



Information Briefing
Employee Safety and Health Team
Larry Grimes – Team Leader
Hurricane Katrina & Rita Emergency Response

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Heat Injury Prevention

HIGH TEMPERATURE + HIGH HUMIDITY + PHYSICAL WORK = HEAT ILLNESS

Heat becomes a problem when humidity, air temperature, and radiant heat combine with hard work to raise body temperature beyond safe limits. Sweat is your main defense. Everyone working in these conditions must understand the importance of staying well hydrated and resting. High heat stress can produce three forms of heat related illness: heat cramps, heat exhaustion, and heat stroke. The mildest is heat cramps. Heat cramps can progress to heat exhaustion and eventually heat stroke (which is a life threatening situation).

HEAT CRAMPS: Heat cramps are involuntary muscle contractions, typically in the large muscle groups, caused by failure to replace fluids or electrolytes, such as sodium and potassium.

Cramps can be relieved with stretching and by replacing fluids and electrolytes. Heat cramps can be prevented by maintaining an adequate intake of water, electrolyte replacement drinks, eating fresh fruits and vegetables, and taking frequent rest breaks.

HEAT EXHAUSTION: Heat exhaustion is characterized by weakness, extreme fatigue, nausea, headaches, wet, clammy skin. Heat exhaustion results when the body produces more heat than it can dissipate. Inadequate fluid intake is a major contributing factor.

Treat heat exhaustion by resting in a cool environment, by removing clothing so that one's sweat can evaporate, and by replacing fluids and electrolytes.

HEAT STROKE: Heat stroke is caused by failure of the body's heat controls. Sweating stops and the body temperature rises.

Although classic teaching describes a heat stroke patient as "hot and dry", recent studies have shown that over 50% of heat stroke patients are sweating heavily. Typically, in the field we do not have medical thermometers. Therefore, the hallmark of heat stroke is altered mental status. You should suspect heat stroke if a person is hot, fatigued, and shows some altered mental status, such as inability to remember the day or the current situation. They may ask, "Where am I?"

Heat stroke is characterized by hot, often dry skin, body temperature above 105.8 degrees Fahrenheit, mental confusion, loss of consciousness, convulsions, or even coma. Heat stroke is a medical emergency. Brain damage and death may result if treatment is delayed. Begin rapid cooling with ice or cold water and fanning the victim to promote evaporation. For rapid cooling, partially submerge the victim's body in cool water. Treat for shock if necessary. Provide oxygen if it is available. Heat cramps and heat exhaustion may be treated locally; heat stroke patients should be transported to a medical facility ASAP, as their condition may worsen suddenly.

PREVENTION: Ensure all individuals know the signs and symptoms of heat-induced illnesses and how to intervene. Perform the heaviest work during the coolest part of the day. Work in pairs. Drink plenty of cool water (one small cup every 15-20 minutes). Consider a carbohydrate / electrolyte sport beverage such as Gatorade as a portion of fluid replacement - this will help retain fluids and maintain energy and electrolyte levels. Wear loose-fitting clothing. Take frequent short breaks in cool shaded areas (allow your body to cool down). Avoid eating large meals before working in hot environments. Avoid caffeine and alcoholic beverages; these beverages make the body lose water and increase the risk for heat illnesses. Persons are at increased risk when they take certain medications, have had a heat-induced illness in the past, or they wear personal protective equipment and clothing (i.e. respirators, etc).

You can assess your hydration by observing the volume, color, and concentration of your urine. Low volumes of dark, concentrated urine or painful urination indicate a serious need to rehydrate. Other signs of dehydration include a rapid heart rate, weakness, excessive fatigue, and dizziness.

HEAT INDEX: To help prevent heat injuries become familiar with the "Heat Index". The **Heat Index (HI)** is the temperature the body feels when heat and humidity are combined. The chart below shows the HI that corresponds to the actual air temperature and relative humidity. **NOTE:** This chart is based upon shady, light wind conditions. **Exposure to direct sunlight can increase the HI by up to 15°F.** By using the two charts listed below you can evaluate the potential injury and take steps to mitigate the hazard before an injury occurs. As humidity and ambient temperatures increase - so does the potential for a heat injury. Think, Act, and Work Safely!

°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

HI	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F - 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	Heat stroke highly likely with continued exposure.

References: 6 Minutes for Safety

Standards for Fire and Aviation Operations, BLM www.fire.blm.gov/Standards/redbook.htm

Fitness and Work Capacity - - Second Edition

NOAA National Forecast Office, Pueblo, CO www.crh.noaa.gov/pub/heat.php

Contact: Jeff Scussel or Jeanette Early (678) 441-5125