



Nitrate

the new super-source?

Earlier this year, SiS released a brand new gel called Go Nitrate to the sports nutrition market. It's the first of its kind containing naturally occurring nitrates and has got a lot of people talking. *Cycling Fitness* went to SiS to find out more.

“**T**op athletes know that nitrates increase nitric oxide (NO) in your body, which helps to deliver oxygen and nutrients more efficiently,” claims the SiS website. “This means you can sustain higher levels of power for longer before fatigue sets in – giving you extra power for those extra-tough events.”

It all sounds very exciting and pretty simple and straightforward, doesn't it? But it's not quite; it's a rather complex topic. The reason why is because nitrate is still a relatively new subject and the research is still in its infancy. People are still finding out what it can do,

how we can utilise it and how it can be incorporated into cycling.

Beetroot juice has been hot news in the world of supplements in the past two years, as that was where the influences of nitrate were first discovered: the first research papers, which looked at nitrate and its positive influence on cardiovascular system and performance, used beetroot as its main source of nitrate. It was these papers, which prompted follow-up research also looking at beetroot, that caused a surge in beetroot supplements.

But why beetroot in the first place? Well, it's thought that beetroot juice contains very high levels of naturally occurring nitrate, which,

according to research papers, can produce remarkable physiological benefits for endurance athletes such as cyclists. Much research has shown that six days of beetroot consumption — half a litre a day — can reduce the amount of oxygen needed by exercising muscles to sustain a given sub-maximal workload, thereby increasing the muscles' efficiency and tolerance to high-intensity exercise and extending endurance.

Recent, more thorough, results have indicated that when beetroot is consumed, improvements have been seen in average power output, cycling efficiency and time to exhaustion, which is staggering. But what does that mean in terms of actual performance? In February of this year, a Dutch study wanted to find out. Published in the international journal, *Nutrition Exercise Metabolism*, they wanted to see if this could be translated into real performance, so they took 12 trained male cyclists and asked them to perform two trials each, separated by 14 days. Each trial consisted of 30 minutes cycling at 45 per cent of max power and 65 per cent of max power, followed by a 10km time trial. For six days before each trial, the cyclists consumed either 140ml per day of concentrated beetroot juice or the same amount of a placebo. The results were quite amazing. The oxygen required to sustain sub-max exercise was lower when the active beetroot juice was

Read it and peak: Nitrates have been proved to enhance athletic performance

consumed. More amazing still was the finding that the active beetroot juice significantly enhanced time trial performance, where the average time recorded fell from 965 seconds to 153 seconds. The average power output during the time trials also rose from 288 watts in the placebo trial to 294 watts in the active beetroot juice trial.

Although a reduction of 12 seconds over 10km might not sound much, it translates to 19 seconds over a 10 mile time trial and a minute over a 25 mile time trial — just from consuming beetroot juice.

There's no doubting that nitrate holds substantial benefits. But when *Cycling Fitness* sat Tim Lawson, creator of SiS, and Dr. Niamh O'Kennedy, R&D Director down to find out more, it's clear that it's not as simple as necking a pint of the red stuff.

"We're looking for good-quality, consistent, safe sources of nitrate. Beetroot is not the best source of nitrate and we need to dispel that myth," says Lawson.

"People tagged onto beetroot juice, because one of the first studies used organic beetroot juice and stated that it's a reasonable way of getting it into your diet. But it's not your best source of nitrates. In fact, when you start analysing sources for content of nitrate, it's gets very interesting.

"We started analysing how much nitrate was in fruit and veg from the supermarkets. And, while you can get the EU averages for spinach, rocket,

lettuce and beetroot, the items you get from the supermarket might have next to nothing. It varies so much: it depends on the soil conditions, light conditions... One piece of rocket could look healthy, but it could contain no nitrate.

"The studies look at concentrated beetroot, with controlled levels of nitrate. You can't emulate that, unless you have a lot of money, time and patience on your hands. And you don't want to be stuffing yourself with spinach or necking pints of beetroot juice prior to your race hoping it's a good batch. You need to know it's going to work."

UP THE NITRIC PATHWAY

"The deal with the gel was to make something that wasn't as nasty as beetroot," says O' Kennedy. "Something that was equally standardising. It's the nitrate we want, not the beetroot or any other source for that matter.

"When you're looking at dietary tests, you have a lot of trouble standardising the level of nitrate that you're taking in. Quite a number of dietary studies don't actually see increases of nitrite. There are huge problems with absorbing all that volume and being able to release the nitrates from where they're stored in the vegetables."

Sitting down with two experts

Real food is impractical

"The literature shows just how many leafy greens you would need to get consume to get the benefits. The EU suggests something like a kilo a day of leafy greens, which is nuts."

Tim Lawson, founder of Science in Sport

in the field of sport science and nutrition who have a tendency to finish each other's sentences can be quite heavy-going. Nitrate, nitrite, nitric oxide; let's start from the beginning. How does it all work in the body?

"Firstly, you take in nitrate from a source," says O' Kennedy. "You metabolise this to nitrite via a little colony of bacteria that sits under the tongue which we swallow in our saliva, where it will then be converted to nitric oxide in your stomach which will then be available for tissue use.

"In addition to that, you have your own nitric oxide pathway and, by including folic acid, it tries to help you stimulate your own nitric oxide pathway and makes sure you don't run out of all the things you need to generate nitric oxide within your own self. So it's a two-pronged approach. You see some similar approaches in some supplements, where they might combine nitrate with arginine. But arginine hasn't really been shown to work, whereas folic acid has. That's why we have gone down this route."

"Nitric oxide was discovered along with all its important functions around the 1980s," says Lawson. "It was thought that the only way of making it was via the amino acid arginine and that gave way to all these body-building nitric oxide-enhancing supplements. But if it worked, it maybe worked acutely once, but tended to do very little

"Just two gels, taken over three days, will make you go faster," claims SiS founder, Tim Lawson

Gel is the way, for now

"You could go other ways, but a gel is a good way to get nitrate into your body in a small amount of volume. But it's all about understanding the kinetics, how it goes in and making the link to the cardiovascular system. We're still not sure, the next generation of answers will emerge through research. And that's where we are. It's evolving."

Dr. Niamh O'Kennedy, R&D director



Groundbreaking in sports science

"This is the most important thing to come out of sport science over the last 10-15 years. I'd say the glucose/fructose combination wasn't that new. It was just some research that quantified it. And there was a lot of commercial interest, which was driven by many companies. There is much more to this. It's creating a real buzz across the country."

Tim Lawson, founder of Science in Sport

afterwards. Then in the late 1990s, they discovered that your body doesn't try to eliminate nitrate or nitrite; it tries to keep hold of it. And they found this pathway that was able to make nitric oxide was via an inorganic dietary nitrate — and that's really new. And that's what's exciting. This is a much better way. But it's amazing how quickly things are emerging. Nitric oxide as a signalling compound in the body was only discovered in the late 1980s. Nobody knew about the different pathways. Dietary nitrate is not the same pathway as the signalling pathway that came about first."

"We've set up some collaborations," interrupts O'Kennedy. "We want to show that taking it in this form is going to be more of an efficient way of increasing your folic and nitrate levels than Swiss chard, where it

originates from. But we also want to look at formats and ways of improving your conversion efficiency from nitrate to nitrites. Because you actually excrete almost everything you take in to the kidneys. There are other formats we can address, but it's a continuing process."

CHANGING TIDES

After sitting down with the guys from SiS, it's clear that something is happening here. A tide is changing in sport performance and we're on the edge of something new. What's more interesting is that no one seems to know how far it can go.

"We're really excited," enthuses Lawson. "Over the years, there have been lots of studies that have made an assumption of a linear relationship between the amount of work you can do and the amount of oxygen you can consume — and that's reflected

The SiS boffins get together to discuss the newest research

in heart rate. Whereas nitrate studies have shown an improvement in efficiency. In effect, you can get more power for less oxygen or less heart rate. It's exciting. We're not improving our VO2 max, we're improving our utilisation."

"What's more exciting is that we just don't know what we can achieve with this," says O' Kennedy. "People are still asking questions. How we use it and how we can get the most out of it. No one really knows where it is. Where is this nitrite? How are we getting at it? Are there other ways we could manipulate it to get it into other compartments to access it in different ways? Do you take it with training; do you save it for racing? There are lots of unanswered questions. But you can't argue with results in performance, studies show one- to two per cent improvements. That's priceless to an athlete."

What we must remember is that Lawson and O' Kennedy aren't fantasists who live in dreamland. They're doctors and sport scientists, who are respected more than most in this area. When they make claims like this, you can't help but listen and start to think about it seriously. Can nitrate really improve performance that easily and quickly?

"There are not many things that will improve your performance instantly," beams Lawson. "You don't have to do anything. Take two of these gels for three days and the chances are you will go faster. This will work every time."

A very real danger?

The debate has been going on for years and research is still being conducted on just how dangerous nitrite is for the body. Many health experts believe it should be avoided at all costs, while others state that it's not as harmful as some people lead you

to believe. But it does cast a shadow over the whole debate.

"We did a whole lot of work on making sure the active ingredient is safe and stable, that we're not converting it into nitrite," says Tim. "You can't have nitrite in food and you

really have to regulate and watch it. Nitrite in high enough doses is acutely toxic. Spinach, for example, has tons of nitrate in it. But if it's not stored properly, cooked and reheated, you could end up with lots of nitrite, which is serious. "You're never going to

get away from safety aspects until scientists get the data. Colon cancer has been cited as a risk so we need to err on the side of caution. But everyone else is saying you could really reduce cardiovascular disease. So we need to get the ball rolling."

