Baylor University

Heat Stress Guidelines

Where might I be exposed to heat stress?

Any process, job site, activity or event that is likely to raise the participants deep core temperature (often listed as higher than 100.4 degrees F (38°C)) raises the risk of heat stress. Operations involving high air temperatures, radiant heat sources, high humidity, direct physical contact with hot objects, or strenuous physical activities have a high potential for inducing heat stress. Outdoor operations, activities or events conducted in hot weather, such as landscaping, exercising, walking to and from workstations or class, organized events, traffic control, and emergency response operations can be dangerous if not prepared. Those activities that require those outside to wear semi-permeable or impermeable protective clothing, are also likely to cause heat stress.

Are there additional causal factors for heat stress?

Age, weight, degree of physical fitness, degree of acclimatization, metabolism, dehydration, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury. Individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

What kind of heat disorders and health effects are possible and how should they be treated?

Heat Stroke is the most serious heat related disorder and occurs when the body's temperature regulation fails, and body temperature rises to critical levels. The condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency that may result in death. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). The elevated metabolic temperatures caused by a combination of workload and environmental heat, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a anyone shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The individual should be placed in a shady, cool area and the outer clothing should be removed to the extent possible. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protests, no e suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Heat Exhaustion signs and symptoms are headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment. Heat exhaustion should not be dismissed lightly. Fainting or heat collapse which is often associated with heat exhaustion. In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable and can be dangerous. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency. Individuals suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest and when possible, ice packs should be applied.

Heat Cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. Cramps appear to be caused by the lack of water replenishment. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments. Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat Rashes are the most common problem in hot work environments where the skin is persistently wetted by unevaporated sweat. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat Fatigue is often caused by a lack of acclimatization. A program of acclimatization and training for work in hot environments is advisable. The signs and symptoms of heat fatigue include impaired performance of skilled manual, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

What kind of engineering controls can be utilized?

General ventilation dilutes hot air with cooler air and in is the most cost effective. A permanently installed ventilation system usually can handle large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.

Air treatment/air cooling differs from ventilation because it reduces the temperature of the air by removing the heat (and sometimes humidity) from the air. **Air conditioning** is a method of air cooling which uses a compressed refrigerant under pressure to remove the heat from the air. This method is expensive to install and operate. An alternative to air conditioning is the use of chillers to circulate unpressurized cool water through heat exchangers over which air from the ventilation system is then passed. Chillers are more efficient in cooler climates or in dry climates where evaporative cooling can be used.

What administrative or work practice controls may be used?

Acclimatize workers by exposing them to work in a hot environment for progressively longer periods. NIOSH (1986) suggests that workers who have had previous experience in jobs where heat levels are high enough to produce heat stress may acclimatize with a regimen of 50% exposure on day one, 60% on day two, 80% on day three, and 100% on day four. For new workers who will be similarly exposed, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.

Replace Fluids by providing cool (50°-60°F) water or any cool liquid (except alcoholic beverages) to workers and encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area.

Reduce the physical demands by reducing physical exertion such as excessive lifting, climbing, or digging with heavy objects. Spread the work over more individuals, use relief workers or assign extra workers. Provide external pacing to minimize overexertion.

Provide recovery areas such as air-conditioned enclosures and rooms and provide intermittent rest periods with water breaks.

Reschedule hot jobs for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.

Monitor workers who are at risk of heat stress, such as those wearing semi-permeable or impermeable clothing when the temperature exceeds 70°F, while working at high metabolic loads (greater than 500 kcal/hour). Personal monitoring can be done by checking the heart rate, recovery heart rate, oral temperature, or extent of body water loss.

Develop a heat stress training program, and incorporate into health and safety plans at least the following components:

- Knowledge of the hazards of heat stress.
- Recognition of predisposing factors, danger signs, and symptoms.
- Awareness of first-aid procedures for, and the potential health effects of, heat stroke.
- Employee responsibilities in avoiding heat stress.
- Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments.
- Use of protective clothing and equipment.
- Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs.

For more information on Heat Stress, you can go to the following link on the OSHA web page: https://www.osha.gov/heat-exposure

Contact the EHS Campus Safety Manager with any questions. 254-709-1991