

## Heat-Related Stress

### **Product (EMS50) Purpose**

This document (EMS50) is intended to provide guidance and best practices for EMS clinicians adapting to extra PPE and higher temperature environments.

### **Developed By**

The Federal Healthcare Resilience Working Group (HRWG) is leading the development of a comprehensive strategy for the U.S. healthcare system to facilitate resiliency and responsiveness to the threats posed by COVID-19. The Working Group's EMS/Pre-Hospital Team is comprised of EMS and 911 experts from a wide variety of agencies and focuses on responding to the needs of the pre-hospital community. This team is composed of subject matter experts from the National Highway Traffic Safety Administration (NHTSA) Office of Emergency Medical Services (OEMS), National 911 Program, Federal Emergency Management Agency (FEMA), U.S. Fire Administration (USFA), U.S. Army, U.S. Coast Guard (USCG) and National Institutes of Health (NIH). Through collaboration with experts in related fields, the team develops practical resources for field providers, supervisors, administrators, medical directors, and associations to better respond to the COVID-19 pandemic.

### **Intended Audience**

State, Local, Tribal, and Territorial Governments (SLTTs), First Responders (Law Enforcement, Fire & Rescue, Emergency Medical Services (EMS) and 911 communication personnel). This is especially for small volunteer and rural EMS agencies but applies to others.

### **Primary Point of Contact**

NHTSA Office of EMS, [nhtsa.ems@dot.gov](mailto:nhtsa.ems@dot.gov), 202-366-5440

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# Heat Stress

Emergency medical services (EMS) respond to a variety of incidents ranging in duration and risk of exposure that require Personal Protective Equipment (PPE). Sustained temperatures can create additional challenges first responders should recognize.



## Heat Illness: What You Should Know

### Types of Heat Illness:

- Heat stroke
- Heat exhaustion
- Muscle breakdown
- Heat cramps

Note: Electrolyte imbalances are a common result of heat illness

### Symptoms:

- Headache, altered mental state
- Profuse sweating
- Weakness/dizziness
- Rapid pulse
- Muscle cramps
- Nausea, vomiting

### Risks and Stressors:

- Caffeine
- Dehydration
- Fatigue
- Prior heat stress event
- Poor fitness level
- Medications and other health factors
- PPE and Clothing
- Lack of Acclimation

## Take Care of Yourself and Others



Perform a self monitor for signs and symptoms (S&S) of heat illness, learn how to listen to your body. Anticipate heat stress and mitigate early. Take routine breaks and hydrate appropriately before developing heat illness.



Look for warning signs in others. Agency supervisors should ensure proper time and supplies for their crews to be able to rest and hydrate.

### Work/Rest and Water Consumption Table

Applies to average sized, heat-acclimated Soldier wearing ACU, hot weather. (See TB MED 507 for further guidance.)

Easy Work	Moderate Work	Hard Work
<ul style="list-style-type: none"> <li>• Weapon Maintenance</li> <li>• Walking Hard Surface at 2.5 mph, &lt; 30 lb Load</li> <li>• Marksmanship Training</li> <li>• Drill and Ceremony</li> <li>• Manual of Arms</li> </ul>	<ul style="list-style-type: none"> <li>• Walking Loose Sand at 2.5 mph, No Load</li> <li>• Walking Hard Surface at 3.5 mph, &lt; 40 lb Load</li> <li>• Calisthenics</li> <li>• Patrolling</li> <li>• Individual Movement Techniques, i.e., Low Crawl or High Crawl</li> <li>• Defensive Position Construction</li> </ul>	<ul style="list-style-type: none"> <li>• Walking Loose Sand at 3.5 mph, ≥ 40 lb Load</li> <li>• Walking Loose Sand at 2.5 mph with Load</li> <li>• Field Assaults</li> </ul>

• The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences (a ¼ qt/hr) and exposure to full sun or full shade (a ½ qt/hr).

• NL = no limit to work time per hr.

• Rest = minimal physical activity (sitting or standing) accomplished in shade if possible.

• CAUTION: Hourly fluid intake should not exceed 1½ qts.

• If wearing body armor, add 5°F to WBGT index in humid climates.

• If doing Easy Work and wearing NBC (MOPP 4) clothing, add 10°F to WBGT index.

• If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add 20°F to WBGT index.

Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		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	¼	NL	¼	40/20 min	¼
2 (green)	82° - 84.9°	NL	¼	50/10 min	¼	30/30 min	1
3 (yellow)	85° - 87.9°	NL	¼	40/20 min	¼	30/30 min	1
4 (red)	88° - 89.9°	NL	¼	30/30 min	¼	20/40 min	1
5 (black)	> 90°	50/10 min	1	20/40 min	1	10/50 min	1

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### Source: [Travis Air Force Base](#)

NOTE: The WetBulb Globe Temperature (WBGT) is a measure of the heat stress in direct sunlight, which takes into account: temperature, humidity, wind speed, sun angle and cloud cover (solar radiation). Heat stress measures should be taken into consideration the PPE that the personnel will be working in.

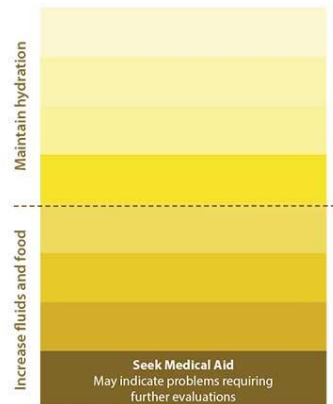
### Start hydrated and stay hydrated!

Training while dehydrated increases the risk for Heat Illness and poor performance

#### Are you starting hydrated? Take the Urine Color Test

How does it work?

- **First thing in the morning**, match your urine color to the closest color in the chart. This will tell how well you have hydrated in the past 24 hours.
- Watch the urine stream, not the toilet water, as the water in the toilet will dilute your urine color.
- Below the line: **Increase fluids and food**
- Above the line: **Continue hydration using the Fluid Replacement Guide on the other side.**
- Comparing urine color other than first thing in the morning is not a reliable indicator of hydration status.



Urine color chart is not for clinical use

### Source: [Army Public Health Center](#)

Developed in coordination with the U.S. Army Research Institute of Environmental Medicine: <http://www.usariem.army.mil/>



# What Should You Do?

## What YOU can do:

- Monitor your hydration using a urine color chart
- Establish work/rest cycles based upon the Water Bulb Globe Temperature (WBGT) readings
- Drink water/electrolyte solutions prior to shift, avoiding caffeinated or sugary drinks
- Ensure adequate supplies of chilled water to provide hydration and set up cooling stations
- Understand how the temperature, humidity, and risk factors will change throughout the shift
- Adjust response tempo, as reasonable, to provide opportunity to rest, cool-off, and rehydrate

## What an EMS AGENCY can do:

- Deploy a logistics vehicle for long duration incidents with water and electrolyte supplements
- Use WBGT to monitor temperature, provide readings to crew at 8 hour intervals, and adjust incident tactics as needed
- Implement training sessions to educate personnel on heat emergency prevention
- Distribute agency (or region) specific active and passive cooling techniques (i.e., vehicle air conditioning, ice packs)
- Adjust staffing practices / models as required

## Daily Checklist

- ✓ Perform self-assessment for S&S of heat stress prior to shift start
- ✓ Be aware of the anticipated weather conditions during shift
- ✓ Have appropriate uniform attire for conditions of shift
- ✓ Check apparatus cooling systems to assure minimum effectiveness
- ✓ Ensure apparatus inventory includes minimum quantity of ice packs for active cooling if activation is for a heat emergency
- ✓ Have sufficient water and electrolyte solutions on hand

## Resources:

- [Protecting Workers from Heat Stress](#)
- [Limiting Heat Burden While Wearing Personal Protective Equipment \(PPE\)](#)
- [Emergency Incident Rehabilitation\\*](#)
- [Emergency Incident Rehabilitation Guide](#)
- [NIOSH Heat Stress Document](#)
- [OSHA-NIOSH Heat Safety Tool App](#)

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