

Cracking the Code on Hydration

Acclimating your body to hot weather reduces your electrolyte losses

By Gale Bernhardt For Active.com Edited by Dr. DeFabio

For most cyclists, competing in events under 90 minutes does not cause many problems for hydration, electrolyte supplementation and fueling. Water or a mostly-carbohydrate sports drink work well for both fueling and hydration. In most cases, cyclists do not need to supplement with electrolytes for sessions under 90 minutes long, but there are some athletes who lose above normal amounts of electrolytes while sweating that will benefit from supplementation during short sessions.

Sweat Rate and Electrolyte Losses

If you are attempting to delay the onset of dehydration during exercise, the first step is to **determine your personal sweat rate** in various situations.

Given the same fitness level and environmental conditions, your sweat rate will vary depending on your cycling situation. If you are sitting in the peloton and conserving energy, your hourly sweat rate will be lower than if you are in a three-person breakaway fighting for a podium position.

Because the average speed you produce on a bicycle is not always an accurate reflection of your actual work effort, you can consider linking your sweat rates to your work effort in terms of heart rates produced or average power output.

Cycling situation aside, your fitness and heat acclimatization affects your sweat rate and the contents of your sweat. See the table below.

Electrolyte Contents of Sweat and the Affects of Fitness and Heat Acclimitization			
Electrolyte	Sweat of unacclimatized, unfit subject	Sweat of fit but unacclimatized subject	Sweat of fit and acclimatized subject
Sodium (Na ⁺)	3.5	2.6	1.8
Potassium (K ⁺)	0.2	0.15	0.1
Magnesium (Mg ⁺)	0.1	0.1	0.1
Chloride (Cl ⁻)	1.4	1.1	0.9

* All values in grams per liter.

* Table adapted from Table 4.2 Electrolyte Contents of Sweat and Blood and the Affects of Fitness and Heat Acclimitization, "Fourth Edition, Lore of Running", Tim Noakes M.D., pp. 214

The major affects of acclimatization to heat can be accomplished in 10 to 14 days. As you can see from the table, if you are unfit and not acclimated to the heat you will lose almost twice

the sodium, twice the potassium and one-and-a-half times the chloride in your sweat compared to when you are fit and acclimated.

The bottom line: Fitness and acclimatization reduces your electrolyte losses.

Electrolyte Replacement

It is much easier to determine your sweat losses during exercise than it is to determine your electrolyte losses.

Do you need to take electrolyte tablets or are the electrolytes in your energy drink enough?

Unfortunately, there is no easy and universal answer to that question. According to Noakes, it is "the amount of sodium and potassium in the body that determines the water balance, not the other way around." Therefore, your electrolyte balance affects your hydration balance.

A good place to begin is to consume a sports drink containing electrolytes when training or racing for durations over two hours. If you believe, based on the salt mine on your clothing and helmet straps, that you lose a lot of electrolytes in your sweat consider supplementing with electrolyte tablets.

Begin with the low end of the manufacturer's recommended dosage AND the recommended fluid intake. Be very wary of water cooler or message board recommendations to pop a handful of electrolyte tablets because "top racer Ricky or Renee" does.

Remember: your body likes balance. Consuming too much water and no electrolytes during extended exercise is not good and can cause hyponatremia. Consuming too many electrolytes with too little fluid is not good and can cause your body to retain fluid rather than releasing it for cooling purposes.

Fluid Replacement

The average sweat rate is between 0.8 to 1.4 liters (roughly 27.4 to 47.3 ounces) per hour during exercise. The average fluid absorption rates range from 0.8 to 1.2 liters per hour (27.4 to 40.6 ounces). Unfortunately, while the sweat-rate range and the fluid absorption ranges are close, some athletes sweat at higher rates per hour than their fluid absorption rate.

Do you have to replace every drop of sweat you lose during exercise? The rule of thumb is that you should neither gain weight during exercise (consuming more fluid than you lose) nor lose excessive weight. Excessive weight loss is considered to be more than 2 percent of your body weight.

If you lose up to 2 percent of your body weight, performance is affected less if you are performing in a cool environment than if you are performing in a hot environment. Weight losses above 2 percent of your body weight should be avoided.

Gastric Emptying

Sloshing. It's a horrible feeling. Sloshing occurs when you are consuming fluids--and perhaps solids--but rather than moving to your intestines the mix just sits in your stomach. Sloshing is worse for runners and mountain bikers than road cyclists, but roadies get it too.

Eventually, sloshing is followed by slowed-to-a-snail's pace performance, barfing or both.

You can increase the rate of gastric emptying by:

- Keeping a small fluid volume in your stomach by consuming fluids every 15 to 20 minutes rather than attempting to consume larger quantities of fluid at 60-minute or more intervals.
- Keeping fat, protein and carbohydrate concentrations low. How much protein and fat you can tolerate depends on your exercise pace and individual tolerance level.
- Remaining hydrated. Dehydration decreases gastric emptying.
- Keeping exercise intensity low. Intensity above 75 percent of maximum decreases the emptying rate.

You can increase intestinal fluid absorption by:

- Using a low-to-moderate level of glucose plus sodium.
- Using a low-to-moderate level of sodium.

What Should You Do?

All of this information can seem overwhelming. To begin cracking your hydration code:

- Determine your sweat rate in various environmental and racing conditions.
- Once you know your sweat rates, hydrate at rates appropriate to each situation. Your sweat and hydration rates are not constant and will need conscious modification given your fitness, the environment and your pace.
- Hydrate so that you keep your body weight loss to less than 2 percent during training and racing sessions.
- Avoid over-hydrating and weight gain during exercise sessions.

Most importantly, know that you have a range of optimal fluid replacement and what is optimum for you may or may not work for the athlete standing next to you.

Gale Bernhardt was the 2003 USA Triathlon Pan American Games and 2004 USA Triathlon Olympic coach for both the men's and women's teams. Her first Olympic experience was as a personal cycling coach at the 2000 Sydney Olympic Games.

References:

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Research has shown that as little as 2% dehydration leads to decreased performance. Take the time to determine your hydration needs to maximize your performance: if someone is going to out perform you, let it be on conditioning or skill, not on basic nutrition. Dr. DeFabio

**For Additional Information Contact
DeFabio Chiropractic Associates
The Athlete's Doctor
908-771-0220**