not be the most palatable

Natural alternatives

The latest research suggests that consuming certain antioxidant-rich foods before or after a hard ride may help boost performance and recovery.

Blackcurrant extract: a double blind study from the University of Chichester found that seven days of supplementation with 300mg New Zealand blackcurrant extract (CurraNZ) improved 16.1km time trial performance by an average of 2.4 per cent and increased fat oxidation by 27 per cent during moderate-intensity cycling.

Cherry juice: a study at Northumbria University in 2014 found that cyclists who consumed 30ml of Montmorency cherry concentrate twice daily for eight days had less muscle damage and inflammation following a 109-minute cycling trial.

race starts. Avoid using antibacterial mouthwash, as this removes beneficial bacteria in the mouth that convert some of the nitrate to nitrite and thus reduces the benefits of beetroot juice. As for side effects, there's a harmless, temporary, pink colouration of urine and stools.

Beta-alanine

Main gain: Greater short-burst power

You know that feeling when you're trying to get up a hill: you're pedalling as hard as you can but you can't pedal anymore because your legs are screaming 'no!' This feeling in part results from rising acidity in your leg muscles, caused by the accumulation of hydrogen ions. Reduce this effect and you help reduce fatigue. Enter beta-alanine.

Beta-alanine is an amino acid and a building block of carnosine, a natural substance that acts as an acid buffer in muscles during high-intensity exercise. More carnosine means that you should be able to do more work at higher intensities for longer and so benefit from greater training adaptations. Indeed, a review of 19 randomised controlled studies by Canadian researchers concluded that beta-alanine supplementation improves performance in short-duration, high-intensity activities. Specifically, it helps increase power output and anaerobic capacity, and decrease feelings of fatigue and perceived exhaustion.

“Beta-alanine supplementation could be beneficial for efforts that last between one and four minutes or involve repeated sprints or surges of power,” advises James Morton. “This makes it potentially useful not only for sprinters and track cyclists but also for road cyclists. Although they do mostly moderate-intensity pacing, they often need to ‘kick’ in order to pass, climb up a hill, or sprint to the finish in a race.”

How much difference can beta-alanine make? According to a 2012 analysis of 15 studies, the average performance improvement after four to six weeks is 2.85 per cent, equivalent to a six-second improvement over four minutes.

A study at the University of Tasmania measured improvements in power output and time trial performance in elite cyclists after four weeks of beta-alanine supplementation. Similarly, a study by Belgian researchers found that beta-alanine supplementation for eight weeks significantly enhanced sprint performance at the end of a simulated two-hour endurance cycle race. The researchers found increases of 11 and five per cent in both maximal and average 30-second sprint power respectively.

The International Society of Sports Nutrition (ISSN) recommends loading with 4-6g per day for four weeks, ideally divided into several small doses. High doses (above 0.8g) may cause side-effects such as flushing and paraesthesia (skin tingling). However, these symptoms are harmless, transient and can be prevented by using smaller doses.

Best avoided

Antioxidant supplements: While early studies suggested antioxidants may help offset exercise-induced free radical damage and promote recovery, the latest evidence shows that high doses of vitamins C and E post-exercise may actually blunt adaptation to training.

Branched chain amino acids: Theoretically they may help prevent protein breakdown and promote protein synthesis during fasted training, but if sufficient protein is being consumed then there appears little benefit in taking BCAAs.

ZMA: This claims to boost strength, increase testosterone and promote recovery but there are no reputable studies to back these up.

As the performance benefits are based upon raising muscle carnosine concentrations, it doesn't matter what time of day you take beta-alanine. The clearance time of muscle carnosine is very slow, so once you've built up your muscle carnosine levels, they should stay elevated for six to 15 weeks, dropping just two per cent every two weeks after you stop taking supplements.

Caffeine

Main gain: Reduced feelings of fatigue

“There's good evidence that caffeine enhances performance for most types of endurance, power and strength activities,” says James Morton. “I advise using caffeine mainly before time trials but also towards the end of stages to help give that final boost for the last 30-60 minutes.”

Exactly how caffeine works is still not fully understood, but it's believed to play a role in the way the brain regulates fatigue and pacing during exercise. It blocks a sleep-inducing brain chemical called adenosine so, instead of feeling tired, you feel more alert and energetic.

Most studies show an average benefit from caffeine consumption of between two and five per cent across a range of protocols and doses. In a 2009 study at the University of Texas, cyclists who consumed caffeine completed a one-hour time trial three minutes four seconds faster than those who took a placebo.

A study conducted by the Australian Institute of Sport found that cyclists who took caffeine before a two-hour ride maintained a lower rate of perceived exertion throughout compared with a placebo despite riding at the same power output. The cyclists then immediately completed a time trial, which they performed one minute faster compared with when they took a placebo. The average benefit from caffeine consumption on performance was around 3-3.5 per cent.

The benefits occur soon after consumption, so you should take caffeine 30-60 minutes before your ride. If you are riding longer than an hour, you could take half your caffeine before and the other half in divided amounts during your ride. It appears that relatively low doses (1-3mg caffeine per kg) are just as effective as higher doses. This equates to 70-210mg caffeine (equivalent to one or



two gels) for a 70kg person.

Whether you take your caffeine in the form of pills, gels, energy drinks or coffee makes little difference to performance, according to a 2015 review of studies by University of Georgia researchers. Bear in mind the caffeine content in coffee can vary greatly and you should experiment in training to find the dose and protocol that suits you.

‘Whey protein has made me stronger’

Dietitian and cyclist James Moran, 32, has experienced training benefits with whey protein



I use a whey protein supplement from a reputable (informed-sport.com) company to support recovery from hard training sessions and sometimes as a convenient way to ensure that I'm meeting my daily protein requirements if I'm not able to use real

food due to travelling or work and/or training commitments.

A whey supplement rather than a specific recovery one is useful for when I'm not training as much and don't need as much carbohydrate but still want to ensure adequate protein intake.

I'll have a shake after most rides, along with some carbohydrate — usually fruit. I'll often have one before training if I'm doing

a fasted ride as it helps me feel better and less hungry.

Over the past 12 months, since paying more attention to my protein requirements and incorporating a whey protein supplement into my diet, I definitely feel generally stronger and have less muscle soreness and fatigue the next day after a tough ride. It has also helped with managing my appetite and weight, which in turn has helped me to improve my speed on climbs.

creatine supplements can improve performance but the greatest improvements are found in high power output efforts repeated for a number of bouts. For this reason, it's favoured by track sprint cyclists; no studies have demonstrated a significant benefit for endurance cyclists.

The ISSN describe creatine as “the most effective ergogenic nutritional supplement currently available to athletes in terms of increasing high-intensity exercise capacity and lean body mass during training.” A review of 22 studies concluded that creatine increases maximum strength by an average eight per cent, and endurance strength (maximum reps at a sub-maximal load) by 14 per cent. Typical lean and total mass gains are one to three per cent (approx. 0.8-3kg) after a five-day loading dose.

Creatine is a protein that is made naturally in the body but is also found in meat and fish. Our muscle creatine is used to produce phosphocreatine (PC), an energy-rich compound that fuels very high-intensity activities, such as lifting weights or sprinting. Boosting PC levels enables you to sustain all-out effort longer than usual and recover faster between bouts, resulting in greater strength and improved ability to do repeated sets.

You can either use a ‘loading protocol’ of 0.3g/kg bodyweight for five to seven days — equivalent to approximately four times 5g (20g) a day for a 70kg person — or use a smaller daily dose of 2-3g over three to four weeks. Both methods will achieve optimal levels in your muscles. Once you have saturated the muscles

with creatine, you can maintain these levels with 0.03g/kg or about 2g per day.

It appears to be a safe supplement; the only side-effect is weight gain. This is due partly to extra water in the muscle cells and partly to increased muscle tissue. For this reason, it could be disadvantageous for road cyclists.

Anecdotally, it is thought some people may be “non-responders”. This may be due to a diet high in meat, meaning the body is already saturated with dietary creatine prior to supplementation.

Conclusion

No supplement has the potency to turn a donkey into a thoroughbred. Supplements provide only the finishing touches on top of a smart nutrition and training programme. The majority are ineffective but the few that are backed by science may give marginal gains.

Whey supplements could promote speedier muscle recovery after long rides and will help to boost immune function during heavy training blocks. Beetroot juice may improve your endurance, allowing you to cycle harder longer and race faster if you're sub-elite, while beta-alanine supplementation could help with sprints and climbs.

Caffeine could make pedalling feel slightly less hard, and make you feel more alert, energetic and less tired.

Finally, creatine could work well for track cyclists, boosting strength and muscle mass as well as enhancing sprint performance, but it won't do much for endurance cyclists.