

## Ask Dr. Spoke

*Dear Dr. Spoke: I know hydration is important in cycling but not sure about how much, how often and factors influencing hydration.*

*Feeling there Heat*

Dear Feeling the Heat,

Great question. Let me start, my response is a bit anecdotal and a lot from internet search. A good article from British Cycling [here](#) provided the framework for this discussion.

We are a bag of water! Depending on the source, our body mass is somewhere between 60% to 72% H<sub>2</sub>O. As an aside, the Earth is approximately 72% covered by water. Approximately 50% of blood is water. Of the many functions water serves, one very important is regulating body temperature / heat management through good old-fashioned sweat. Dogs pant with their tongues out to manage heat. We release water through pores onto skin and cool through evaporative loss. Still trying to figure out how cats keep cool. But I digress.

Sweat production is, of course, a function of our metabolic rate. As we exercise, our metabolic rate increases causing body heat to increase. The cooling effect of sweat attains a necessary homeostasis or equilibrium of heat build-up to heat dissipation. Factors affecting sweat production are intensity of the workout – cycling, ambient temperature, body mass (bigger means more sweat), and general physical condition. Leaner, more fit cyclist will generally sweat less.

Heat loss through sweat is the second part of the equation. Environmental factors such as air temperature, humidity, ambient wind, and altitude will all affect evaporative loss. For us in Albuquerque, our evaporative rate is higher and so we may not notice we are sweating, and thus may not recognize our depleting water reserves – dehydration – in time. I note, cold weather can also mask dehydration (loss through breathing). How one dresses is important. As cyclists, we must wear clothing maximized to wick sweat and heat away.

So what is the big deal? First, the more noticeable is performance loss. The others are the physical perils of heat exhaustion and heat stroke. Another aside, some individuals see water loss as a means of weight management. We know the type who wears sweats on a 100 degree F day. It is a fool's errand and dangerous.

Some years ago one of my friends put me onto hydration packs such as the Camelbak to use while mountain biking. Previously I carried water in the form of two 750ml bottles in their cages. Certainly, I hydrated but how often? Those who mountain bike understand reaching for a bottle and riding is a bit trickier than for a road bike. When I started using the hydration pack, I hydrated more frequently – more adequately! The change in my performance was very noticeable.

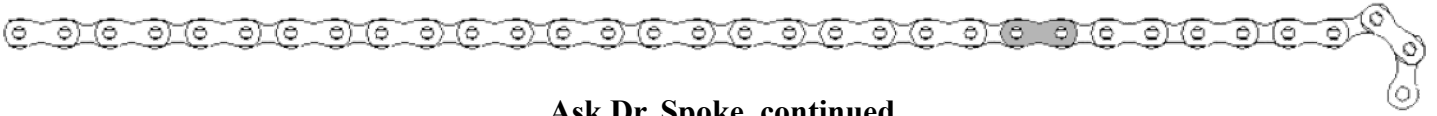
Why? Even low fluid losses can have an impact. A 2% drop, based on one article, will impair performance. A 4% drop will affect one's capacity for muscular work. At 5%, heat exhaustion can be an issue and muscular capacity drops up to 30%. Keep going to 7%, hallucinations may occur. At 10% circulatory collapse, heat stroke and death become very real. For reference, a 2% drop for a 180 lb rider is approximately 1.5 to 2 quarts of water.

While performance loss from dehydration has several physiological factors, these really caught my attention: decreased sweat rate, decreased heat dissipation, and increased core temperature. It's a deadly trifecta.

How does one monitor hydration? To quantify, weigh oneself before and after exertion. If one notes significant drops in weight post-exercise, one is likely dehydrated (assuming no other physical issues). Another is one's urine. A properly hydrated and otherwise healthy individual's urine will be a clear, pale yellow. As dehydration progresses, our kidneys work to reduce fluid loss resulting in urine becoming darker and an amber color. One will also note decreased urination as dehydration progresses.

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## Ask Dr. Spoke, continued

How much water should one consume? I stress this varies from individual to individual. One way to gauge water usage is to weigh (clothes off) before exercise. After one hour exercise, dry residual sweat off and weigh again. This will provide one's loss rate. To convert, one gram is equivalent to one milliliter of fluid. I'll leave it to the "student" to sort it out. Practically most riders will lose between 500 to 1000 ml per hour (one liter is about one quart). Replenishment is essential but may be 75% of total loss.

Leading us back to the hydration pack. A good rule of thumb is two-three healthy gulps every 15 minutes beginning at the ride and throughout. Water bottles require coordination hence potentially reduced usage while riding (especially on the mountain bike). During summer I also use my hydration pack while road biking. *As a safety tip, when in the front or middle of a pace line reaching for and dropping a water bottle is highly hazardous to the trailing riders!*

So, water is essential. But what else one may ask? Electrolytes. For a short ride, under 60 minutes, water alone is sufficient. For longer rides, one must replenish lost electrolytes or salts. Insufficient electrolytes will impair cellular functions resulting in severe physiological distress. The principal salts are sodium, potassium, calcium, and magnesium. One can get sufficient replenishment from sport drinks like Gatorade. I note, sport drinks also contain carbohydrates. For those wishing to avoid carbohydrates, an alternative is electrolyte tabs dissolved in a water bottle. Any local bike shop will have several choices.

Can one drink too much water? Yes. I know of at least one instance when a runner excessively drank water (no electrolytes) at each rest stop to the point of severe over-hydration. The consequence was to greatly dilute her depleted electrolytes resulting in her death. It's unusual, but real.

Two hazards one must prepare and treat as medical emergencies are heat exhaustion and heat stroke. I offer the following but wish to emphasize the symptoms and first aid may not be complete in their description. For a quick reference, see the graphic on the next page or go to the CDC website at <https://www.cdc.gov/disasters/extremeheat/warning.html>.

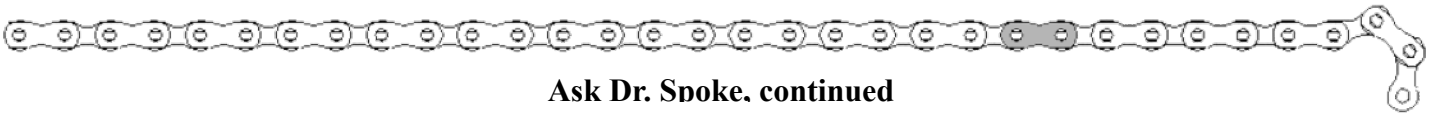
Heat exhaustion exhibits itself through clammy/warm skin, weakness, nausea, dizziness, irritability, thirst, and headache. First aid involves moving the victim to a cool place; removing extra clothes; cooling through fanning/wet towels; and, drinking water and sports drink (electrolytes!). Only withhold fluids if too disoriented to drink or vomiting.

Heat stroke is deadly! Victims will have nearly or completely stopped sweating, their body temperature will be abnormally high, skin will be dry (hot and red), elevated pulse, nausea, and confusion. Unconsciousness may occur. CALL 911! First aid involves moving the individual to a cooler place. Attempt to cool the individual with cool cloths or cool bath. Do not give the person fluids.

Let me conclude. In sailing, there is an old rule if one is thinking about reefing (reducing sail area in higher winds), they have waited too long. For us cyclists, waiting to drink until thirsty is waiting too long. We should begin the ride with our body water table topped off and replenish as we ride. Drink too much at first? More "comfort stops." For the long rides, we must include electrolytes. Start by sipping a sport drink an hour before the ride. Managing water and electrolyte levels are essential to our health and safety.

If you have a question for Dr. Spoke, send an email to "[DrSpoke@nmts.org](mailto:DrSpoke@nmts.org)" and watch for a response in a future newsletter.

An archive of this and prior "Ask Dr. Spoke" articles is available on the NMTS web site at <https://www.nmts.org/spoke.php>.



## Ask Dr. Spoke, continued

# HEAT-RELATED ILLNESSES

### WHAT TO LOOK FOR

### WHAT TO DO

#### HEAT STROKE

- High body temperature (103°F or higher)
  - Hot, red, dry, or damp skin
  - Fast, strong pulse
  - Headache
  - Dizziness
  - Nausea
  - Confusion
  - Losing consciousness (passing out)
- Call 911 right away-heat stroke is a medical emergency
  - Move the person to a cooler place
  - Help lower the person's temperature with cool cloths or a cool bath
  - Do not give the person anything to drink

#### HEAT EXHAUSTION

- Heavy sweating
  - Cold, pale, and clammy skin
  - Fast, weak pulse
  - Nausea or vomiting
  - Muscle cramps
  - Tiredness or weakness
  - Dizziness
  - Headache
  - Fainting (passing out)
- Move to a cool place
  - Loosen your clothes
  - Put cool, wet cloths on your body or take a cool bath
  - Sip water
- Get medical help right away if:**
- You are throwing up
  - Your symptoms get worse
  - Your symptoms last longer than 1 hour

#### HEAT CRAMPS

- Heavy sweating during intense exercise
  - Muscle pain or spasms
- Stop physical activity and move to a cool place
  - Drink water or a sports drink
  - Wait for cramps to go away before you do any more physical activity
- Get medical help right away if:**
- Cramps last longer than 1 hour
  - You're on a low-sodium diet
  - You have heart problems

#### SUNBURN

- Painful, red, and warm skin
  - Blisters on the skin
- Stay out of the sun until your sunburn heals
  - Put cool cloths on sunburned areas or take a cool bath
  - Put moisturizing lotion on sunburned areas
  - Do not break blisters

#### HEAT RASH

- Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)
- Stay in a cool, dry place
  - Keep the rash dry
  - Use powder (like baby powder) to soothe the rash

