Heat Stress

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PDH: 1

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Module 1: Protecting Workers from Heat Illness and Environmental Hazards

Learning Objectives

By the end of this section, you will be able to:

- **Identify** environmental and personal risk factors that contribute to heat-related illnesses in occupational settings.
- **Evaluate** symptoms to differentiate between heat rash, heat cramps, heat exhaustion, and heat stroke.
- **Select** appropriate first aid and preventative measures for heat stress and other outdoor environmental hazards.

Executive Summary: Heat stroke is a life-threatening medical emergency occurring when the body's thermoregulation fails and core temperatures reach critical levels. Prevention centers on the integration of hydration, acclimatization, and work/rest cycles in shaded or cooled environments. Effective management requires training workers to recognize early symptoms in themselves and peers to intervene before illness progresses to critical stages.

Factors That Increase Risk to Workers

At times, workers are required to work in hot environments for long periods. When the human body is unable to maintain a normal temperature, heat-related illnesses can occur and may result in death.

Environmental and Physical Constraints

- **High temperature and humidity**.
- **Direct sun exposure** without available shade.
- **Indoor exposure** to other sources of radiant heat such as ovens or furnaces.
- **Limited air movement** or lack of breeze.
- **Physical exertion** and low fluid consumption.
- **Heavy personal protective clothing** and equipment.

Personal Risk Factors

- **Poor physical condition** or existing health problems.
- **Pregnancy**.
- **Advanced age** (65+).

- **Lack of recent exposure** to hot working conditions.
- **Previous history** of heat-related illness.
- **Medications**, including blood pressure pills or antihistamines.

Health Problems Caused by Hot Environments

Heat Stroke (Medical Emergency)

Heat stroke is the most serious heat-related health problem. It occurs when the body's temperature regulating system fails and body temperature rises to critical levels.

Symptoms of Heat Stroke

- **Confusion** and loss of consciousness.
- **Seizures**.
- **Very high body temperature**.
- **Hot, dry skin** or profuse sweating.

Heat Exhaustion

Heat exhaustion is the next most serious heat-related health problem.

Symptoms of Heat Exhaustion

- **Headache, nausea, and dizziness**.
- **Weakness and irritability**.
- **Thirst**.
- **Heavy sweating**.
- **Elevated body temperature**.
- **Decreased urine output**.

Heat Cramps and Heat Rash

- **Heat Cramps:** Muscle pains usually caused by physical labor in a hot work environment. They are caused by the loss of body salts and fluid during sweating.

- **Heat Rash:** The most common problem in hot work environments. It looks like a red cluster of pimples or small blisters. It usually appears on the neck, upper chest, groin, under the breasts, and in elbow creases.

First Aid Application

Condition	Immediate Action Steps
Heat Stroke	1. Call 911 immediately. 2. Move the worker to a shaded, cool area and remove outer clothing. 3. Wet the worker with cool water and circulate the air. 4. Place cold wet clothes or ice all over the body. 5. Stay with the worker until help arrives.
Heat Exhaustion	1. Take the worker to a clinic or emergency room; call 911 if medical care is unavailable. 2. Remove worker from the hot area and give liquids to drink. 3. Remove unnecessary clothing, including shoes and socks. 4. Cool with cold compresses to the head, neck, and face.
Heat Cramps	1. Replace fluid loss by drinking water and having a snack or carbohydrate-electrolyte replacement liquids every 15 to 20 minutes. 2. Get medical help if the worker has heart problems, is on a low sodium diet, or if cramps do not subside within one hour.
Heat Rash	1. Provide a cooler, less humid work environment. 2. Keep the rash area dry. 3. Apply powder for comfort. 4. Avoid ointments or creams.

⚠️ **Safety Constraint:** Heat stroke is a life-threatening emergency. While first aid measures are being implemented, you must call 911 and get emergency medical help. If a worker is unable to drink, get emergency medical help immediately.

Prevention Recommendations

Hydration and Monitoring

- **Water Frequency:** Remind workers to frequently drink small amounts of water before they become thirsty to maintain good hydration.
- **Quantity:** During moderate activity in moderately hot conditions, workers should drink about 1 cup every 15 to 20 minutes.
- **Urine Color:** Instruct workers that urine should be clear or lightly colored.
- **Electrolytes:** Workers should eat regular meals and snacks as they provide enough salt and electrolytes. Electrolyte drinks (e.g., Gatorade) are usually not necessary.
- **Fluid Limits:** Workers should generally not drink more than 12 quarts (48 cups) in a 24-hour period.

💡 **Design Tip:** Set up a buddy system if possible; if not, check routinely (several times an hour) to make sure workers are making use of water and shade and not experiencing heat-related symptoms.

Work Environment Modifications

- **Acclimatization:** If a worker is new to the job or has been away for more than a week, gradually increase the workload or allow more frequent breaks the first week.
- **Engineering Controls:** Use air conditioning or increased ventilation. Provide reflective shields to redirect radiant heat and insulate hot surfaces.
- **Water Temperature:** Provide cool water in convenient, visible locations. Water temperature should be 50-60°F if possible.

🧮 **Calculation Note:** The use of fans to increase air speed will improve heat exchange unless the air temperature is higher than the skin temperature.

Outdoor Environmental Hazards

Sun Exposure Management

Sunlight contains ultraviolet (UV) radiation, which causes premature aging of the skin, wrinkles, cataracts, and skin cancer.

- **Clothing:** Wear loose-fitting, long-sleeved shirts and long pants.
- **Sunscreen:** Use sunscreen with an SPF of at least 30.
- **Headwear:** A wide brim hat, not a baseball cap, works best because it protects the neck, ears, eyes, forehead, nose, and scalp.
- **Timing:** Limit exposure between 10 a.m. and 4 p.m. when UV rays are most intense.

Biological Hazards

Lyme Disease and Tick-Borne Illness

- **Precautions:** Wear light-colored clothes to see ticks more easily. Tuck pant legs into socks or boots.
- **Removal:** Remove attached ticks promptly and carefully with fine-tipped tweezers.

⚠️ **Safety Constraint:** Do not use petroleum jelly, a hot match, or nail polish to remove the tick.

West Nile Virus

- **Repellent:** Apply Picaridin or insect repellent with DEET to exposed skin.

- **Source Control:** Get rid of sources of standing water to reduce or eliminate mosquito breeding areas.

Poisonous Plants (Ivy, Oak, Sumac)

- **Contact:** Urushiol sap can be deposited on the skin by direct contact or by contact with contaminated objects like tools and clothing.
- **Treatment:** Keep rubbing alcohol accessible; it removes the oily resin up to 30 minutes after exposure.

Checkpoint Quiz

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1. **A worker presents with confusion, a high body temperature, and hot, dry skin. While waiting for emergency services, what is the most critical first aid action?**
   a) Provide 12 quarts of water over the next 24 hours.
   b) Apply ointments and creams to the skin.
   c) Move the worker to a shaded, cool area and wet them with cool water while circulating air.
   d) Wait one hour to see if the symptoms subside.

Answer: (c). Heat stroke is a medical emergency requiring rapid cooling.

2. **What is the recommended hydration rate for a worker performing moderate activity in moderately hot conditions?**
   a) 1 cup every 15 to 20 minutes.
   b) 1 quart every hour.
   c) Only when the worker feels thirsty.
   d) One gallon at the start of the shift.

Answer: (a). Frequent small amounts of water are necessary to maintain hydration.

3. **Which of the following is an incorrect method for removing an attached tick?**
   a) Using fine-tipped tweezers.
   b) Using a hot match or nail polish.
   c) Gripping the tick carefully.
   d) Prompt removal upon discovery.

Answer: (b). Petroleum jelly, hot matches, or nail polish should not be used for tick removal.

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