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Swimming Hydration, Electrolyte Strategies for Improved Performance and Muscle Cramp Prevention

Guest column by Ralph Teller, 1Vigor.com

WHETHER you are a competitive short or long course pool swimmer or a casual or competitive open water swimmer, attention to good hydration and electrolyte balance is essential not only to your enjoyment of swimming and peak performance, but also to muscle cramp prevention, health and safety.

One of the biggest threats to a swimmer's performance, safety and health is dehydration. Dehydration is an illness which causes extreme electrolyte imbalances in the body. It occurs when you do not take in enough fluids to replace what have been lost through sweat and urination. While dehydration is a danger during any sport of physical exertion, it is more so during swimming. This is true for two reasons. First, when you exercise, you sweat. When you are in the water swimming, you do not realize that you are still sweating losing fluid. Second, because you are surrounded by water, your brain is tricked to think you have all the fluid you need, and does not signal your mouth and throat to be thirsty.

Hydration, Kidney Health and Swimming Performance

Maintaining good hydration is particularly important to competitive and distance swimmers as the continuity of good hydration is important to kidney health. Our kidneys play two very important roles. First, red blood cell production begins in our kidneys with the production of the hormone Erythropoietin. Maintaining a good red blood cell count will directly impact our athletic performance, aerobic fitness and maximal oxygen consumption capacity (also called VO2 max). Second, our kidneys play a key role in electrolyte balance.

Fluid Intake Requirements for Swimming

Dehydration can contribute significantly to fatigue and can be detrimental to swimming performance – not only physically, but also mental skills such as focus, technique skills, judgment and decision making can be adversely affected.

Here are some key hydration points to consider:

- In general, to determine how much water you should be consuming on a daily basis, divide your body weight by half. That is amount of water in ounces you should be consuming daily without exercise.
- Two hours before exercise, swimmers should consume 16 fluid ounces (or half a litre) of water or a sports drink to help hydrate them ahead of time.
- Swimmers should always bring a plastic drinks bottle with them to training sessions.
- Long-term, moderate to intense activity of 30 minutes or more requires periodic rehydration, such as the 8 fluid ounces (quarter of a litre) every 20 minutes.
- Another measure of adequate fluid intake is body weight. Athletes are recommended to weigh themselves daily prior to training so they can become aware of decreases in body weight due to dehydration. Athletes who are down 1-2% in body weight can be assumed to be dehydrated. Performance can suffer when a swimmer loses as little as two (2) percent of body weight as sweat. Average sweat losses have been estimated at 365ml/hr and 415 ml/hr for female and male swimmers respectively, with sweat losses greater during the anaerobic threshold sessions than aerobic sessions.
- A post swim hydration is important to recovery.

What is the Function of Hydration and Electrolytes?

Our body composition is 66% water. Proper hydration and electrolyte balance is important for cellular metabolism, blood flow and therefore physical and athletic performance.

Good hydration and electrolyte balance are critical for nerve and muscle function.

Electrolytes are molecules capable of conducting electrical impulses and include Sodium (Na+), Potassium (K+), Calcium (Ca2+), Magnesium (Mg), and Chloride (Cl).



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Both muscle tissue and neurons are considered electric tissues of the body. Muscles and neurons are activated by electrolyte activity between the extracellular fluid and intracellular fluid. Muscle contraction is dependent upon the presence of calcium (Ca²⁺), sodium (Na⁺), and potassium (K⁺). Without sufficient levels of these key electrolytes, muscle weakness or severe muscle contractions may occur.

Foods and Natural Sources of Electrolytes

It is a good strategy to be in electrolyte balance prior to your swim, race or competition! Here is a list of natural food sources of electrolytes to include in your diet the week leading up to your swim.

A good natural source of electrolytes is from food. Fruit and vegetables, including canned or frozen vegetables like corn, carrots and green beans, are high in electrolytes, as are bread, milk, and fruit. Water with a small pinch of salt (1/3 tsp per liter), sugar (3-5 tsp/liter) and flour added to it will provide electrolytes and energy.

A teaspoon is approximately 5 grams (5000 mg) and for sodium chloride (table salt) about ½ of this is sodium (this is an approximation as a teaspoon measures volume and grams are a measure of mass and every item has a different mass but it is close enough). Most sport drinks sodium at contain ~ 50 mg / 100 ml (0.5 g / liter). So ½ tsp in 2 liters is about the correct amount.

Electrolyte content of some foods (note 100 g is about 3.5 oz)

mg/100g Na Cl K

Milk 55 100 139

Wheat flour (whole) 2 38 290

Rice (polished, raw) 6 27 110

Potatoes 3 79 410

Carrots 50 69 311

Apricots 0.6 — 440

Dates (dried) 1 290 790

Oranges 1 3 170

Bread (whole meal) 540 860 220

Bananas 1 93 467

It's a good idea to take a salt pill with water at the onset of cramping. This might quickly stop the cramping.

Muscle Cramps are Symptoms of Improper Hydration or Electrolyte Imbalance – Other Warning Signs

If you are feeling thirsty, you are already somewhat dehydrated. If you have any of the following warning signs of dehydration, for safety it is recommended you not to engage in long distance swimming in open water or by yourself.

The warning signs of dehydration include:

- Thirst
- Muscle cramping
- Headaches
- Dry mouth
- Weakness
- Unclear thinking
- Fatigue
- Dark yellow urine
- Significant weight loss during exercise
- Decrease of sweat during exercise



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Things to Avoid to Maintain Hydration and Electrolyte Balance

Two days prior to swimming, you will want to avoid caffeine, alcohol and sugars as much as possible as they are natural diuretics (cause dehydration).

Water Conditions Impact Hydration Needs of Swimmers

Once the body starts to become dehydrated, it can't function at its full capacity and as normal metabolism becomes impaired; your health and physical performance is at risk. Dehydration risks increase during certain water conditions.

1. Cold Water Hydration. Surprisingly, dehydration is also a cold water hazard. Our body's metabolism is revved up more so in cold water as the body strives to maintain a health core body temperature. More hydration is needed water when swimming in cold water.

The onset of dehydration often times is the cause of hypothermia. Hypothermia is very possible during endurance swimming or long pool sessions in cold or cool water.

2. Warm Water Hydration. The debilitating effects of heat stress on the ability to perform prolonged strenuous exercise are well established. During exercise in a hot environment, a substantial rise in body core temperature is often linked with the onset of fatigue and dehydration. Fluid replacement before and during prolonged swimming in the warm water has been shown to be effective in reducing the elevation of body temperature and in extending swimming endurance capacity. Long swims in a wetsuit in too warm water can cause the body to overheat more quickly.

Recent studies have shown that ingestion of a cold drink before and during exercise in the heat reduced physiological strain (reduced heat accumulation) during exercise, leading to an improved endurance capacity. Exercise time was longer with the cold drink than with the warm drink, as the cold drink lowered heart rate, lowered skin and core temperature. Drinking cold drinks during exercise also reduced the need to sweat, resulting in a longer sweating capacity.

When swimming in very warm water, the combination of the external heat and the internal heat produced from the exercise, heat within the body can build causing Hyperthermia which is having a core body temperature that is too high. Maintaining good hydration can reduce the onset of Hyperthermia as good hydration enhances sweating which acts to cool core body temperatures.

3. Rough Water Conditions. Rough water conditions including wind, tide and current related water conditions require greater physical swimming output and thus greater hydration needs.

Ralph Teller is a triathlete and Finisher at Ironman Canada 2005, Ironman UK 2006 Ironman European Championship (Germany) 2007 and the 70.3 Ironman California, Lake Stevens, Longhorn (Austin), Boise and Calgary. Ralph is the founder of 1Vigor.com focused on natural health and peak performance. Ralph is also a lawyer in Washington State, is a Masters Swimmer and resides in the Seattle area. See Ralph's 1Vigor Swim Calendar