

Don't cramp your style – minimising the risk of muscle cramps

by Andrew Hamilton BSC Hons MRSC ACSM

If you've never experienced the excruciating and debilitating pain of a muscle cramp, count yourself lucky! When muscle cramping strikes during exercise, it can scupper even the best-laid competition or workout plans. And post-exercise cramping is no less traumatic, especially when it strikes in the middle of the night. For all sportsmen and women therefore, minimising the risk of muscle cramps with good nutritional strategies makes extremely good sense.

What are muscle cramps?

A muscle cramp occurs when a muscle suddenly becomes forcibly and uncontrollably shortened and locked into a painful spasm. A spasm occurs when a muscle, or even a few fibres of a muscle contract involuntarily (ie without you consciously willing it). If the spasm is forceful and sustained, it becomes a cramp. A muscle cramp is thus defined as an involuntarily and forcibly contracted muscle that does not relax. This causes a visible or palpable hardening of the involved muscle. Muscle cramps can affect any skeletal muscles in the body, but are most common in muscles or muscle groups that span two joints.

However, in addition to these areas, cramps can also affect the hands, tummy muscles (abdominals), the muscles around the rib cage, and the feet and toes. Muscle cramps can last anywhere from a few seconds to (in severe cases) 15 minutes or longer. A muscle cramp in a particular location may also recur multiple times until it finally goes away. In severe cases, an episode of muscle cramping can even lead to post-cramping muscle soreness, akin to delayed onset muscle soreness (DOMS).

What causes muscle cramps?

Despite being a very common condition that affects nearly everybody at sometime in their life, the exact causes of cramps remain something of a mystery (something that makes their prevention easier said than done, as we shall see later). What we do know is that cramping occurs when the normal mechanisms controlling muscle contraction and relaxation become temporarily impaired.

These control mechanisms involve the electrical stimulation of muscle fibres (motor unit firing) and subsequent deactivation (relaxation). There are a number of physiological requirements for efficient muscle contraction and relaxation and if any one of these requirements is not met, muscle

cramping becomes more likely. These requirements include:

- Adequate hydration and proper and adequate levels of the electrolyte minerals (together, they're needed for motor unit firing and relaxation);
- Well-trained muscles that are both supple and sufficiently conditioned for the exercise being undertaken (muscle cramps are much more likely to occur in muscles that are unused to vigorous training);
- Adequate rest and recovery; we know that muscles are much more likely to cramp when fatigued.

In addition to the above, genetics are known to play a role (some people are simply more prone to muscle cramping than others all other things being equal) as does age (muscles in the elderly ►►



The common sites in the body for muscle cramps include:

- The calf muscles of the lower leg (gastrocnemius);
- The hamstring muscles of the rear thigh;
- The quadriceps muscles of the frontal thigh.

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are more prone to cramping than in younger people). Certain diseases such as cirrhosis of the liver are also associated with an increased incidence of muscle cramping, and the risk of cramps can also be increased by injury, where certain muscles may go into spasm in order to 'brace' and protect the injured area.

However, most authorities agree that 'true cramps' – those we normally associate with vigorous exercise, fatigue and dehydration/electrolyte imbalances etc. – are caused by hyperexcitability of the nerves that stimulate the muscles, which also explains why much attention on preventing cramps has been focussed at minimising this excitability through optimum nutrition and conditioning protocols.

Who can get muscle cramps?

Anyone can experience muscle cramps, regardless of age, gender or fitness level. Cramps can occur not just while you exercise, but also while you sit, walk, or even just sleep. Sometimes, the slightest movement that shortens a muscle can trigger a cramp. However, in otherwise healthy people, the fact remains that muscle cramps are most common in endurance athletes such as marathon runners and triathletes, and those who perform strenuous physical activities without previous experience or lacking base conditioning. In short, the fitter and better trained you are for your event, the lower the risk of muscle cramps.

Cramps are most likely to strike towards the end of intense or prolonged exercise, or around 4-6 hours later, indicating that muscular fatigue (especially unaccustomed fatigue) is a major factor. The obvious implication is that with improved fitness and conditioning, the risk of cramps can be significantly reduced. However, an important question to ask is what other strategies can reduce cramping risk and in particular, whether improved nutrition and hydration can help?



Reducing muscle cramping risk

Strategies involving stretching and relaxing muscles are proven ways to reduce cramping risk and help treat cramping when it occurs (more later). When it comes to improved nutritional strategies however, the scientific evidence about what actually reduces the risk of cramping is far from clear-cut, mainly because there's actually very little data from published studies.

One reason for the paucity of data is the sheer unpredictability of muscle cramps; because it's hard to predict when cramping will occur, it's almost impossible to collect together a group of athletes to run tests before during and after cramping episodes. There are also ethical reasons; muscle cramps are painful and debilitating and it would be hard to justify studies that deliberately induced severe cramping just to collect data!

To add to the confusion, the studies that have been conducted have often

produced mixed results. For example, South African scientists studied 72 runners competing in an ultra-distance marathon and compared data from those who suffered exercise-induced cramps and those who didn't⁽¹⁾. Although they found small variations in blood levels of post-exercise sodium and magnesium, they concluded that there were no clinically significant alterations in blood electrolyte concentrations and no alteration in hydration status in runners with 'exercise associated muscle cramping' (EAMC).

Dietary basics

Part of this nutritional strategy involves the getting the dietary basics right. Consuming sufficient fluid both during and after training is of course vital, as is a high-carbohydrate diet containing plenty of carbohydrate-rich foods such as breads, cereals, rice, corn, pasta, potatoes, beans, peas and lentil, and starchy fruits and vegetables such as yams, sweet potatoes, bananas, pears, etc. ▶▶

This type of unprocessed diet will contain plenty of potassium and because many foods such as cereals, breads, cheese and other foods such as canned beans, tuna, sauces, pickles etc contain added salt (sodium), maintaining adequate sodium intake shouldn't be a problem either.

The best dietary sources of calcium include milk, cheese and yoghurt, nuts and seeds, green leafy vegetables and canned fish with bones such as sardines. Magnesium is something of a forgotten mineral and one that is often sub-optimally supplied in Western diets⁽⁴⁾. Moreover, research suggests that sub-optimum intakes of magnesium can impair exercise performance more generally⁽⁵⁾. Good sources of magnesium include wholegrain unrefined (not white) breads and cereals, while brown rice, all nuts and seeds (especially sesame seeds), beans peas and lentils (especially chick peas) and all green leafy vegetables.

Using sports drinks

Dietary basics are essential, but depending on your sporting activity

and environment, maintaining optimum hydration, electrolyte balance and muscle glycogen levels may require assistance in the form of purpose-designed sports drinks.

- In hot and humid conditions, sweat losses can be considerable – even when the duration and intensity of exercise are fairly modest. In such conditions, the main priority is fluid and electrolyte mineral replacement. Some carbohydrate replacement is also advantageous, but its importance is secondary to fluid/electrolyte considerations;
- In cooler, less humid conditions and where the exercise duration is longer leading to significant reductions in muscle glycogen (ie over an hour to an hour and a half), carbohydrate replacement becomes more of an issue, although fluid and electrolyte replacement is still vital.

For hot and humid conditions, High5's 'Isotonic' fits the bill perfectly. Each 385 calories' worth of replacement carbohydrate supplies in the region of 1000mgs of sodium and 290mgs of potassium. Meanwhile 'EnergySource' is better suited to cooler, higher energy output conditions where carbohydrate

replacement becomes more important, with each 385 calories' worth of carbohydrate supplying 690 and 180mgs of sodium and potassium respectively.

As we've already stated, there's no sure-fire way to guarantee that you won't be affected by cramping, but by following the fluid/energy replacement guidelines supplied with these products, you can significantly reduce the likelihood of fluid/electrolyte/carbohydrate depletion, which have been linked to increased muscle cramping risk by a number of scientific authorities⁽⁶⁾. For example, in long duration activities, researchers have established that a 6% carbohydrate-electrolyte sports drink can help delay the onset of exercise induced muscle cramps, but not prevent them entirely⁽⁷⁾. Similarly, a review article on hydration in elite tennis players competing in multiple rounds in hot and humid conditions concluded that fluid, electrolyte and carbohydrate replacement was a valuable nutritional strategy⁽⁸⁾.

Calcium and magnesium research

When it comes to controlling muscle contraction and relaxation, calcium and magnesium are two important minerals, working synergistically to maintain normal electrical potentials and to coordinate muscle contraction-relaxation responses in the muscles. In muscle cells, an increased calcium concentration triggers contraction of the muscle fibres while increased intracellular magnesium concentration counteracts this effect, resulting in relaxation. Because of their function in muscles, much research has been focused on the role of calcium/magnesium in muscle cramps.

Scientists have long recognised that in pregnant women, low magnesium status is associated with an increased incidence of muscle cramps, and that magnesium supplementation helps ameliorate this condition⁽⁹⁻¹¹⁾. Moreover, magnesium supplementation has ►►

Despite the lack of unequivocal evidence however, most scientific authorities agree that any nutritional cramp-prevention strategy should aim to address three important areas:

- 1. Maintaining adequate hydration⁽²⁾** – because all electrical signalling activity in the muscles takes place in an aqueous (water) environment and even small shortfalls in hydration levels could lead to impaired electrical signalling and an increased risk of cramping;
- 2. Ensuring adequate dietary intake of the electrolyte minerals⁽³⁾** – sodium and potassium because they're involved in conducting electrical signals to/from muscles, and calcium and magnesium, which are essential for the contraction and relaxation of muscle fibres;
- 3. Replenishing energy in the form of carbohydrate** – because even small drops in the level of stored muscle carbohydrate (glycogen – your body's premium fuel for exercise) can lead to increased fatigue, which may in turn increase the risk of muscle cramps.



Stay Strong and Cramp Free

also been shown to help sufferers of 'night cramps', which involves nocturnal muscle cramping (normally in the legs⁽¹²⁾). There's even been a suggestion that sub-optimum magnesium intake could be linked to more generalised muscle tension and tension headaches⁽¹³⁾.

Despite these findings, the evidence that magnesium (or calcium) supplementation can reduce the risk of muscle cramping associated with exercise is patchy; some studies have reported altered blood magnesium concentrations in sufferers of exercise associated cramps⁽¹⁾, but the clinical significance of these findings are poorly understood.

Nevertheless, sub-optimum magnesium intakes are common in Western diets and unfavourable for exercise performance, and given the solid evidence for magnesium supplementation as a therapy for other forms of cramps, those prone to cramping could do worse than to ensure their diets are well supplied in magnesium. Supplementation may also be worth considering, especially as magnesium supplements are both cheap and non-toxic.

Stretching

One thing that nearly everybody agrees upon is that a regular stretching program targeted at muscles prone to cramping can greatly reduce the incidence of exercise associated muscle cramps as well as stopping cramp once it's started^(14,15). Passive stretches held for 15-30 seconds at a time seem to be effective; the mechanism is unclear but a regular program of stretching is known to lengthen muscle fibres, favourably altering spinal neural reflex activity. Regular massage may also be beneficial as it promotes general muscle relaxation and helps accelerate the disposal of exercise metabolites from muscle cells.

Summary of main points

So what's the best overall plan for avoiding cramps? Well, there's no easy answer to that question, but by following the recommendations below, you can certainly minimise your cramp risk:

- Build training intensity gradually. Remember, unaccustomed fatigue plays a major role in muscle cramps;
- Stretch regularly and particularly those muscles used in your more strenuous training sessions;
- Consume a high-carbohydrate diet, drink plenty of fluid and ensure

you consume plenty of calcium and magnesium-rich foods;

- Use carbohydrate-electrolyte drinks during longer training sessions and/or during recovery;
- If you're a long-term sufferer of cramps, consider trying magnesium supplementation;
- Try massage therapy as an additional method of relaxing muscles, particularly after tough workouts.

Andrew Hamilton
BSc Hons MRSC ACSM

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