



Companion to the Interim Guidance for Limiting Heat Burden in Ebola Personal Protective Equipment (PPE)

Limiting Heat Burden in Ebola PPE:

A training resource for site coordinators and healthcare personnel in Ebola-affected areas



Photo by CDC

Training Purpose

- This presentation is a companion resource to CDC's [Interim Guidance for Limiting Heat Burden in Ebola PPE](#).
- It is intended to help organizations educate healthcare personnel and site coordinators on recognizing, preventing, and responding to heat-related illness while wearing recommended PPE.
- Organizations may use this presentation to support:
 - Instructor-led training
 - Orientation of new personnel
 - Refresher training
 - Preparedness planning and exercises
 - Independent review by healthcare personnel and site coordinators
- This presentation supplements—but does not replace—the interim guidance linked here.
 - Organizations should adapt the presentation to their local operations, PPE protocols, and emergency procedures while maintaining consistency with current CDC guidance.

Training Topics

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Symptoms and First Aid for Heat-Related Illnesses

Learning Objectives

- Recognize risk factors for heat-related illness.
- Recognize symptoms of heat-related illnesses and know first aid.
- Apply recommendations for limiting the heat burden and protecting yourself from heat-related illnesses.
- Identify tools that can help with monitoring temperatures and humidity.

OVERVIEW

Wearing PPE increases risk for heat-related illnesses

- PPE helps protect healthcare workers from exposure to Ebola disease and other hazards.
- Recommended PPE for managing Ebola patients is:
 - Fully encapsulating = Covers the entire body, including head, hands, and feet.
 - Impermeable = Liquids and fine particles cannot pass through.
- Ebola PPE increases heat stress because it:
 - Is often worn in hot environments.
 - Reduces the body's ability to cool itself through sweating.
 - Traps heat and moisture close to the body.
- Understanding how to recognize and prevent heat-related illness can help personnel work more safely while wearing PPE.

Conditions that increase heat stress risk

Operational conditions

- Long work shifts
- Staffing shortages
- Limited electrical power
- Limited access to electrolyte replacement fluids
- Limited medical oversight during rest periods

Environmental conditions

- High temperatures and humidity
- Direct sun exposure
- Radiant heat sources (floodlights or mechanical equipment)
- Limited air movement

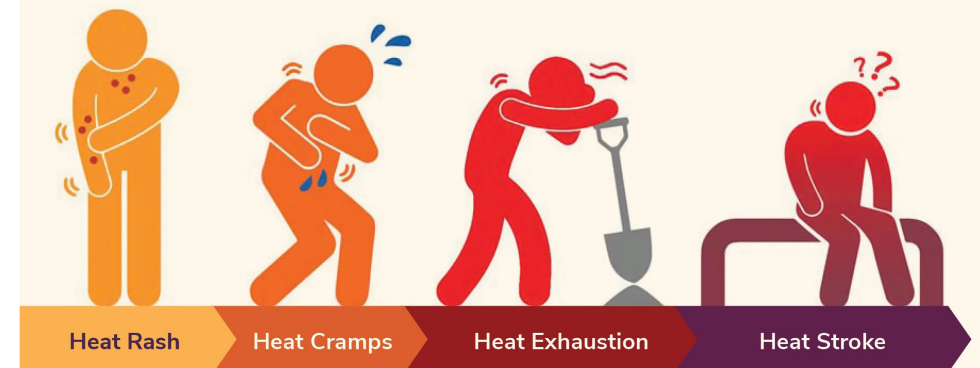
See Supplement A slides for more information.

OVERVIEW

Heat-related illness

- Heat-related illness can progress quickly while wearing fully encapsulating PPE.
- Heat-related illnesses include
 - Heat rash
 - Heat cramps
 - Heat exhaustion
 - Heat stroke
 - Rhabdomyolysis
- Be familiar with the symptoms and first aid for each.
 - See Supplement B slides for more information.

Types of Heat-related Illness





Recommendations for Site Coordinators

Photo by CDC

RECOMMENDATIONS FOR SITE COORDINATORS

Monitor environmental conditions

- Adjust work/rest schedules as needed
 - Use a [wet-bulb globe temperature \(WBGT\)](#) device or local weather information when available.
- As temperatures and humidity increase, personnel may need:
 - More rest breaks and
 - Increased water or electrolyte replacement fluids.
- Because impermeable PPE traps heat and moisture, healthcare personnel may experience increasing heat strain **even when temperatures and humidity are not extreme.**



RECOMMENDATIONS FOR SITE COORDINATORS

Acclimatization

- Acclimatization is the body's gradual adjustment to working in hot environments.
- When acclimatized, the body adapts by improving sweating efficiency and stabilizing circulation, which helps reduce the risk of heat-related illness.
- Workers who are not properly acclimatized are at increased risk for heat-related illnesses.
- Develop work schedules that allow both new and experienced workers to gradually adjust to hot working conditions.



Set Acclimatization Schedules



- Gradually increase the time you schedule personnel in hot conditions over a 7- to 14-day period.
 - Schedule personnel **new to the hot environment** no more than 20% of the usual work duration on day 1. Increase exposure by no more than 20% each additional day.
 - Schedule personnel **with previous experience in similar conditions** for no more than: 50% of the usual work duration on day 1, 60% on day 2, 80% on day 3, and 100% on day 4.
- Acclimatization is for all work, not just time spent wearing PPE.
- If full acclimatization is not possible, schedule personnel new to the hot environment with shorter shifts until their bodies adjust to the heat.



Example Acclimatization Schedules

Personnel should advance to the next acclimatization level on a subsequent day only after they have recovered adequately. Additional acclimatization may be needed.

New personnel wearing fully-encapsulating PPE

Work Day	Number of Entries into the Hot Environment
Day 1	1 entry
Day 2	2 entries
Day 3	3 - 4 entries
Day 4	5 entries
Day 5	6 entries (full work schedule)

Personnel **with previous experience** working in hot environment wearing fully-encapsulating PPE

Work Day	Number of Entries into the Hot Environment
Day 1	3 entries
Day 2	4 entries
Day 3	5 entries
Day 4	6 entries (full work schedule)

Work day = An 8-hour shift

Entries= 30-45-minute periods while wearing fully-encapsulating PPE, separated by rest breaks.

Set Rest Breaks



- A work/rest schedule based on environmental conditions and work tasks should guide when rest breaks are required.
- Rest break times should not include the time needed to put on and remove PPE.
- Consider multiple factors that influence heat strain when establishing work/rest schedules:
 - Acclimatization status
 - Environmental conditions
 - Heat-related illness symptoms
 - Hydration
 - Individual tolerance
 - Physical demands of work
 - PPE ensemble



Suggested work/rest schedule

PPE, Cooling, and Other Conditions	Suggested Work Duration while Wearing PPE	Suggested Rest Break After PPE Removal	Key Considerations
Fully encapsulating PPE WITHOUT active cooling [†]	30–45 minutes	At least 30 minutes and until fully cooled and rehydrated	Highly protective PPE can cause body temperature to rise quickly. Limiting time in PPE to 30–45 minutes helps reduce the risk of heat-related illness.
Fully encapsulating PPE WITH active cooling [†]	45–60 minutes [‡]	At least 30 minutes	Cooling devices can slow increases in body temperature and may allow workers to safely wear PPE for longer periods.
Less encapsulating gown-based PPE (when clinically appropriate)	Up to 60 minutes	20–30 minutes, adjusted by symptoms and environmental conditions	Some PPE ensembles place less heat and physical strain on workers and may be better tolerated during extended use.
Extreme heat and humidity, high workload, or poor acclimatization	15–30 minutes	30+ minutes, with medical evaluation if symptoms occur	Tolerance to heat varies by worker. Shorter work periods may be needed when temperatures are higher, or other risk factors are present.

[†] Active cooling includes wearable personal cooling systems, cooling vests, or other PPE-compatible cooling devices.
[‡] Personal cooling devices can reduce heat stress and may allow longer work periods. Consider 45–60-minute work periods only when cooling strategies and close monitoring of personnel are in place.

RECOMMENDATIONS FOR SITE COORDINATORS



Maintain Rest Areas

- To help prevent heat illness, site coordinators should establish and maintain rest areas that include:
 - Shaded area with chairs and cots
 - Fans, misters, or other cooling devices, if available
 - Bottled water and electrolyte replacement fluids or oral rehydration salts
 - Basic first aid supplies
 - Non-contact infrared thermometers (to check temperatures of personnel during breaks)
 - Rapid cooling supplies for personnel with suspected heat-related illness, such as cool water for immersion or dousing
 - Emergency communication equipment

RECOMMENDATIONS FOR SITE COORDINATORS



Assign a Rest Area Monitor (Part 1)

- Rest areas should have a trained monitor who can recognize symptoms of heat-related illness and provide basic first aid and cooling measures.
- Monitor responsibilities can include:
 - Conducting brief mental health status assessment as personnel enter and leave the rest area.
 - Ask simple questions, such as the worker's name and the date.
 - Watch for symptoms of heat-related illness, such as slurred speech.
 - Checking personnel's temperatures with an infrared thermometer at the beginning of each break.
 - Communicating when it is time for rest breaks using radios, visual signals, or relayed messages.
 - Ensuring rest areas remain stocked with water, electrolyte replacement fluids or oral rehydration salts, and cooling supplies.



Assign a Rest Area Monitor (Part 2)

- Monitor responsibilities can include:
 - Ensuring personnel with altered mental status, elevated body temperature, or other symptoms of heat-related illness not return to work until after:
 - They have cooled down and rehydrated,
 - Any symptoms have resolved, and
 - Their temperature has decreased to 99.5°F (37.5°C) or below.

Note: Persistent or unexplained elevated temperature, especially with any other symptoms, might also indicate Ebola disease or another infectious illness, and should be handled according to facility illness-reporting and return-to-work procedures.

RECOMMENDATIONS FOR SITE COORDINATORS

Educate About Heat-related Illness

- Ensure personnel know the symptoms of heat-related illness.
- Do not allow personnel to begin a shift if they have recently experienced vomiting or diarrhea.
 - These conditions can cause dehydration and increase the risk of heat-related illness.
 - During an Ebola response, vomiting or diarrhea might indicate Ebola disease or another infectious illness.
 - These conditions should be reported and evaluated according to facility procedures.
- Require personnel to follow facility procedures for reporting illness and returning to work.



Display this poster, [Prevent Heat-Related Illness](#), where personnel will see it daily.

Promote Hydration

- Encourage personnel to hydrate before, during, and after shifts.
- Encourage use of electrolyte replacement fluids during heavy sweating.
- Provide a space for personnel to monitor for fluid loss, including a scale and a way to track weight changes.



RECOMMENDATIONS FOR SITE COORDINATORS

Assign Buddies



- Designate a buddy for each healthcare worker during shifts.
 - This buddy may also serve as the IPC/PPE buddy responsible for monitoring PPE use and identifying potential breaches.
- Buddies should:
 - Watch for early symptoms of heat-related illness.
 - Regularly ask your buddy how he or she is feeling.
 - Encourage rest and water breaks.
 - Escort coworkers out of hot areas if they feel unwell.
 - Follow emergency procedures if a coworker develops heat-related symptoms or faints.

RECOMMENDATIONS FOR SITE COORDINATORS

Plan for Heat-Related Emergencies



- Develop a plan for responding to heat-related illness. This should include procedures for situations in which a healthcare worker becomes ill or loses consciousness while wearing PPE.
- Specifically, the plan should cover:
 - Emergency PPE removal
 - Medical evaluation and treatment
 - Communication
 - Transportation for medical care
- Before personnel enter contaminated care areas or perform duties while wearing PPE, facilities should ensure that:
 - Emergency PPE removal procedures have been practiced as a team.
 - Workers understand their roles and responsibilities.
 - Equipment and supplies needed for emergency PPE removal are readily available.



Recommendations for healthcare personnel

Take Time to Acclimatize



- Gradually increase time spent working in hot conditions over a 7–14-day period.
- If new to the hot working environment, begin with shorter shifts until your body adjusts to the heat.



Stay Well Hydrated



- Arrive for your shift already well-hydrated.
- Drink fluids regularly and do not wait until you feel thirsty.
- Rehydrate during every rest break by drinking water, electrolyte replacement fluids, or oral rehydration salts.
- Avoid alcohol, caffeine, and other stimulants.





Monitor Fluid Loss

- Monitor and record changes in your body weight to track fluid loss.
- Weigh yourself before putting on PPE and again after removing PPE and sweat-soaked scrubs.
- Notify a supervisor if body weight decreases by 2% or more during a work shift.
 - A loss of 2% of body weight can reduce heat tolerance and increase heart rate and body temperature.
 - For example, a 150-lb worker who loses 3 lbs has lost 2% of their body weight ($150 \text{ lbs} \times 0.02 = 3 \text{ lbs}$).
- Do not begin a work shift if you have recently experienced vomiting or diarrhea.
 - These conditions can cause dehydration and increase the risk of heat-related illness.
 - They might indicate Ebola disease or another infectious illness.
 - Notify your supervisor and follow the medical evaluation and return-to-work policy.

RECOMMENDATIONS FOR HEALTHCARE PERSONNEL

Watch for Symptoms of Heat-related Illnesses

- Avoid working alone.
- Site coordinators should designate a buddy for you.
- Check in with your buddy periodically about how they are feeling.



Take Time to Rest and Cool Down

- Change out of sweat-soaked clothing during breaks.
- Arrive for shifts well rested and after adequate sleep.



Wearing PPE Increases Your Risk for Heat-related Illnesses



Take time to acclimatize.

Work shorter shifts until your body has adjusted to the heat.



Watch for signs of heat-related illnesses.

Designate a buddy and ask how they feel periodically.



Take time to rest and cool down.

Sit somewhere cool, rest, and rehydrate frequently.



Stay well hydrated.

Drink often, before you get thirsty.

OCCUPATIONAL HEAT STRESS

Additional Resources

- [Interim Guidance for Limiting Heat Burden in Ebola PPE | Ebola | CDC](#)
Primary guidance document
- [Heat Stress and Workers | Heat Stress | NIOSH | CDC](#)
Supplemental information about heat stress
- [Heat-related Illnesses | Heat | NIOSH | CDC](#)
Supplemental information about heat-related illness
- [PPE Heat Burden | Heat | NIOSH | CDC](#)
Supplemental information about PPE heat burden
- [Prevent Heat Related Illness | NIOSH | CDC](#)
Poster about preventing heat-related illnesses
- [Heat - Heat Hazard Recognition | Occupational Safety and Health Administration](#)
Supplemental information from OSHA about heat stress

What is Heat Stress?

Heat Stress is the combination of:



Metabolic
Heat



Environmental
Factors



Clothing/
PPE

which results in
increased heat storage
within the body.



Heat Stress Risk

SUPPLEMENT A

Conditions that increase heat stress risk

Long work shifts

- Long work shifts can increase risk by reducing opportunities for rest, cooling, and rehydration.
- Shorter work shifts are better for healthcare personnel who work in hot, humid environments.
- Shorter work shifts may not be possible when PPE supplies and staff are limited.

Limited electrical power

- Air-conditioning and fans may not be available.

Limited access to electrolyte replacement fluids

- Most healthcare personnel have only bottled water to drink.
- Electrolyte replacement is important during heavy sweating.

Conditions that increase heat stress risk

Other illnesses

- Healthcare personnel may become ill from consuming contaminated food or water.
- Illnesses that cause vomiting or diarrhea can lead to dehydration.

Limited medical oversight during rest periods

- Sometimes, only a person who is not a healthcare provider is available to monitor rest breaks and supplies.
- Limited medical oversight during rest periods may delay recognition and management of heat-related illness.

Staffing shortages

- New personnel may be required to begin working in hot conditions before they are fully acclimatized.

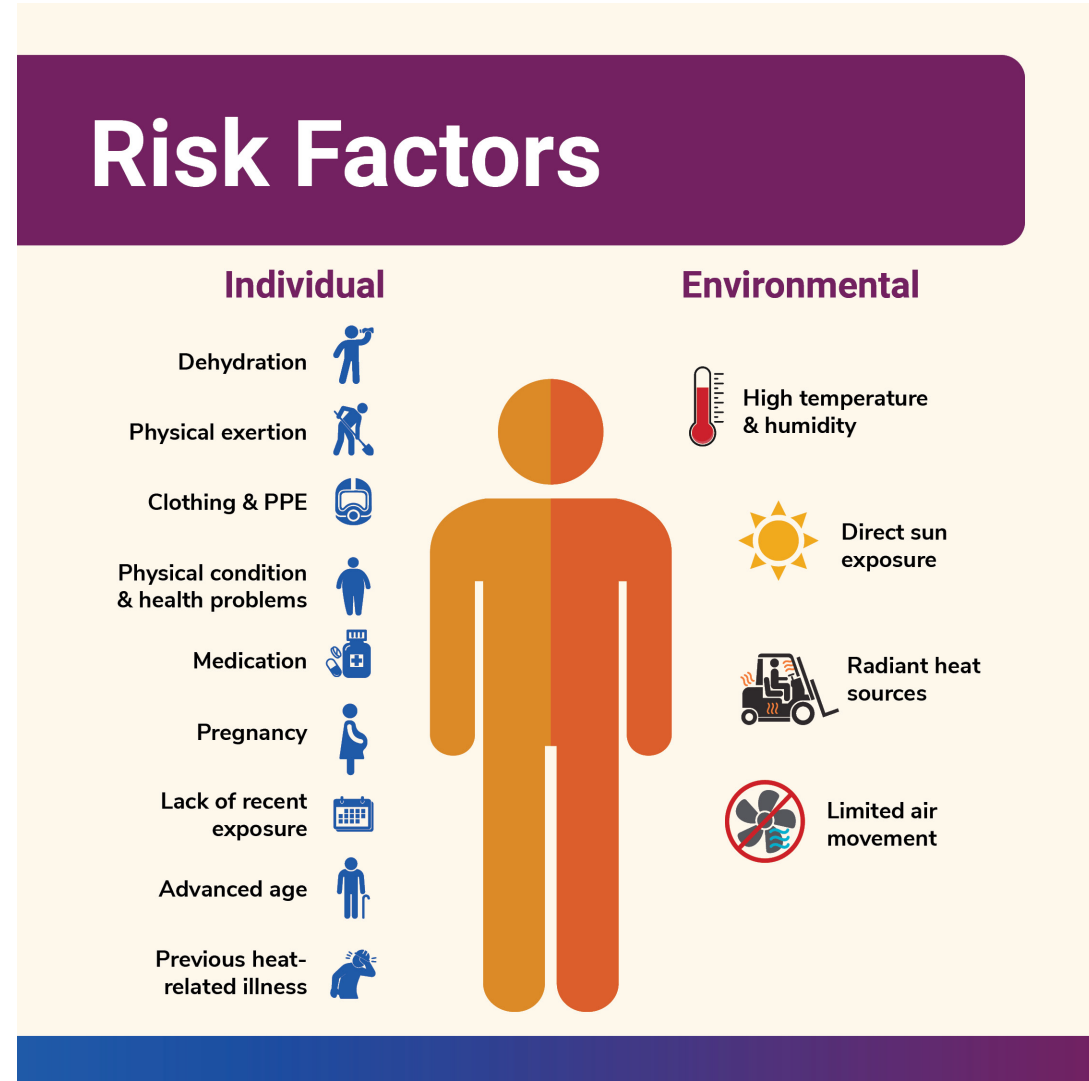
HEAT STRESS RISK PART 3

Additional risk factors for heat-related illness

Prescreening healthcare personnel can reduce the risk of heat-related illness while working in hot environments.

Ask about:

- Medical conditions
- Medication use
- History of heat illness
- Other risk factors





Types of Heat-related Illnesses

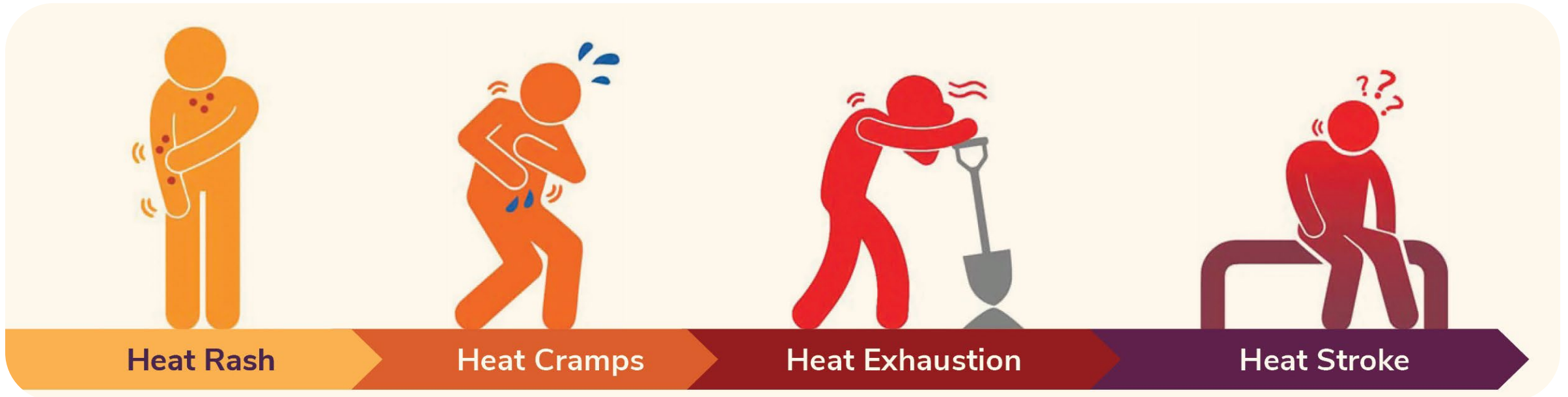
SUPPLEMENT B

Photo by CDC

HEAT-RELATED ILLNESSES

Symptoms and Severity

Heat-related illnesses can range from mild conditions to severe illness.



Heat Rash

A skin irritation caused by excessive sweating during hot, humid weather.

Symptoms

- Clusters of red bumps on skin
- Often appears on neck, upper chest, groin, under the breasts, and in elbow creases

First Aid

- Keep the rash area dry.
- Change out of sweaty clothes into fresh dry clothes frequently.
- Powder may be applied to increase comfort.
- Do not use ointment or creams.



Heat Cramps

Sweating depletes the body's salt & moisture levels.

Low salt levels in muscles causes painful cramps.

Symptoms

- Muscle pain or spasms
- Usually in the abdomen, arms, or legs

First Aid

- Drink water and have snacks and/or electrolytes during breaks.
- AVOID salt tablets. They do not replace lost fluid and may worsen dehydration.
- Wait a few hours before returning to heavy work.
- Seek medical care if you have heart problems, are on a low-sodium diet, or if cramps do not subside within 1 hour.



Heat Exhaustion

The body's response to an excessive loss of water and salt, usually through excessive sweating.

Symptoms

- Headache
- Dizziness
- Heavy sweating
- Nausea
- Weakness
- Elevated temperature
- Irritability
- Thirst
- Decreased urine output

First Aid

- Get medical evaluation or treatment for the worker.
- Move to cooler area and give liquids. Encourage frequent sips.
- When safe to do so, immediately move to the doffing area. Follow emergency doffing procedures and begin cooling quickly.
- Cool body with cold compresses or wet their head, face, and neck with cold water.
- Seat the worker in an air-conditioned area or next to a misting fan.



Heat Stroke

The body's temperature-regulating system fails and temperature increases to critical levels.

Symptoms

- Confusion, altered mental status, slurred speech
- Loss of consciousness
- Red, hot, dry skin OR profuse sweating
- Seizures
- Very high body temperature

First Aid

- Get medical care immediately.
- When safe to do so, immediately move to the doffing area. Follow emergency doffing procedures and begin cooling quickly.
- Cool body with a cold water or ice bath; wet skin, or soak clothing in cool water
- Fan air around the body.
- Place cold wet cloths or ice on head, neck, armpits, and groin.



Rhabdomyolysis

This is a condition associated with heat stress and prolonged physical exertion, resulting in the rapid breakdown, rupture, and death of muscle. Rhabdomyolysis can result in death of muscle tissue, irregular heart rhythms, seizures, and kidney damage.

Symptoms

- Muscle cramps/pain
- Exercise intolerance
- Weakness
- Abnormally dark urine (tea or cola colored)
- Asymptomatic

First Aid

- Stop activity.
- Increase oral hydration (water preferred).
- Seek immediate care at nearest medical facility.
- Ask to be checked for rhabdomyolysis (i.e., blood sample analyzed for creatine kinase).



Thank you.

For more information, contact CDC

1-800-CDC-INFO (232-4636)

TTY: 1-888-232-6348 <https://www.cdc.gov/> | <https://www.cdc.gov/niosh>

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U. S. Centers for Disease Control and Prevention or the National Institute for Occupational Safety and Health.

