



*NC Department of Environmental Quality*

**Heat Stress & Heat Strain**

rev. 07-2023



# Heat Stress vs. Heat Strain

**Heat Stress:** Physiological stress experienced as a result of heat

**Heat Strain:** The overall physiological response resulting from heat stress



# Contributing Factors

High Temperature & Humidity

Direct Sun Exposure

Indoor Radiant Heat Sources

Limited Air Movement

Insufficient Fluids

Elevated Physical Activity

Recent use of Alcohol or Diuretics

PPE & Clothing

Physical Condition & Health

Use of Medications

Lack of Recent Heat Exposure

Advanced Age

Previous Heat Related Illness



# How to Identify Heat Strain

## Symptoms:

- Dizziness
- Light-Headedness
- Fainting
- Altered Mental State
- Confusion
- Muscle Cramps
- Seizures



# How to Identify Heat Strain

## Conditions:

- Heat Stroke
- Heat Exhaustion
- Rhabdomyolysis
- Heat Syncope
- Heat Cramps



# Heat Stroke

- Symptoms:
  - Confusion
  - Altered Mental Status
  - Slurred Speech
  - Loss of Consciousness or Coma
  - Hot, Dry Skin
  - Profuse Sweating
  - Seizures
  - Very High Body Temperature

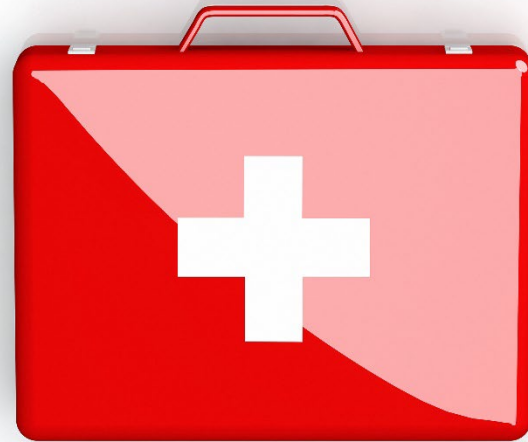


**Heat stroke is fatal if treatment is delayed**



# Heat Stroke First Aid

- **Call 911**
- **Stay with the worker**
- **Move to shaded or cool area**
- **Remove outer clothing**
- **Cool ASAP by:**
  - ✓ **Ice bath**
  - ✓ **Wetting skin**
  - ✓ **Applying wet cloths**
  - ✓ **Soak clothing with cool water**



# Heat Exhaustion

## Symptoms:

- Thirst
- Headache
- Nausea
- Dizziness
- Weakness
- Heavy Sweating
- Irritability
- Decreased Urine Output



# Heat Exhaustion First Aid

- Take worker to clinic or ER
- Call 911 if medical care isn't available
- Stay with worker
- Remove worker from heat
- Remove unnecessary clothing
- Give water
- Encourage water consumption
- Cool worker off



# Rhabdomyolysis

## Symptoms:

- **Muscle Cramps**
- **Pain**
- **Very Dark Urine (tea or cola-colored)**
- **Weakness**
- **Intolerance to Exercise**
- **Can be Asymptomatic**



# Rhabdomyolysis First Aid

- **Stop the worker's activity**
- **Drink more liquids-preferably water**
- **Seek immediate medical care**
- **Ask to be checked for rhabdomyolysis (blood sample analyzed for creatine kinase)**



# Heat Syncope

## Symptoms:

- Fainting
- Dizziness
- Light-headedness
- Lacerative or convulsive injuries,  
typically to face and scalp



# Heat Syncope First Aid

- **Have worker sit or lie in cool place**
- **Slowly administer water, clear juice, or a sports drink**
- **Check worker for other injuries if unconsciousness occurred**



# Heat Cramps

## Symptoms:

- Muscle cramps
- Pain in the:
  - ✓ Arms
  - ✓ Legs
  - ✓ Abdomen



# Heat Cramps First Aid

- Administer water
- Replace carbohydrates & electrolytes
- Avoid salt tablets
- Seek medical attention if employee:
  - ✓ Has heart problems
  - ✓ Is on a low sodium diet
  - ✓ Cramps don't subside within 1 hour



# Heat Rash

**Heat Rash:** Skin irritation caused by excessive sweating. Obsessive moisture and sweat obstructs the sweat ducts.

## Symptoms:

- **Red clusters of small blisters or pimples**
- **Usually appear on the:**
  - ✓ **Neck**
  - ✓ **Groin**
  - ✓ **Upper chest**
  - ✓ **Under breasts**
  - ✓ **Elbow creases**



# Heat Rash First Aid

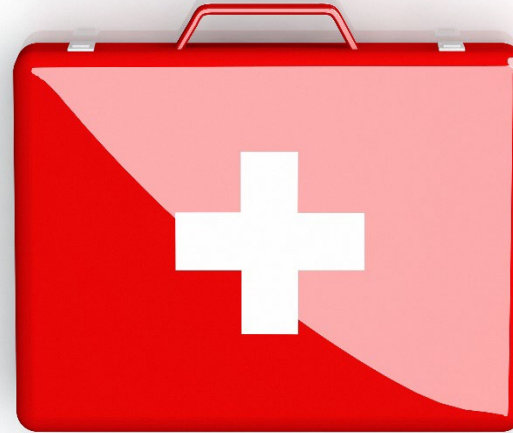
- **Work in a less humid, cooler environment**
- **Keep the rash area dry**
- **Do not use creams or ointments**
- **Apply powder for comfort**



# How to Cool Someone Down Quickly

Apply cool water or ice to places on the body where veins are closest to the surface:

- **Wrists**
- **Neck**
- **Chest**
- **Temples**



# OSHA and Heat Strain

- Heat Strain is currently regulated under the General Duty Clause, which is very vague
- October 2021: OSHA stated it is developing a standard for Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings
- April 2022: OSHA published a National Emphasis Program to protect employees from heat related hazards. It is valid through 2025.



# Drugs That Contribute to Heat Strain

- **Blood Pressure Medications**
- **Antihistamines**
- **Decongestants**
- **Overactive Bladder Treatments**
- **Stimulant Medications for ADHD**
- **Psychiatric Medications**



# Preventing Heat Strain

- **Stay Hydrated**: Once you are thirsty you are already mildly dehydrated. A good starting point is 8 oz. water per 15-20 minutes. Sports drinks with balanced electrolytes are better for prolonged sweating over several hours.
- Understand the high-risk groups
- Understand the warning signs
- Understand the first aid responses
- Have an **Acclimatization Plan** for new and returning workers



# Acclimatization Plans

## OSHA has found that:

- Almost half of heat-related deaths occur on a worker's first day on the job (Arbury, 2014)
- Over 70% of heat-related deaths occur during a worker's first week (Tustin, 2018)

## Work Duration for New Workers:

- 20% First Day: New workers should only work 20% of the normal duration on day 1
- 20% Each Additional Day: Increase work duration by 20% per day for the first week

**This plan is for physically fit employees with no medical conditions. Others may need up to 14 days to acclimate.**



# Salt Tablets

- No longer recommended
- Poorly absorbed
- Raise blood pressure
- Force kidneys to excrete more water



# Urine Color

Athletic departments and the military use urine color to approximate hydration.

## Are you hydrated? Urine color chart

<b>1</b>		<b>Congratulations!</b>
<b>2</b>		If your urine matches colors 1, 2, or 3, you are properly hydrated.
<b>3</b>		Continue to consume fluids at the recommended amounts.
<hr/>		
<b>4</b>		If your urine is below the <b>RED</b> line, you are <b>DEHYDRATED!</b>
<b>5</b>		You are at risk for cramping, heart attack, anxiety attack, heat illness and more.
<b>6</b>		<b>You need to drink more water now!</b>
<b>7</b>		If your urine is this color, you must drink water immediately or die a slow, painful death.
<b>8</b>		<b>Seek medical attention immediately</b>



# OSHA-NIOSH Heat Index App

[Apple Store link](#)

[Google Play link](#)

- **OSHA recommends using this app**
- **Uses GPS to calculate local heat index**
- **Provides hydration & shade recommendations**
- **Allows scheduled hydration reminders**
- **Provides symptoms for types of heat stress**
- **Provides first aid response for each type of heat stress**



# Thank you for your time

**We will revisit this topic when OSHA publishes the new heat standard.**

**Feel free to contact me with any questions or concerns related to workplace safety and health:**

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