

Ironman

140.6 and 70.3. The cramp bites on the run because of what you did on the bike.

Small numbers point to the sources on page 2.

1 Where cramps bite

- Triathletes are the most cramp-prone endurance group: about two in three report EAMC².
- In 210 Ironman finishers only two things predicted cramping: a faster race than usual (especially a fast bike) and a history of cramping in your last 10 races¹.
- Dehydration and blood sodium did NOT differ between crampers and non-crampers¹. Cramp is a fatigued-nerve problem before it is a salt problem.
- Typical sites: quads and calves, once cycling fatigue lands on the run^{1,2}.

2 Cut your risk

- Ride the bike power you rehearsed, not what feels good at 40 km. Harder bike, worse run; an easier final 20 to 30 km improved the run by up to 40% in controlled work⁷.
- Eat on the bike: carbohydrate during cycling measurably improves the run that follows⁷.
- Rehearse race intensity in training. Cramp is most likely when you race faster than you trained¹.
- Cramp history is the strongest personal predictor. If you cramp, plan for it rather than hoping¹.
- Nothing prevents EAMC reliably for everyone; stack the small edges².

3 When it hits

- Ease the pace before it locks. A twinge is your warning, not the cramp.
- Stretch the cramping muscle to full length and hold. Still the first-line response in every review².
- **Early, not late.** Take your GOAT Shot at the twinge. In the lab a small measured shot cut cramp duration to about 85 s against 134 s for water, through a mouth-to-nerve reflex rather than digestion³.
- Do not chug plain water to fix a cramp. Neither dehydration nor blood sodium separated crampers from non-crampers in field studies¹.
- Once it releases, rebuild pace over 3 to 5 minutes. Straight back to race pace re-triggers it.
- The evidence behind this tactic is lab-based and mixed: Miller (2010) found a clear effect, later trials found a small or non-significant one⁹. What it is not: an electrolyte top-up. Test it in training, not on race day.

4 Fuel

- Carb load 10 to 12 g/kg/day for 36 to 48 h before the gun⁵.
- Breakfast 1 to 4 g/kg carbohydrate, 1 to 4 h out⁵.
- Target 60 to 90 g/h from a glucose plus fructose mix. Ironman finishers average 62 to 71 g/h, and more carbs correlated with faster finishes^{4,5}.
- Front-load on the bike, hold what your gut allows on the run.
- Train the gut: 31% of Ironman athletes report serious GI symptoms, and a history of gut trouble is the best predictor of it⁴.

5 Fluid and salt

- Pre-load 5 to 7 ml/kg of fluid about 4 h before⁶.
- Drink to a plan built from your sweat rate (range 0.3 to 2.4 L/h). Aim to finish within 2% of start weight, not above it⁶.
- Sweat carries roughly 1 g sodium per litre: use a sodium-containing drink for anything over 2 h and in the heat⁶.
- Over-drinking plain water on a long, slow, hot day is the hyponatraemia risk⁶.

6 Race day

- Taper 8 to 14 days: cut volume 41 to 60%, keep intensity and frequency⁸.
- Bike: check tyres, bottles, computer, spares. Run: socks, lube, cap.
- Kit: GOAT Shot in the bento box and T2 bag, gels on the bike, back-up on the run belt.
- Morning: up 3 h out, eat, sip, transition early, swim warm-up.
- Write your bike power cap and run pace on your wrist. Race the plan.

Sources and the fine print

Every numbered claim on page 1 traces to one of these. Peer-reviewed studies and consensus statements only, no influencer opinion.

1. Schwellnus MP et al. Increased running speed and previous cramps rather than dehydration or serum sodium changes predict EAMC: 210 Ironman triathletes. *Br J Sports Med* 2011;45:650-656.
2. Maughan RJ, Shirreffs SM. Muscle cramping during exercise: causes, solutions and questions remaining. *Sports Med* 2019;49(S2):115-124.
3. Miller KC et al. Reflex inhibition of electrically induced muscle cramps in hypohydrated humans. *Med Sci Sports Exerc* 2010;42(5):953-961.
4. Pfeiffer B et al. Nutritional intake and gastrointestinal problems during competitive endurance events. *Med Sci Sports Exerc* 2012;44(2):344-351.
5. Burke LM et al. Carbohydrates for training and competition (IOC consensus). *J Sports Sci* 2011;29(S1):S17-27.
6. Thomas DT, Erdman KA, Burke LM. Nutrition and athletic performance: ACSM / Academy of Nutrition and Dietetics / Dietitians of Canada position. *Med Sci Sports Exerc* 2016;48:543-568; Sawka MN et al. ACSM exercise and fluid replacement, 2007.
7. Running performance decline in IRONMAN-distance triathlon: a scoping review. *Sports* 2026;14(8):345 (incl. Suriano & Bishop; McGawley et al.).
8. Wang Z et al. Effects of tapering on performance in endurance athletes: systematic review and meta-analysis. *PLOS ONE* 2023;18(3):e0282838.
9. Behringer M et al. Effects of TRPV1 and TRPA1 activators on the cramp threshold frequency: randomised placebo-controlled trial. *Eur J Appl Physiol* 2017;117:1641-1647; Lavender AP et al. Mouth rinsing vs ingesting pickle juice. *Appl Sci* 2021;11:12096.

GOAT Shot, plainly

A 10 mL single-serve shot of Australian organic apple cider vinegar with the mother, saltbush brine and native botanicals, in a small thin sachet that opens easily. A food, not a medicine.

The research above (Miller 2010; Behringer 2017; Lavender 2021) is what the twinge tactic on page 1 is built on. Read it and make your own call.

Test any race-day tactic in training first. That includes this one.

Pickled GOAT is a food under the Food Standards Australia New Zealand code. It is not a therapeutic good and is not intended to diagnose, treat, cure or prevent any condition. This guide is general information for healthy adults, not medical advice. If cramps are frequent, severe or happen at rest, see a sports doctor. Informed Sport and HASTA certification are stated goals and are not currently held.

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