



FACT SHEET

Cramps and stitches

You have trained hard, you are mentally focused, your muscle glycogen levels are topped up, and you have the desire to perform better than ever. You are now at your peak. But there are still two things that can stop you dead in your tracks: the cramp and the stitch. They will override all of your mental and physical training and your performance will suffer.

As many athletes have experienced one or both of these painful episodes, you would naturally think that plenty of research has been undertaken to determine the cause and a solution to the problem. Unfortunately this is not so. However, the following is a summary of what we do know and how you can minimise your chances of getting a cramp or stitch.

Cramp

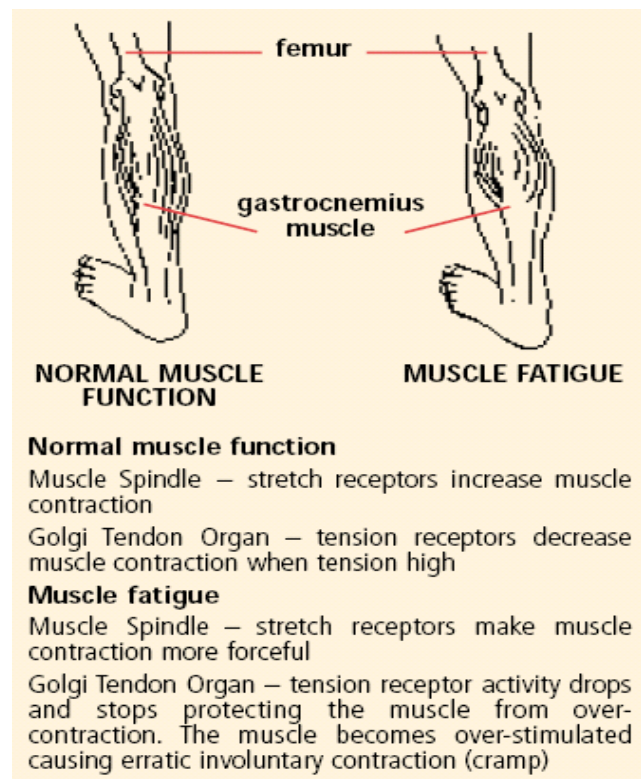
About two out of every three athletes have experienced painful muscle cramp during sport. It commonly occurs in the muscle groups directly involved in the exercise task (eg. the calf muscle (gastrocnemius) in running, and the foot during swimming). In the scientific literature, it is now referred to as Exercise Associated Muscle Cramping (EAMC) to distinguish it from other causes of cramp, including those that may occur at rest or as a symptom of a medical condition.

A number of theories have been put forward to explain what causes cramps during exercise. These have included:

- abnormal or low salt (sodium) levels in the blood due to sweating;
- abnormal potassium, magnesium or calcium levels in the blood due to sweating;
- dehydration due to heavy sweating and inadequate fluid intake;
- heat or cold stress during sport.

Although some of the above might increase your risk of cramp, most now agree the primary cause of EAMC is altered neuromuscular function (i.e. a physiological process involving both the nerves and muscle) secondary to extreme fatigue in the exercised muscle.

In muscles there are two structures that control muscle contraction. The muscle spindle monitors the stretch of a muscle, while the golgi tendon organ monitors muscle tension. Stretch receptors increase muscle contraction, while the tension sensors protect the muscle from damage by reducing contraction if the tension gets too great. Exercise can cause an abnormal stimulation of the muscle, causing an involuntary and forceful contraction, which is more likely to occur in the tired muscle and one already in the shortened position.



Normal muscle function

Muscle Spindle – stretch receptors increase muscle contraction

Golgi Tendon Organ – tension receptors decrease muscle contraction when tension high

Muscle fatigue

Muscle Spindle – stretch receptors make muscle contraction more forceful

Golgi Tendon Organ – tension receptor activity drops and stops protecting the muscle from over-contraction. The muscle becomes over-stimulated causing erratic involuntary contraction (cramp)

Research has revealed that abnormal blood levels of potassium, magnesium or calcium do not cause EAMC. While some athletes will incur large losses of sodium during sport secondary to a high concentration of sodium in their sweat and/or high sweat losses, the evidence that this can lead to cramp is still inconclusive.

While dehydration has for a long time been associated as a possible cause of cramps, a study of marathoners in the mid 1980's and a number of more recent studies of athletes competing in endurance events have shown there has been no difference in the hydration status of those experiencing cramps and those free from cramps. However, it is still important that athletes, especially when competing in hot/humid conditions, replace adequate amounts of fluid and sodium to minimise the level of dehydration during training and competition (See Fact Sheets [1](#) and [11](#)). Extremes of temperature don't appear to be the direct cause of EAMC, but they do increase the risk.

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Treatment of cramp

If you do get a cramp, stretching and resting the cramped muscle is the best way to reduce the pain. If cramping occurs in the calf muscle, grab the toes and ball of your foot and pull them towards the kneecap. Stretching increases the tension in the muscle, which in turn stimulates the tension receptors to increase their activity, thereby signaling the stretch receptors to decrease muscle contraction. This greatly relieves muscle pain as the muscle relaxes.

Reducing the risk of cramp

1. Be fit. Cramps are less common in athletes who are well trained and conditioned for the sport/event they are training for/competing in.
2. Ensure adequate intake of carbohydrate before and during exercise, which may help prevent premature muscle fatigue.
3. Stretch before and after exercise.
4. Wear proper clothing. Loose comfortable clothes are best. Tight fitting clothes can reduce blood flow to muscles making them more susceptible to cramps.

Stitch

The stitch is a common abdominal pain that affects most athletes at some stage. Researchers refer to the stitch as Exercise-related Transient Abdominal Pain (ETAP). Sometimes the pain will go away during sport and you might be able to 'run through' the stitch, other times it stays until after the sport is finished. A recent study of some of the finishers in the Sydney City to Surf community run found that 27% of respondents complained of cramp during the event. In a survey of 965 Australian athletes, 75% of swimmers, 69% of runners, 62% of horse riders, 52% of aerobics participants, 47% of basketballers and 32% of cyclists experienced the stitch in the previous year. You can see this is a common problem.

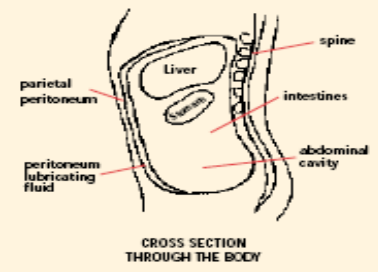
The suspected causes of stitch include:

- Drinking too much fluid
- Reduced blood flow to the diaphragm
- Jolting motion causing stress on the ligaments connecting the abdominal organs to the diaphragm.

Although the second view has long been thought to be the most likely cause, none of these theories can explain the stitch in all people. For example, some athletes suffer stitch in the lower abdomen, which is far removed from the diaphragm. Also, swimmers get the stitch despite their sport not involving a significant jolting action. Others have experienced 'shoulder stitch', a painful shoulder without any obvious cause.

There is recent evidence that the pain actually starts at the parietal peritoneum in the abdomen. Lining the inside front of the abdominal cavity are two layers of membrane, collectively called the peritoneum. One layer covers the abdominal organs and the other attaches to the abdominal wall (parietal peritoneum). Between the two layers is lubricating fluid that allows the two surfaces to rub against each other during sport and digestion without pain. If the parietal peritoneum does get irritated, often by increased movement in the abdominal region during sport, there is friction between the abdominal contents and the peritoneum causing pain in the region. Friction may occur if the stomach is distended, such as after eating a big meal or drinking lots of fluid at one time. This pushes the two surfaces together causing friction.

Another possibility is dehydration reducing blood flow to the abdomen, which in turn reduces the production of the lubricating fluid. If this is the case, it helps to explain why pain might be from any part of the abdominal region. But why the shoulder pain? Parts of the parietal peritoneum are supplied by the phrenic nerve, which refers pain to the shoulder tip region.



At the moment the best advice we have to help avoid unwanted stitches during exercise is:

- Don't eat substantial amounts of food just prior to beginning exercise. This fits the advice from [Fact Sheet 2](#), where we advise athletes to eat two to three hours before sport, as this allows time for the stomach contents to empty into the small intestine. The extra benefit might be that it avoids food bouncing around inside the stomach, causing friction to the peritoneum lining.
- Be well hydrated and consume small, frequent amounts of fluid during sport to reduce the risk of over-stretching the stomach walls.
- Avoid highly concentrated drinks, such as soft drinks and fruit juice, immediately before and during sport, as they seem to increase the risk of suffering a stitch during exercise. These drinks empty slowly from the stomach, leaving it distended for longer and increasing the amount of friction generated. Choosing fluids that empty quickly from the stomach (e.g. water or sports drink) reduces the risk of friction and subsequent pain.

Summary

Science has not found all the answers to the problems of muscle cramp and the stitch. Cramp is due to an involuntary muscle contraction. While for a long time they have been associated with dehydration, heavy salt losses, or extremes of temperature, most recent evidence suggests altered neuromuscular function secondary to extreme fatigue in the exercised muscle as the most likely cause. Well trained athletes are at least risk of experiencing muscle cramps.

The pain of the stitch is likely to come from the abdominal cavity. To reduce the risk of developing a stitch during exercise, the athlete should avoid eating just prior to starting and adopt appropriate hydration strategies before and during sport (see [Fact Sheet 1](#)). Water or sports drinks are the best choices.

- Athletes should follow strategies for healthy eating which focus on moderate amounts of mono-unsaturated and omega-3 fats, and a reduction in intake of saturated fats.