**What is Exertional Heat Illness?**

Heat Illness associated with physical exertion is known as exertional heat illness (EHI). EHI is a spectrum of disorders to include dehydration, mild heat cramps, heat exhaustion (when the cardiovascular system cannot maintain the high blood flow required for both movement and sweating), and heat stroke. Hyponatremia, or exertional hyponatremia, occurs when excessive water consumption causes an imbalance to the body chemistry. Table 1 summarizes these conditions.

**Why is Heat Illness a concern to the Army?**

Despite well documented effective techniques to prevent EHI, they continue to be a threat to Soldiers in training and combat. On average, 2-3 Soldiers die annually from EHI, and more than 1,000 Soldiers develop an EHI requiring medical attention and/or lost duty time. Even mild heat illness can significantly degrade performance. As a result, Army policy mandates all personnel receive annual heat illness prevention training before May, and all heat stroke and heat exhaustion cases are reported.

**What causes EHI and how can it be prevented?**

EHIs are caused by a combination of external conditions and individual risk factors. Key external factors include heat category within the past 3 days, exertion level, acclimation, and time of exposure and rest period (HEAT).

### Heat category

Most EHIs occur between May and September, especially above 75°F. However, military cases of EHI (including stroke) occur year-round, even in cooler temperatures. In addition to the basic temperature, it is important to consider the amount of sunlight, humidity, and wind speed. The Wet Bulb Globe Temperature (WBGT) index combines these into one value. WBGT Risk Categories (Table 2) must be used to determine activity levels. Prevention: Avoid Risk Categories 4 and 5, especially repeated days; conduct activities at night/ before sun up, in shade.

### Lack of acclimation

Higher rates of EHI are seen among trainees, especially recruits from northern locations. This is often due to incomplete acclimation, when personnel are not used to sudden climate changes or increased frequency and duration of strenuous activities. Prevention: Gradually increase exposure (e.g., 2 weeks or more) to warm climates and higher exertion in warm climates; increase rest periods during high exertion.

**Exertion (duration, frequency, intensity)**

Strenuous physical training, sports, or job tasks increase EHI risk especially if activities extend over long time periods (e.g., >60-90 minutes), are repeated over days, and/or persons must wear protective equipment or carry heavy loads. Physically intense military activities such as Basic Combat Training, field training exercises, and road marches over 8 kilometers are examples of high risk activities. Prevention: Add 5°F to the WBGT for ruck sack/body armor and 10°F for full chemical protective gear to capture actual risk level; minimize activity duration, frequency, level of exertion, and/or gear to reduce risk.

**Dehydration**

Even in moderate weather conditions, heavy exertion causes fluid loss, which can result in dehydration if not replaced. This increases EHI risk and can result in sub-optimal performance. While 2% loss of body weight from dehydration has been suggested as a threshold for reduced aerobic performance, a specific percent cannot be used to assess likelihood of EHI due to individual variability and other risk factors.

**Personal risk factors**

The following characteristics and behaviors are associated with a higher risk of developing EHI:

- **Previously having had an EHI**
- **Not being adequately fit** (e.g., slow 2-mile run times or weight not within Army standards)
- **Currently being ill** (e.g., having fever, diarrhea, or flu)
- **Being especially highly motivated** (e.g., persons who push themselves harder may ignore early EHI signs or symptoms)
- **Recently using alcohol or certain drugs** (e.g., antihistamines, blood pressure medications, decongestants, antidepressants, and some diuretics)
- **Representing an at-risk demographic group** (e.g., the typical Army heat casualty is a Caucasian male <30, but data suggests persons >40 years have higher risk of EHI; men have higher risk of heat stroke, while women have higher risk of mild EHI, including heat exhaustion.)

NOTE: typical consumption of caffeinated drinks has not been shown to lead to fluid loss or dehydration.

**Prevention:** Be aware of high risk persons; identify and mark persons with prior EHI (e.g., use red beads); use buddy system to monitor signs, symptoms, and hydration status.
Table 1. Heat Casualties: Signs, Symptoms, Actions\textsuperscript{1, 10, 11}

<table>
<thead>
<tr>
<th>Heat cramps: a first sign to catch</th>
<th>Heat Exhaustion: catch signs early and treat</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Muscle pain or spasms (abdomen, arms, legs)</td>
<td>• Dizziness</td>
</tr>
<tr>
<td>• Stop activity, move to shade</td>
<td>• Heat in shade</td>
</tr>
<tr>
<td>• Drink juice/water with 1/2 pack salt or sports drink</td>
<td>• Loosen uniform/remove head gear</td>
</tr>
<tr>
<td>• Drink large amounts of water</td>
<td>• Ensure excess water has not been consumed, limit to 2 quarts over 1-hour period</td>
</tr>
<tr>
<td>• Evacuate if no improvement in 30 min, or if condition worsens</td>
<td></td>
</tr>
</tbody>
</table>

Heat Stroke: a medical emergency

- Convulsions and chills
- Confusion, mumbling
- Possibly combative
- Possibly passing out (unconscious)
- Cool and CALL (ASAP)!
- Strip clothing
- Rapid cool (ice sheets)
- Call for ER evacuation
- Continue cooling during transport
- Keep same person to observe for mental change during transport

Hyponatremia: a medical emergency

- History of large water consumption
- Confusion
- Vomiting (liquid, no food)/repeat vomiting
- Clear urine
- Convulsions
- Water intoxication (overconsumption of water) requires medical treatment ASAP!

When in doubt – call 911 for emergency evacuation!

Table 2. Wet Bulb Globe Temperature Risk Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>WBGT, °F</th>
<th>WBGT, °C</th>
<th>Flag Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt; 82</td>
<td>&lt; 27.8</td>
<td>White</td>
</tr>
<tr>
<td>2</td>
<td>82 - 84.9</td>
<td>27.8-29.3</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>85 - 87.9</td>
<td>29.4 - 31.0</td>
<td>Yellow</td>
</tr>
<tr>
<td>4</td>
<td>88 - 89.9</td>
<td>31.1 - 32.1</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>≥ 90</td>
<td>≥ 32.2</td>
<td>Black</td>
</tr>
</tbody>
</table>

Reference:

   Magazine/ArtID/7428/ArticleID/6620
5. Army Medical Surveillance Activity (AMSA), from Defense Medical Surveillance System (March Surveillance Reports: Vol 07/No 03 –Vol 22/No 03).

More:

\textsuperscript{4} APHC Heat Illness Prevention webpage: https://php.amedd.army.mil/topics/hip hailed/Pages/default.aspx