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Ironman in Waterworld

Years of being told to “hydrate, hydrate, hydrate” caused first-time Ironman athlete Dan Fontaine to overlook the dangers of overhydration.

By Emily Beers

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Courtesy of Dan Fontaine

He had been training for his first Ironman for 12 months.

Dan Fontaine thought he had done everything right. He followed a careful training plan and implemented CrossFit Endurance workouts. He read books to educate himself on the do's and don'ts of getting through what he hoped

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would be no more than a 12-hour event. He even took a three-month leave of absence from his career as a civil engineer to train full time.

Fontaine focused on his nutrition, his sleep, his recovery. He turned to training books to help him draft a plan to avoid becoming dehydrated.

“The only problem was my plan had a big flaw,” 32-year-old Fontaine said almost five years later.

It never occurred to him that drinking too much during the race would dilute his blood-sodium levels to the point that—three hours in—he would vomit violently and be left on the side of the road in a depleted state, unable to continue for hours.

Fontaine was never officially diagnosed with exercise-associated hyponatremia (EAH), a potentially life-threatening condition that leaves an athlete with dangerously low blood-sodium levels. But he has since researched what happened to him and has confidently deduced he was hyponatremic in 2010 at an Ironman race in Penticton, British Columbia.

An athlete who drinks too much during exercise runs the risk of diluting blood-sodium levels to below the normal range of 135 to 145 millimoles per liter (mmol/L). Symptoms of EAH include fatigue, nausea, vomiting and seizures. The most serious cases have led to fatal swelling of the lungs or the brain. Damage from brain swelling—[exercise-associated hyponatremic encephalopathy \(EAHE\)](#)—has taken the lives of at least 12 otherwise-healthy people since 1981.

“A common scenario is that (many people) ignore their thirst mechanism and just drink continuously (to avoid dehydration).”

—Dr. Mitchell Rosner



Dave Re/CrossFit Journal

Dr. Mitchell Rosner advises athletes to rely on the body's thirst mechanism instead of unfounded claims in ubiquitous advertising.

Dr. Mitchell Rosner, professor of medicine at the University of Virginia, said because he wasn't in Penticton to assess Fontaine's condition in the moment, it would be impossible to give an exact diagnosis today. But, he added, the symptoms Fontaine experienced are “consistent with hyponatremia.”

Part of the reason athletes drink too much during endurance exercise stems from a deep-rooted fear many people have of getting dehydrated, said both Fontaine and Rosner. Advertising from companies such as Gatorade and various bottled-water companies, as well as advice from the American College of Sports Medicine (ACSM), has likely helped to perpetuate widespread fear of dehydration, Rosner said.

In 2007, for example, the [ACSM's official position paper on exercise and fluid replacement](#) recommended athletes pre-hydrate before exercise to prevent dehydration.

Other myths published by the ACSM include advice to [consume as much fluid as possible](#), as well as to diligently drink at regular intervals during exercise—all in the name of avoiding dehydration, Rosner explained.



Courtesy of Dan Fontaine

Dan Fontaine finished the 2010 Ironman in Penticton, British Columbia, but he's certain overdrinking almost ended his race an hour into the cycling segment.

In a satirical piece about hydration, comedian Jerry Seinfeld noted how powerful these myths have become.

"Wouldn't I get thirsty first?" Seinfeld rhetorically asked in response to people telling him, "You need to hydrate, Jerry. ... You gotta be hydrating. Make sure you're hydrating. Are you hydrating?"

"According to the fitness people on TV, if you feel thirsty, you're too late. What do you mean I'm too late?" Seinfeld continued.

This idea of being "too late" is a fallacy, Rosner explained. The best way to know when to drink is to listen to the body's internal thirst mechanism, he said.

"A common scenario is that (many people) ignore their thirst mechanism and just drink continuously (to avoid dehydration)," Rosner said.

If you're force-feeding yourself water—like Fontaine said he did during the Ironman—your body doesn't need water, Rosner added.

Although Fontaine couldn't pinpoint why he chose to chug water when he wasn't thirsty, he knows the fear of dehydration was never far from his mind. Advertisements, event organizers, the reading he did and the people he knew kept telling him to drink more, ultimately to his detriment.

Dehydration on the Brain

Fontaine began his Ironman morning with his regular pre-training meal: a smoothie with almond milk, seed oil, strawberries and protein powder.

"It was, like, a 1,000-calorie smoothie," Fontaine said.

Then he chugged about 16 oz. of water, ensuring he was hydrated at the start of the race. He continued to sip water until the race began.

The swim went well for Fontaine. Assuming it would be the hardest leg, he found himself more comfortable in the open water than he expected, finishing the 2.2-mile swim in 82 minutes.

"I felt good coming out of the water," he remembered.

Emotionally good but physically bloated, he said his stomach felt slightly distended.

"I swim with my mouth open, so I assume I swallowed a lot of lake water," he said of a factor he believes contributed to the bloating.

He added: "It was the same feeling I get when I hydrate heavily."

Fontaine didn't consider swallowing unwanted lake water in his hydration plan, so he kept drinking.

"People kept telling me how hot it would be in Penticton, so I wanted to make sure I wasn't going to get dehydrated," he said.

What worried him the most was how dehydration would negatively affect his performance.

"I thought I'd be dehydrated after swimming for an hour and a half because I was told, 'Even though you're cool in the water, you're still sweating hard! And in my mind, I

thought I hadn't been able to drink anything (during the swim), and I didn't want to some hours later hit a point of dehydration," he said.

To avoid dehydration, he stuck to his plan to chug a 16-oz. bottle of water right after the swim.

"In retrospect, during (shorter) triathlon races in the past, I would bike for an hour and not drink because I didn't feel like I needed it. ... But this was an Ironman, and I thought hydration was so important that I kind of had to force myself to keep up with my plan," Fontaine said.

Leading up to the Penticton race, one of the books Fontaine turned to for advice was Gale Bernhardt's "Training Plan for Multisport Athletes: Your Essential Guide to Triathlon, Duathlon, Xterra, Ironman & Endurance Racing." Bernhardt's advice was similar to what others had told Fontaine: Drink up.



Courtesy of Dan Fontaine

Without a coach, Fontaine set a goal of drinking 16 oz. of fluid every hour during the Ironman. Many elite triathletes set no hydration goals and drink only when thirsty.

"Dehydration levels as low as 2 percent of body weight are thought to impair athletic performance—perhaps by as much as 20 percent," Bernhardt wrote.

“People kept telling me how hot it would be ... so I wanted to make sure I wasn't going to get dehydrated.”

—Dan Fontaine

He goes on to say athletes should drink “4 to 8 ounces every 15 to 20 minutes” during endurance training.

Fontaine remembered briefly reading about overhydration and sodium-water balance, but he doesn't remember coming across the term “hyponatremia” in the months leading up to the race, nor was he aware of how dangerous the condition can be.

“Had I had a coach, maybe it's something that would have come up,” he said.

Elite triathletes today do receive advice from their coaches to drink to thirst, exercise physiologist Trent Stellingwerff explained in the CrossFit Journal article “Hydrating the Elite.” However, many recreational or first-time triathletes, such as Fontaine, don't have coaches.

Fontaine carried on drinking every 20 minutes during the race, his ultimate goal being to consume about 16 oz. each hour.

He was one hour into the 112-mile cycle when he had to urinate.

“I passed a rest area, and there were Porta Potties and a bunch of people waiting in line, so I said, ‘Fuck it, I'll go to the next one,’” he recounted. “Within five minutes after that, I started to cramp pretty severely. So I downshifted and slowed down. ... Within one minute, I pulled off to the side of the road and vomited violently.”

Courtesy of Rachel Corey



An Ironman veteran, Rachel Corey said larger events generally include better-trained medical personnel. In some races, medical staff are acutely aware of the dangers of hyponatremia.

He added: "The cramps went on for an hour-and-a-half as I sat on the side of the road. I tried to recompose myself and get up and grab my bike, but every time I stood up the cramps got me and I couldn't stand up straight."

The only thing that marginally alleviated his discomfort was lying down. Every so often, he sat up and tried to drink. Each time, he vomited.

"And then it dawned on me that I wouldn't be able to drink until I had salt. But I didn't have any salt," Fontaine said.

Tired, nauseous and cramping severely in his stomach, Fontaine resumed his place on the side of the course, hoping someone would bring him salt.

After some time, Fontaine noticed a paramedic tent in the distance. He walked over, told the staff what had happened and asked for salt. They didn't have any.

Untroubled by Fontaine's belief that his blood-sodium levels were too low, the medical staff brushed off his concerns and asked him if he was going to continue the race.

"I'm not ready," Fontaine said.

He added, laughing: "Then I told them, 'So I'm just going to sit over there. If you see me pass out, do you mind taking me to the hospital?'"

"I tried to recompose myself and get up and grab my bike, but every time I stood up the cramps got me and I couldn't stand up straight."

—Dan Fontaine

Fontaine returned to his resting place until eventually the “sag wagon” came along.

“They’re the ones who pick up the people who quit the race,” he said. “I was last at that point. Everyone had passed me, and they asked me if I wanted to quit.”

He asked them for salt. They didn’t have any. Fontaine persisted. One woman darted off to a local fruit stand, where she acquired a jar of pickling salt.

“So I started eating it. I put my tongue on it and let it dissolve. I couldn’t swallow water without puking, but with the salt, I could now swallow water,” Fontaine said.

He carried on licking the salt for 15 minutes. The cramps disappeared. He started feeling better.

Although Fontaine noticed an almost instantaneous reaction to pickling salt, the science around salt supplementation is “controversial,” Rosner said. While supplementing with salt might seem like common sense to an endurance athlete, he added, the science is still unclear as to whether salt supplementation helps prevent or alleviate EAH.

Nobody to the Rescue

Dr. Tamara Hew-Butler, a professor of exercise science at Oakland University in Rochester, Michigan, has spent the last 15 years researching hyponatremia. One of her goals is to educate the endurance community—including athletes, coaches, medical staff and volunteers—about the dangers of drinking too much. Hew-Butler is herself a marathon runner.

“Our efforts so far have been grassroots—individuals doing the best they can within their communities.”

—Dr. Tamara Hew-Butler



Dave Red CrossFit Journal

Dr. Tamara Hew-Butler has researched hyponatremia for 15 years after seeing its effects at the 2000 Houston Marathon.

Hew-Butler’s interest in EAH started in 2000 at the Houston Marathon in Texas. It was a particularly hot day. Many runners drank too much, and four ended up in comas. One of the major problems: Medical staff at the event assumed the runners were dehydrated and administered IVs, ultimately making the situation worse. (More information about this incident can be found in the CrossFit Journal article “[Confronting the Drinking Problem.](#)”)

Since that day in 2000—a day Hew-Butler said she will never forget—she has been committed to her cause. While she said people are more educated about hyponatremia than they were in 2000, there’s still a long way to go, especially when it comes to educating medical volunteers at endurance events.

“Whether or not race participants, spectators, event staff, medical personnel ... are educated or not really comes down to the knowledge base of the event medical director.

So you will see large disparities in care depending on how knowledgeable the head medical person is and how well he can persuade the race director to hold training sessions with everyone involved in the race,” Hew-Butler said.

She added that larger endurance events, such as the Boston Marathon, which hosted more than 35,000 participants in 2014, generally do a better job of training their medical team and volunteers than smaller events.

As detailed in the CrossFit Journal article “WaterWise,” Dr. Dale Benjamin Speedy had success in the late 1990s educating the endurance community in New Zealand about EAH.

Speedy implemented a prevention program to educate aid-station workers to avoid forcing liquids on athletes. His



Courtesy of Rachel Corey

Corey believes a friend suffered from hyponatremia during a race but said on-site medical personnel weren't sure what was wrong, highlighting a large hole in the race-day safety net.

findings—published in 2000 in the Clinical Journal of Sports Medicine article “Diagnosis and Prevention of Hyponatremia at an Ultradistance Triathlon”—noted the number of New Zealand Ironman participants who were treated for EAH decreased from 3.8 percent in 1997 to 0.6 percent in 1998.

Rachel Corey, a longtime triathlete, has completed two Ironman and 10 half-Ironman races. The 33-year-old from Boise, Idaho, is a registered nurse who's participated in triathlons in Arizona, Florida, Idaho, Oregon and Washington. Her thoughts echoed Hew-Butler's.

“Medical staff at the larger events seem to be more educated. ... In the smaller races, I don't think they're well trained in that area.”

Small events, Corey added, don't have the funding or resources.

“But in larger races they're starting to weigh runners before and after (the race). If they gain weight, then you know they're overhydrated,” she said.

Athletes should expect to lose between 2 to 4 percent of their body weight during an endurance event, Hew-Butler explained. If an athlete finishes a race or a training session weighing the same or more than when he started, he's overhydrated, she said.

Corey said she believes a friend of hers suffered from hyponatremia during a triathlon race but wasn't officially diagnosed because medical personnel at the event weren't sure what was wrong and had no way of administering a blood test.

Most paramedics at endurance events don't have access to portable electrolyte monitors, so they're unable to measure blood-sodium levels themselves, Hew-Butler said. Point-of-care devices that allow measurement of an athlete's blood-sodium levels on site often cost in the neighborhood of US\$8,000, Hew-Butler explained. Most events don't have funding for this.

Despite the financial limitation, Hew-Butler said medical personnel should still be able to assess an athlete based on his or her symptoms.

“At first, we (clinicians) tried to classify hyponatremia by a numerical value,” she said.

“I definitely didn’t know how dangerous it was. I didn’t realize until much later that people die from it.”

—Dan Fontaine

Mild hyponatremia was defined as falling between 130 to 134 mmol/L, while 120 to 129 mmol/L was considered moderate, and less than 120 mmol/L was seen as severe. A blood test is required to discover this information.

“But then we realized that the number didn’t really tell us how sick an athlete was (or) have any predictive value on how well the athlete would recover,” Hew-Butler said.

She explained scientists believe the “rate of decline”—the amount any given athlete’s sodium concentration changes during exercise in relation to where it started—is likely more important than the number measured by a blood test.

“So now we classify severity due to clinical signs and symptoms,” she said.

Fontaine, who was vomiting profusely, would have been considered to have moderate EAH had knowledgeable medical personnel assessed him, she said. Mild symptoms include lightheadedness, dizziness and nausea, while severe symptoms include altered mental status, disorientation, seizures and coma.

This is the kind of education medical staff and volunteers at endurance events need, Hew-Butler said. Judging by Fontaine’s story, there’s still work to be done, she noted.

“Our efforts so far have been grassroots—individuals doing the best they can within their communities,” Hew-Butler said.

While it’s a good start, she added she’s interested in reaching athletes and medical personnel on a wider scale—to stop situations like Fontaine’s.

“There persists a lack of knowledge on appropriate hydration strategies and even basic knowledge on what causes EAH or, even worse, that drinking too much fluid during exercise can kill athletes,” she said.

14 Hours, 58 Seconds

Today, Fontaine views his Ironman experience much differently than he did in the moment. Back then he still wanted to finish the race.

After two hours of resting mid-Ironman, Fontaine got up and started cycling again. He no longer cared about his time. He was just happy to be moving. At one point, he pulled over and gave another athlete his spare tire. He helped another fix a chain.

When he reached the storage area where he kept his bag, he drank a smoothie. Later, he had some cold chicken soup. Every time he ate, he felt a bit better.

Fontaine finished the cycle just five minutes before the cut-off to begin the 26.2-mile run.

Nobody was happier to see him run by than his parents, who had been worried sick about their son. They had been watching the progress report to see where he was, and suddenly information about his whereabouts stopped coming.

“I ran by them. They were so excited to see me. And I told them as I ran by, ‘I have a good story for you.’”

Fontaine finished the Ironman in 14 hours, 58 seconds and then set out to discover what went wrong.

“I went home and started looking into it ... to find out what happened. I knew that I screwed up on my salt-water balance, but I hadn’t processed hyponatremia,” Fontaine said.

“I definitely didn’t know how dangerous it was. I didn’t realize until much later that people die from it.”



About the Author

Emily Beers is a CrossFit Journal contributor and coach at CrossFit Vancouver. She finished 37th at the 2014 Reebok CrossFit Games.