HYDRATION AND ELECTROLYTE CONSIDERATIONS FOR TACTICAL ATHLETES

Proper hydration is one of the most fundamental tenets of performance nutrition. For tactical athletes training in extreme environments, proper hydration can be the difference between life and death. Understanding fluid needs and what increases or decreases these needs can help tactical athletes avoid potentially dangerous extremes in terms of hydration.

**FLUID NEEDS**

The first step in any type of hydration assessment is to determine baseline hydration needs, or how much fluid an athlete needs without training. The Institute of Medicine estimates that average adult women need 2.7 L and men need 3.7 L a day, which includes fluid from food (5). The difference in fluid needs for men and women is based largely on average body size and caloric needs. With equal size and physical fitness level, fluid needs do not differ much between men and women. Women sweat less but have similar heat tolerance to men when exercising at equivalent relative aerobic intensities (6). Most men and women can adapt to the heat equally.

Interestingly, age is not a factor with regard to fluid needs or heat adaptation as long as physical fitness levels are maintained (6). There is no specific age when a person’s ability to thermoregulate decreases and they require more fluid; however, after age 65 there may be a decline in renal function, which would reduce the body’s ability to retain water and sodium.

Given these average requirement guidelines, fluid needs for tactical athletes can be much higher depending on body size, strenuous physical activity, and environmental factors. In addition, uniforms worn by tactical athletes may increase sweat rate. For example, heavy protective uniforms can induce a sweat rate of 1 – 2 L per hour (6). Apart from using average requirements, another way to determine fluid needs is to use ½ – 1 oz per lb of bodyweight, which accounts for additional fluid for training and exercise. This formula may better prepare a tactical athlete to meet their fluid requirements. For example, a 180-lb tactical athlete needs 90 – 180 oz (11 – 23 cups or 3 – 6 L) of fluid daily.

**ENVIRONMENT**

Understanding how an environment affects fluid losses can help the tactical athlete prepare for activities in that environment. There are two types of heat: wet and dry. Wet heat, or humidity, is generally at locations closer to sea level, while dry heat is normally at higher elevations. Given equal temperatures, the body is apt to sweat more in dry climates and have a more difficult time cooling down in humid climates. The human body can lose up to 1 – 2 L per hr in hot climates, regardless of whether it is a wet or dry climate (6). However, be aware that during physical exertion, the primary mechanism of heat loss is through evaporation (8). In humid environments, the increased water vapor content in the air alters the concentration gradient and reduces the air’s ability to accept more water vapor molecules through evaporation, so the body becomes less efficient at cooling itself and core temperature can rise dramatically (8).

Elevation affects fluid needs significantly. Regardless of temperature, individuals at elevations over 5,000 ft will require an additional 1 – 2 L of fluid a day, largely due to physical changes in respiration and urination due to acclimatization (7). Additionally, the more acclimatized a person is, the less electrolytes they will lose in their sweat (7). Increasing fluid intake may help prevent acute mountain sickness and dehydration.

Cold temperatures are often overlooked, but tactical athletes can lose up to 3 – 4 L per day from breathing in extremely cold environments (7). The body is able to thermoregulate using respiration in cold temperatures. Therefore, inadequate hydration in cold temperatures can put tactical athletes at a higher risk for hypothermia.

**REPLENISHING ELECTROLYTES**

After determining estimated fluid requirements, tactical athletes must decide what to drink. The selection process for a sport drink can be quite overwhelming, and the added ingredients in many sport drinks can be confusing. A sport drink label should not look like a multivitamin label. Some tactical athletes take multivitamins already and it is possible to get too much of certain vitamins and minerals, which can have negative effects. Sport drinks should not contain caffeine unless the tactical athlete is intentionally using it as a stimulant.

Supplementing sport drinks with 3 – 4 daily meals and snacks can be an effective way to replace the main electrolytes lost in sweat (sodium and potassium) and should provide a small amount of carbohydrates to aid in absorption. For example, if a tactical athlete training in harsh environments requires 5,000 mg of sodium, it can be estimated that approximately 3,000 mg of sodium can be consumed through 3 – 4 meals and snacks throughout the day. This means that approximately 2,000 mg of sodium can be taken in 1 – 2 L of a sport drink. A tactical athlete training in a temperate environment or performing an easy training day may only require 2,000 – 3,000 mg of sodium, which might be adequately consumed in their normal diet, or with the addition of a small amount of sport drink. While sweating usually also results in a loss of magnesium, iron, zinc, manganese, and calcium, most diets suffice to compensate for these losses (6).
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SWEAT RATES
The goal is simple—replace the fluids and electrolytes that were lost. The amount is not the same for everyone but it is not difficult to estimate. Change in bodyweight is an easy way to determine the amount of fluid lost: one pound equals two cups of fluid. One way to determine sweat rates is to weigh the tactical athlete before and after short bouts of training and gradually apply this to longer durations. Different types of activities will produce different sweat rates. For instance, an hour of road marching may produce 1 – 1.5 L of sweat compared to an hour of running, which may produce 0.5 – 1.8 L (6,10). Intensity, clothing, and load carried are all factors that can make a difference when it comes to sweat rates. A general recommendation for tactical athletes is to aim to stay within 2 – 3% of normal bodyweight to remain adequately hydrated and not see a drop in performance (4,9). For a 180-lb tactical athlete, this is about 4 – 5 lb. Dark urine, strong smelling urine, or not urinating at all may be indicators of inadequate hydration. If a tactical athlete is drinking what seems to be sufficient or perhaps excess amounts of water, yet feels bloated, cramped, or has not urinated in a few hours, this may indicate hyponatremia and medical attention may be necessary (4). Hyponatremia, or electrolyte “wash out,” can occur with excessive water consumption, especially when dietary intake is limited (1,3,8). Sodium and chloride are the primary electrolytes lost in sweat; therefore, as the body sweats, sodium and chloride are lost (3). If water is continually replaced in the absence of sodium (e.g., food deprivation exercise or simply limited food intake), the body’s sodium concentrations will be diluted and can lead to an electrolyte imbalance and possible illness (1,8).

CONCLUSION
It is important for tactical athletes to be aware of their fluid intake and hydration status when training for or performing job duties. Tactical athletes can do this by monitoring their urine color, odor, and frequency; understanding environmental factors; and estimating and tracking their sweat rates. In general, it is recommended to replace about 75% of the fluid lost from exercise immediately and replenish the rest afterward (up to 125 – 150%). Forcing hydration is not always the best strategy; rather, listening to the body and drinking before the feeling of thirst may be the best guideline for tactical athletes to stay in a healthy range when it comes to hydration.

REFERENCES
ABOUT THE AUTHOR
Trisha Stavinoha’s United States Army and dietetic career began in 1998 after earning her Bachelor of Science degree in Nutrition from Texas State University and being accepted into the United States Army’s dietetic internship program. Stavinoha earned her Master of Science degree in Sport Nutrition from Long Island University while concurrently competing on their track and field and cross-country teams. She has been a credentialed sport dietitian and strength and conditioning coach since 2008. Her credibility in sport nutrition comes from being a soldier, scholar, and athlete. Stavinoha’s experience with athletes includes a wide range of Olympic hopefuls in the Army’s esteemed World Class Athlete Program, high school and collegiate cross country runners, triathlon and endurance athletes, tactical soldiers, Wounded Warriors, and overweight service members trying to pass body fat and physical fitness standards.

<table>
<thead>
<tr>
<th>ELECTROLYTE</th>
<th>CONCENTRATION IN SWEAT</th>
<th>AMOUNT IN MOST SPORT DRINKS</th>
<th>ADEQUATE INTAKE</th>
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</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>460 – 1,840 mg/L</td>
<td>400 – 1,000 mg/L</td>
<td>1,300 mg/day</td>
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<td>Chloride</td>
<td>710 – 2,840 mg/L</td>
<td>300 – 1,000 mg/L</td>
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<tr>
<td>Potassium</td>
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<td>100 – 800 mg/L</td>
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<tr>
<td>Magnesium</td>
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<td>0 – 160 mg/L</td>
<td>240 – 420 mg/day</td>
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<tr>
<td>Calcium</td>
<td>0 – 3 mg/L</td>
<td>0 – 25 mg/L</td>
<td>1,000 – 1,300 mg/day</td>
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