

# LOVE THE HEAT

How to use heat acclimation strategies to achieve optimal performance in hot weather races.

By Ben Greenfield



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Participants in the 2008 Ironman Louisville event may recall stepping onto a Tanita body composition scale during athlete check-in. This scale measures approximate hydration levels, and data collected from all 1,782 participants revealed some interesting key findings:

- In men who tested with a hydration level above 65 percent, 97.78 percent finished. Men who tested with a hydration level below 55 percent either finished in the bottom 18 percent or did not finish.
- In women who tested with a hydration level above 60 percent, 92.5 percent finished. Women who tested with a hydration

level below 50 percent either finished in the bottom 13 percent or did not finish.

In this article, you'll learn why the Tanita study revealed hydration to be such a crucial component of Ironman, what the implications are for a hot and humid race like Ironman Hawaii and how to design a complete hydration and heat acclimation strategy for any race, no matter whether you're from a hot or cold climate.

The average person's body contains about 85 pounds of water, over 60 percent of which is inside the cells. When the water outside the cells becomes depleted, which happens at a rapid rate during exercise in hot or humid conditions, the water inside the cells moves

out to replace the lost fluids. As the cells dehydrate and shrink past 3 percent fluid-volume loss, physical performance begins to suffer. After 5 percent water loss, concentration loss occurs; after 10 percent water loss, consciousness severely decreases, and after 11 percent fluid loss (slightly over 15 pounds in an average individual), death may occur.

In addition to loss of cellular function, dehydration depletes blood volume, which limits cooling, and oxygen and sugar delivery. Meanwhile, loss of electrolytes via sweat affects normal electrical function of the body, resulting in cramping and loss of muscular contraction control.

In hot weather and humid conditions such as at Kona during the Ironman World Championship, the average temperatures on race day will range from 82 to 95 degrees F, with the humidity hovering around 90 percent. In these conditions, the sweat rate of the average individual will be a minimum of 1 liter per hour, and can reach up to 2 liters per hour, which is 70 ounces of fluid, or nearly three water bottles! Furthermore, with a sodium loss of 800–900 mg/liter in these conditions, a heavily sweating athlete can reach nearly 2 grams of sodium loss per hour, accompanied by a significant loss of other minerals such as calcium, magnesium and potassium.

While we can't all have the genetic gifts and ability to tolerate the levels of heat and humidity in the lava fields, the body can be trained to tolerate extreme temperatures, retain higher amounts of water and blood volume and lose less salt. This process is called acclimation.

The first step of acclimation requires gathering actual fluid loss data for your specific body. A simple method is to weigh yourself nude prior to exercise, and then conduct two hours of exercise outdoors or in a controlled environment that simulates race-day conditions. After the session, re-weigh yourself, account for any fluids you have consumed, and determine your total loss of fluid. For example, if you weigh 150 pounds, you drank 50 ounces

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of water over two hours, and your weight loss is two pounds, or 32 ounces, then you know your total loss over two hours was 50 + 32, or 82 ounces. A simple rule is to replace 40 percent to 50 percent of fluid loss at regularly timed intervals during exercise, with an upper limit of total water intake at 33 ounces per hour, which is the maximum fluid absorption rate of the body (additional fluid can cause water intoxication). Attempt to limit total fluid loss during exercise to no more than 2 per-



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cent, but remember that during very long training sessions that exceed five to six hours, you may also lose a pound or more in energy stores (glycogen, fat and muscle tissue).

Next, you must engage in heat acclimation sessions—preferably beginning 14 days from your planned event. The ideal length of a heat acclimation exercise session is 60 to 90 minutes, and should simulate race-day conditions as closely as possible. For cool-climate athletes, this will mean training indoors with a radiating heat fan or humidifier placed near the indoor bike trainer or treadmill, or exercise sessions in a sauna or steam room. During these sessions, you should not only train your body to absorb your goal fluid intake, but should also engage in regularly timed electrolyte consumption of sodium, potassium, magnesium and calcium. While excessive clothing is not necessary, a non-breathing cotton layer covered by a nylon shell can enhance humidity in the absence of a humidifier.

In the final week leading up to the race, ensure that you continue to adequately hydrate, both during and after exercise sessions, preferably with at least 2 L of water per day. In addition, the body's electrolyte stores can be maintained with salt capsule or tablet consumption, use of oral or topical magnesium

and consumption of smaller amounts of trace minerals in liquid or capsule form. On race morning, consume 20 to 25 ounces of water per hour leading up to the race, tapering fluid consumption approximately 30 minutes prior to the swim start.

While a heat acclimation strategy will significantly assist with race-day performance, additional cooling techniques should be used during the event, including frequent skin and clothing exposure to ice and cold water, wearing vented or meshed apparel, using a visor and sunglasses, limiting excessive food consumption and avoiding heavy sunscreen use (which can affect sweat rate).

If you're properly heat acclimated, then during the race you will experience decreased core temperature, heart rate, salt loss and rate of perceived effort, with increased exercise tolerance, cooling capacity and blood volume. While you can never expect to finish a race such as the Hawaii Ironman in a fully hydrated condition, you can absolutely control the damage and performance detriments that occur, which will translate into a bigger smile on your face at the finish line! **A**

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