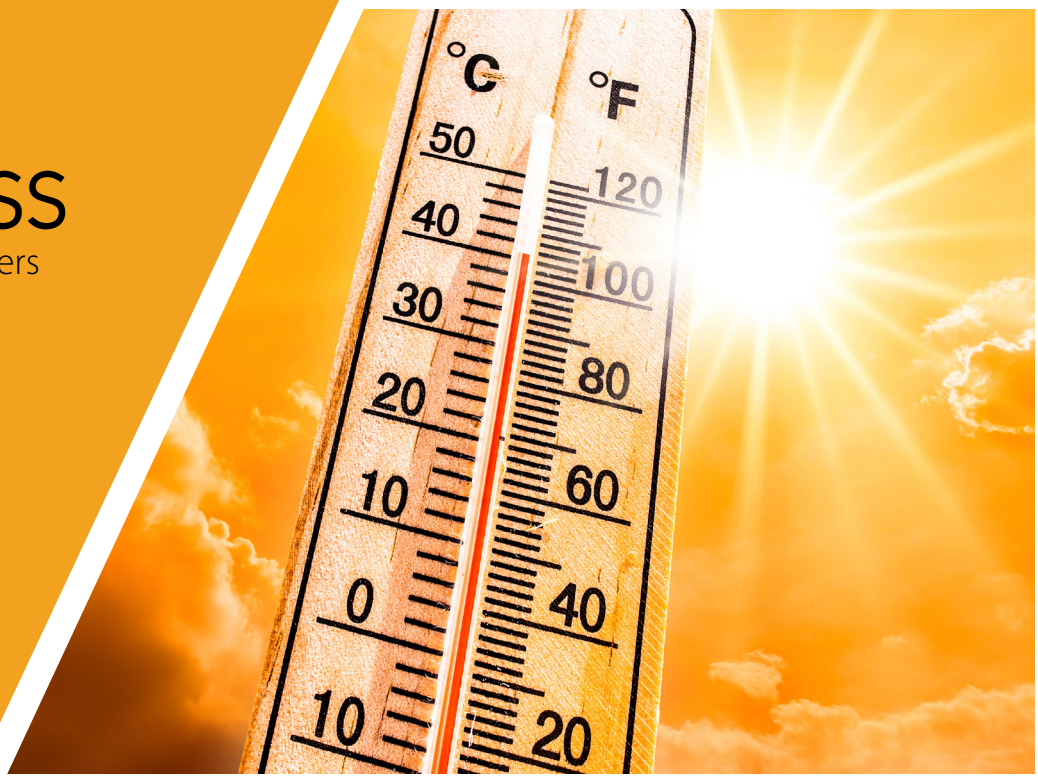
Exertional Heat Illness

Prevention for Service Members

Recognize Risks & Take Action to Prevent Heat Illness

Defense Health Agency



Exertional heat illnesses (EHI) refers to conditions that can occur when your body overheats, ranging from dehydration and mild heat cramps, to a more serious medical condition called heat exhaustion, to the life-threatening medical emergencies heat stroke and hyponatremia (a condition when excessive water consumption causes an imbalance to the body's chemistry). Failure to prevent milder conditions from progressing can result in more serious heat casualties, including death.

This guide is a quick reference for non-medical service members to minimize their risks and recognize when action is required to respond to someone experiencing EHI.

Personal Risk Factors

The more factors, the higher the risk

- Prior history of an EHI. Even a less severe EHI can raise your risk.
- Being new to the heat. You need 10-14 days to get used to the heat. This period is called acclimatization.
- Not staying properly hydrated (see Tables on page 2).
- Consecutive daily (2-3 days) exposure to high heat, humidity, and high activity.
- Low fitness level (e.g., slow 2-mile run time or overweight).
- Being highly motivated. Persons who push themselves may ignore early EHI symptoms.
- Current illness (such as flu, fever, diarrhea)
- Sickle Cell Trait (SCT).
- Use of alcohol in the last 24 hours.
- Taking certain medications, supplements, or dietary aids such as cold remedies, stimulants, or performance-enhancing drugs.
- Certain skin disorders, such as heat rash and sunburn, or skin grafts that can inhibit sweating.

Environmental Hazards

Heat, Humidity, Wind, and Activity

- High heat is a primary EHI hazard.
  - Most EHIs occur between May and September, especially when the outside temperature is over 75° Fahrenheit (F).
- Temperature is not the only factor:
  - Also consider the amount of sunlight, humidity, and the wind speed.
  - The Wet Bulb Globe Temperature (WBGT) index combines these into one value.
  - Strenuous exertion activities, especially several days in a row, increases the risk of an EHI.
- When planning activity levels based on risk categories, also factor in:
  - Amount of exposure time to a risk category
  - Recovery time before repeat exposure

The military WBGT Risk Categories (see below) help to determine activity levels.

Heat Cat	WBGT Index, °F	Flag Colors
1	78° - 81.9°	
2	82° - 84.9°	
3	85° - 87.9°	
4	88° - 89.9°	
5	> 90°	

For more information, contact your installation's Department of Public Health.

Fluid Replacement & Work-Rest Guidelines

These tables are extracted from the current doctrinal manual TB MED 507 as medically-recommended guidance for limited/controlled activities (such as training, Table 1), and operational conditions such as during deployments that may exceed 4 hours (Table 2). The doctrinal guidance in Table 2 is intentionally limited (such as regarding the amount of rest time between work durations). Leaders need to weigh the risk reduction offered by longer rests and breaks from heat exposure, strenuous activity, and Mission Oriented Protective Posture (MOPP)/ combat clothing with other operational mission requirements and risks.

Table 1. Fluid Replacement and Work-Rest Guidelines for Training up to 4 Continuous Hours

If activities will be greater than 4 hours use Table 2 – along with adequate rest.

Heat Cat	WBGT Index, °F	Easy Work		Moderate Work		Heavy Work		Very Heavy Work	
		Work (min)	Water Intake qt/hr	Work/Rest (min)	Water Intake qt/hr	Work/Rest (min)	Water Intake qt/hr	Work/Rest (min)	Water Intake qt/hr
1	78° - 81.9°	NL	½	NL	¾	40/20	¾	20/40	1
2	82° - 84.9°	NL	½	NL	¾	30/30	1	15/45	1
3	85° - 87.9°	NL	¾	NL	¾	30/30	1	10/50	1
4	88° - 89.9°	NL	¾	50/10	¾	20/40	1	10/50	1
5	> 90°	NL	1	20/40	1	15/45	1	10/50	1

Table 2. Recommendations for Continuous Work Duration and Fluid Replacement

Specific rest cycle durations are not prescribed for continuous operations; however, leaders should ensure rest breaks for Heat Category 3 and above.

Heat Cat	WBGT Index, °F	Easy Work		Moderate Work		Heavy Work		Very Heavy Work	
		Work (min)	Water Intake qt/hr	Work (min)	Water Intake qt/hr	Work (min)	Water Intake qt/hr	Work (min)	Water Intake qt/hr
1	78° - 81.9°	NL	½	NL	¾	100	¾	45	¾
2	82° - 84.9°	NL	½	NL	1	70	1	40	1
3	85° - 87.9°	NL	¾	NL	1	60	1	25	1
4	88° - 89.9°	NL	¾	180	1 ¼	50	1 ¼	20	1 ¼
5	> 90°	NL	1	70	1 ½	45	1 ½	20	1 ½

Cat: Category | min: minutes | qt/hr: quart per hour | NL: no limit | WBGT: wet bulb globe temperature

Easy Work = weapons maintenance, marksmanship training, drill and ceremony
Moderate Work = patrolling with a 30-pound load, low and high crawl, digging a defensive position
Heavy Work = patrolling with a 45-pound load, 4-person litter carry (180 pounds), jogging 4 mph
Very Heavy Work = 2-person litter carry (150 pounds), move under direct fire, obstacle course

Prevent Exertional Heat Illness

Individual Preventive Measures

- Know the heat category (WBGT) at your location and be aware as it changes over time.
- Wear clothing level appropriate for the Risk Category.
- Stay hydrated but avoid over-hydration.
  - Adhere to fluid replacement and work-rest guidelines (see Tables 1 and 2).
  - Do not exceed 1 quart per hour (qt/h) under most conditions.
  - Under certain very strenuous conditions a maximum of 1½ qts/h or 12 qts/day may be advised.
  - As a means of self-check, urine should in general be pale yellow to clear.
  - Do not empty canteens to lighten your load.
- Inform your leader and battle buddy if you have had a prior EHI or have other heat illness risk factors.
- Use beads or knots to track how much fluid you are consuming (allowing others to see your fluid consumption can be lifesaving and may be the only immediate way to differentiate heat stroke and hyponatremia (too much fluid consumption).
- Proper nutrition is as essential as hydration to reducing risk of EHI.
  - Avoid use of alcohol, energy drinks, and supplements.
  - Salt tablets are not recommended.
  - Flavored drink powders can be used to encourage fluid consumption.

Did you know? Holding hands and forearms under ice or cold water for a period of time can help lower core body temperature. Raising hands after allows cold water to drip down towards a person's torso to further cool. This concept is known as the Arm Immersion Cooling System which has been used in some Army training settings to remove excess body heat.

Unit-level Preventive Measures

- Ensure WBGT readings accurately reflect personnel exposures.
  - Take hourly WGBT readings.
  - WBGT reading should be taken at the location where Service members are active (i.e., not in a shady spot away from most activities).
- Identify means to ensure unit awareness and ability to monitor (such as use of markings, beads, or knot system).
  - Persons in the unit with high individual risk (e.g., prior EHI, illness).
  - Individuals' fluid consumption levels (such as tracking number of canteens or camelbacks consumed).
- Encourage proper fluid consumption and rest breaks (Tables 1 and 2).
- Plan strenuous activities by considering Risk Categories and work activity levels of consecutive days.
- Find ways to reduce heat stress in individuals.
  - Conduct training and other strenuous activities in the early morning or evening when possible.
  - Use the Arm Immersion Cooling System (AICS) at unit training sites.

Table 3. Clothing Guidance

Heat Category	Clothing Guidance
1-2	Normal wear
3	Unblouse trouser legs Unbuckle web belt
4-5	Unblouse trouser legs Unbuckle web belt Remove uniform top down to t-shirt (unless presence of biting insects) Remove helmets unless there are specific safety reasons (e.g., being on a firing range)
MOPP 4: Add 10°F to WBGT index for easy work, and 20°F to WBGT index for moderate and hard work. Body Armor: Add 5°F to WBGT index.	

More Information

- Army Technical Bulletin, Medical (TB MED) 507, Heat Stress Control and Heat Casualty Management. 12 April 2022
- DCPH-A Heat Illness Prevention webpage
- Warrior Heat- and Exertion-Related Events Collaborative (Uniformed Services University)

Signs, Symptoms, & Actions for Suspected Heat Casualties

Service members should be familiar with the signs and symptoms of exertional heat illness so that they can take action and seek medical support.

Table 4. Warning Signs, Symptoms, and Immediate Actions

Extracted from Table 5-1, TB Med 507.

Common Signs and Symptoms	Immediate Actions
• Dizziness • Headache • Nausea • Unsteady walk • Weakness • Muscle cramps • Fatigue • Chills	• Remove from training • Rest casualty in shade; fan and spray with water • Loosen or remove unnecessary clothing • Drink water • Medically evaluate casualty; monitor rectal temperature and mental status • If no medic available, call for an ambulance

Significant Signs and Symptoms	Immediately call for an ambulance for emergency transport while doing the following:

• Persistent mental status changes
• Delirium
• Inappropriate behavior or aggressiveness
• Convulsions and/or seizures
• Coma
• High rectal temperature (> 104 ºF)
• Recurrent vomiting
• Loss of bowel control/fecal incontinence
• Flaccid muscles or persistent rigidity
• Weak or rapid pulse
	• Lay casualty down in shade, elevate feet until an ambulance arrives
	• Remove as much clothing as possible
	• Cool rapidly using best method possible:
	  · Pour water over body while fanning
	  · Repeatedly wrap in iced sheets
	  · Apply contour conforming ice bags/frozen gel packs covering torso, neck, and scalp
	  · Douse or immerse in iced/cold water
	• If conscious, provide sips of water
	• If persistent hyperthermia not improving, and emergency evacuation delayed, start IV hydration
	• Monitor airway and breathing

Mental Status Assessment

An important sign that a Service member is in a serious life-threatening condition is mental confusion (with or without increased temperature).

Anyone can do a mental status assessment asking some simple questions.

What is your name?
What month is it? What year is it?
Where are we/you?
What were you doing before you became ill?

Call for an ambulance if the person does not know the answers.

Scan the QR code for more information.

https://phc.amedd.army.mil/Pages/default.aspx
Developed in coordination with the U.S. Army Institute of Research in Environmental Medicine:
http://www.usariem.army.mil/

DCPH–A
Defense Centers for Public Health – Aberdeen
(formerly U.S. Army Public Health Center)