Background

Heat stress is a buildup of body heat generated either internally by muscle use or externally by the environment. Heat exhaustion and heat stroke result when the body is overwhelmed by heat. As the heat increases, body temperature and the heart rate rise painlessly. An increase in body temperature of 2°F can affect mental functioning. A 5°F increase can result in serious illness or death. During hot weather, heat illness may be an underlying cause of other types of injuries, such as heart attacks, stroke, falls and equipment accidents.

The most serious heat related illness is heat stroke. The symptoms are confusion, irrational behavior, convulsions, coma, and death. While over 20% of heat stroke victims die regardless of health or age, children and older adults seem to be more susceptible to heat strain. In some cases, the side effects of heat stroke are heat sensitivity and varying degrees of brain and kidney damage.

Preventing heat stress will:

- Protect Health - Heat illness is preventable and treatable before it is life threatening.
- Improve Safety - Any heat stress can impair functioning.
- Increase Productivity - People work slower and less efficiently when they are suffering from heat stress.

Employers, supervisors and workers all have an essential role to play in preventing heat stress. Each member of the team should use good judgment to prevent heat related illness. A heat stress control program should protect all workers at the operation, from those who can work comfortably in heat to those in poor physical shape.

Key elements for controlling heat stress are:

- Encourage workers to drink before they are thirsty. If a worker is thirsty, he/she is already dehydrated. Workers should pre-hydrate the night before the work is scheduled.
- Drink ½ qt. to 1 qt. of water an hour, depending on the heat and humidity. This is the best way to replace lost body fluid. You body cannot absorb more than 1½ qts. an hour. Potable water must be available on-site.
- Although water is the preferred site fluid, electrolyte replacement fluids (Gatorade™, Squencher™, Powerade™, etc) are often used. Dilute these fluids by 50%. The sugar content of these drinks can upset the stomach and cause vomiting.
- Discourage the use of soda, high sugar and high caffeine drinks. These fluids may upset a workers stomach and cause dehydration.
- The supervisor should track fluid consumption to assure their workers are properly hydrated.
- Use SPF 30 sunscreen or greater throughout the day.
- Read medication labels to determine if they cause the body to react to the sun and heat.
• Avoid alcohol, before and after the work shift, as it can increase the effects of the heat and/or further dehydrate a worker.
• Avoid smoking and the use of other tobacco products as they increase a workers heart rate.
• Build up tolerance for working in the heat. Heat tolerance is normally built up over a one to two week time period. Supervisors should evaluate new workers and modify their tasks if they are not acclimated to the environmental conditions.
• Take breaks to cool down. Determine the work/rest schedule based on the environmental conditions. This work/rest schedule may change throughout the day.
• Provide heat stress training to workers and supervisors.
• Manage work activities and match them to employees’ physical condition.
• Use special protective gear, such as cooling garments and cooling vests.
• Set up a rehab/break area in an air conditioned environment or use canopies, high volume fans or misting fans.
• Know heat stress first aid techniques.

When possible, schedule heavy tasks and work requiring protective gear for cooler, morning or evening hours. Prolonged, extreme hot temperatures may mandate the postponement of nonessential tasks. Most protective garments limit sweat evaporation (but not sweat production) and chemical-resistant suits can cause rapid dehydration if sweat is not replaced.

• If the temperature is above 70 degrees Fahrenheit, cooling vests may be useful when workers are wearing chemical-resistant suits and are either doing heavy or moderate work for a prolonged period.
• If the temperature is above 80 degrees Fahrenheit, working in chemical-resistant suits for more than a half hour without taking frequent water and rest breaks may be unsafe. Cooling garments and frequent breaks are recommended.
• Powered air-purifying respirators and supplied-air respirators generally feel cooler than other types of respirators because breathing resistance is minimized and the airstream has a cooling effect.

Sun Safety

• **Reduce Time in the Sun** - It is important to limit sun exposure between 10 a.m. and 4 p.m., when the sun's rays are strongest. Even on an overcast day, up to 80 percent of the sun's UV rays can get through the clouds. Stay in the shade as much as possible throughout the day.
• **Dress with Care** - Wear clothes that protect your body. Cover as much of your body as possible if you plan to be outside on a sunny day. Wear a wide-brimmed hat, long sleeves, and long pants.
• **Be Serious about Sunscreen** – Make sure you are using a "sun protection factor" (SPF) of 15 or more. SPF represents the degree to which a sunscreen can protect the skin from sunburn. The higher the number, the better the protection "broad spectrum" protection
• **Tips for Applying Sunscreen** - Apply the recommended amount evenly to all uncovered skin, especially your lips, nose, ears, neck, hands, and feet. Apply sunscreen 15 minutes before going
out in the sun. If you don't have much hair, apply sunscreen to the top of your head, or wear a hat. Reapply at least every two hours.

• **Protect the Eyes** – Where sunglasses that offer 99 to 100 percent UV protection. This assures that the glasses block both forms of UV radiation.

### Temperature Monitoring

Temperature monitoring on-site is recommended. The most accurate heat stress monitor is a Wet Globe Bulb Temperature (WGBT) Unit. This unit measures the air temperature, radiant heat temperature and evaporative cooling. If a WGBT unit is not available, monitor the temperature and the humidity and use a heat index (HI) chart to determine the temperature a worker’s body may feel. If HI is used, add 15˚F to the air temperature if working in the direct sun to account for the radiant heat.

Use the WGBT or adjusted HI to determine the work/rest frequency and fluid consumption rate.

### On-Site Medical Monitoring

On-site medical monitoring should be implemented based on the level and type of chemical protective equipment used and the atmospheric conditions. On-site medical monitoring should be performed by trained medical personnel (EMT, Paramedic, Nurse, etc.). Implement medical monitoring when workers are wearing Level B or greater or when atmospheric conditions (high heat, high humidity) strenuous physical activity warrant it. Medical monitoring is performed before the work is started for the day, each time a worker exits the exclusion zone and prior to reentry. Assess for the following:

- Heart rate (pulse)
- Blood pressure
- Body temperature
- Respiratory rate
- Mental status
- Weight Change

Workers should be prevented from dressing out in chemical protective clothing and entering the exclusion zone if their resting vital signs meet or exceed the following criteria:

- Systolic BP >180 mm Hg and <90 mm Hg
- Diastolic blood pressure (bottom number): > 105 mm Hg
- Respiration rate: > 24 breathes per minute
- Body Temperature: > 99.5˚F
- Heart rate greater than:
  - 20-25 years old – 140
  - 26-30 years old – 136
  - > 3% change in weigh
  - 31-35 years old – 132
  - 36-40 years old – 128
  - 41-45 years old – 125
  - ≥ 45 years old – 122

### Signs and symptoms of heat stroke and heat exhaustion

- Heat stroke
  - Dry, hot skin
  - Very high body temperature
  - Altered mental status
  - Unconscious
  - Vomiting
- Heat exhaustion
  - Moist, clammy skin
Heat stroke first aid:

- Seek medical attention immediately. All heat stroke victims need emergency care.
- Move the victim to a cool place. Remove heavy clothing; light clothing can be left in place.
- Immediately cool the victim by any available means. Such as placing ice packs at areas with abundant blood supply (neck, armpits, and groin). Wet towels or sheets are also effective. The cloths should be kept wet with cool water.
- Keep the victim's head and shoulders slightly elevated.
- Care for seizures if they occur.

Heat exhaustion first aid:

- Move the victim to a cool place.
- Keep the victim lying down with legs straight and elevated 8-12 inches.
- Cool the victim by applying cold packs or wet towels or cloths. Fan the victim.
- Give the victim cold water if he or she is fully conscious.
- If no improvement is noted within 30 minutes, seek medical attention.

Emergency Treatment

Workers must be transported to an emergency facility if they experience any of the following:

- Heart palpitations
- Chest pain
- Shortness of breath
- Signs of heat stroke
- Altered mental status
- Persistent vomiting
- Resting (after cool down) heart rate > 140
- Systolic blood pressure > 200 at any time
- Diastolic blood pressure > 120 at any time

Review the following points:

- Heat stress is serious and should be handled as such.
- As strain from heat increases, body temperature and heart rate can rise rapidly.
- Exposure to heat can be serious to children and adults.
- Decrease work periods and increase rest periods as temperature and humidity increase.
- Have plenty of liquids available and administer first aid as needed.

Quiz Answer Key

Training Roster for Heat Stress Site Safety Briefings

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Response Site/Location:

Conducted by:

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Note: All completed forms should be retained in site files.
Heat Stress Training Module Quiz

Trainer’s Note: This quiz can be taken as a group. If taken as a group, note on this quiz sheet.

Name__________________________

1. The illness caused by heat stress is very real. T  F
2. Heat stress may result from the buildup of muscle generated heat in the body. T  F
3. Exposure to heat stress is not a problem with children. T  F
4. The most serious heat related illness is heat stroke. T  F
5. Over 20% of those who suffer a heat stroke die. T  F