HEAT STRESS POLICY

Table of Contents

Introduction

In an effort to reduce or eliminate the likelihood of heat related injuries _____ has developed the following guidelines. All employees working in non climate controlled environments should be trained in prevention, recognition and care of employees that might be showing signs of heat exhaustion or heat stroke. Prevention and early detection are keys to ensuring all employees enjoy a safe and productive day of work and are able to return to their family at the end of their shift.

Casual Factors

- A person's age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. In addition, the type of clothing worn must be considered. Furthermore prior heat injury predisposes an individual to additional injury.
- It is difficult to predict who will be affected and when. Individual susceptibility varies. In addition, environmental factors include more than the ambient air pressure. Radiant heat, air movement, conduction and relative humidity all affect an individual's response to heat.

Prevention

- Water- workers exposed to extreme heat should drink a cup of water every 15 minutes.
- Food- eat regular meals and snacks.
- Buddy system- train employees on what to look for and ask all employees to watch for signs of heat exhaustion.
- Reduce physical demands- switch employees out of trailers if loading/unloading.
- Clothing- wear light colored loose fitting clothing (wicking if possible).
- Shade- have a shaded, well ventilated or air conditioned area to take breaks.
- Rest- allow employees to take more frequent breaks.

Heat Disorders and Health Effects

Heat Stroke Signs and Symptoms

Heat stroke occurs when the body's system of temperature regulation fails and the body temperature rises to critical levels. This condition is caused by a combination of highly variable factors and its occurrence is difficult to predict. **Heat stroke is a medical emergency**. **The primary signs and symptoms of heat stroke are confusion, irrational behavior, loss of consciousness, convulsions, a lack of sweating (usually), hot and/or dry skin and an abnormally high body temperature** e.g. a rectal temperature of 41ºC (105.8ºF). **If body temperature is too high it can cause death**.

First aid

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. 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 workers protests, no employee 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

The signs and symptoms of heat exhaustion are headache, nausea, vertigo, weakness, thirst and giddiness. Fortunately, this condition responds readily to prompt treatment. Heat exhaustion should not be dismissed lightly for several reasons. One is that a fainting associate with heat exhaustion can be dangerous because the victim may be controlling machinery or controlling an operation that should not be left unattended. Moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those seen in heat stroke which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, given fluid replacement and be encouraged to get adequate rest.

Heat Cramps

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. It is important to understand that cramps appear to be caused by a lack of water replenishment. Because sweat is a hypotonic solution ($\pm$ 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide for the need for water. Instead, water must be taken every 15 – 20 minutes while in hot environments.
Under extreme conditions such as working 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 Collapse

During heat collapse (fainting), the brain does not receive enough oxygen because the blood pools in the extremities. As a result, the exposed individual may lose consciousness. The 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. To prevent heat collapse the worker should gradually become acclimatized to the hot environment.

Heat Rashes

Heat rashes are the most common problem in hot work environments. 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. Prickly heat occurs in skin that is consistently wetted by un-evaporated sweat and the heat rash papules may become infected if not treated. In most cases, heat rash disappears when the affected individual returns to a cool environment.

Heat Fatigue

A factor that predisposes an individual to heat fatigue is lack of acclimatization. Using a program of acclimatization and training for work in hot environments is advised. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor and 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.

Control

Ventilation, air cooling, fans, shielding and insulation are the five major types of engineering controls used to reduce heat stress in hot work environments. Heat reduction can also be achieved by using power assists and tools that reduce the physical demands placed on a worker. However, for this approach to be successful the metabolic effort required for the worker to use or operate these devices must be less than the effort required without them. Another method is to reduce the effort necessary to operate power assists. The worker should be allowed to take frequent rest breaks in a cooler environment.

Acclimatization

The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimatization. After a period of acclimatization the same activity produces fewer cardiovascular demands. The worker sweats more efficiently (causing better evaporative cooling) and is more easily able to maintain normal body temperatures.

A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such a program basically involves exposing employees to work in a hot environment for progressively long periods. (NIOSH 1986) states that for workers who have had previous experience in jobs where heat levels are high enough to produce heat stress the regimen should be 50% exposure on day one, 60% on day two, 80% on day three and 100% on day four. For

new workers similarly exposed, the regimen should be 20% on day one with a 20% increase in exposure each additional day.

Fluid Replacement

Cool (50ºF – 60ºF) water or any cool liquid (except alcoholic beverages) should be made available to workers to 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. Although some commercial replacement drinks contain salt, it is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

Engineering Controls

General Ventilation – General ventilation is used to dilute hot air with cooler air (generally cooler air that is brought in from the outside). This technique works in cooler climates better than in hot ones. A permanently installed ventilation system usually handles large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.

Air Treatment/Air Cooling – Air treatment/cooling differs from ventilation because it reduces the temperature of the air by removing heat (and sometimes humidity) from the air.

Air Conditioning – Air conditioning is a method of air cooling but is expensive to install and operate. An alternative to air conditioning is the use of chillers to circulate cool water through heat exchangers over which air from the ventilation system passes. Chillers are more efficient in cool and dry climates where evaporative cooling can be used.

Local Area Cooling – Local area cooling can be effective in reducing air temperature in specific areas. Two methods are used successfully in industrial settings. One type, cool rooms, can be used to enclose a specific workplace or to offer a recovery area near hot jobs. The second type is a portable blower with built-in air chiller. The main two advantages of a blower are portability and minimal set-up time.

Convection – Another way to reduce heat stress is to increase the air flow or convection using fans, etc. in the work area (as long as the air temperature is less than the worker's skin temperature). Changes in air speed helps workers stay cooler by increasing both the convective heat exchange (the exchange between the skin surface and the surrounding air) and the rate of evaporation. Because this method does not actually cool the air, any increases in air speed must impact the worker directly to be effective.

If the dry bulb temperature is higher than 35ºC (95ºF), the hot air passing over the skin can actually make the work hotter. When the temperature is more than 35ºC and the air is dry, evaporative cooling is improved by air movement. This improvement is offset by the convective heat. When the temperature exceeds 35ºC and the humidity is 100%, air movement makes the worker hotter. Increases in air speed have no effect on the body temperature of workers wearing vapor-barring clothing.

Heat Conduction – Heat conduction methods include insulating the hot surface that generates the heat and changing the surface itself.
Simple engineering controls, such as shields, can be used to reduce radiant heat, i.e. heat coming from hot sources within the workers line of sight. Surfaces that exceed 35ºC (95ºF) are sources of infrared radiation that add to the worker's heat load. Flat black surfaces absorb heat more than smooth polished ones. Having cooler surfaces surrounding the worker assists in cooling because the workers body radiates toward them.

With some sources of radiation such as heating pipes, it is possible to use both insulation and surface modifications to achieve a substantial reduction in radiant heat. Instead of reducing radiation from the source, shielding can be used to interrupt the path between the source and the worker. Polished surfaces make the best barriers, although special glass or metal mesh surfaces can be used if visibility is a problem.

Shields should be located as to not interfere with air flow unless they are also being used to reduce convective heating. The reflective surface of the shield should be kept clean to maintain its effectiveness.

Administrative Controls and Work Practices

Training is the key to good work practices. Unless all employees understand the reasons for using new, or changing old work practices, the chances of such a program succeeding are greatly reduced

NIOSH (1986) states that a good heat stress training program should include at least the following components:

- Knowledge of the hazards of heat stress.
- Recognition of the 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.

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

Worker Monitoring Program

Every worker who works in extraordinary conditions that increase the risk of heat stress should be personally monitored. These conditions include wearing semi permeable or impermeable clothing when the temperature exceeds 21ºC (69.8ºF) and working at an extreme metabolic load (greater than 500 kcal/hour), etc.

Personal monitoring can be done by checking the heart rate, recovery heart rate, oral temperature and the extent of body water loss.

To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period.

The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P1) with the pulse rate taken at 2.5 minutes (P3) after the rest break starts. This data can be interpreted on the graph below.

Oral temperature can be checked with a clinical thermometer after work but before the employee drinks water. If the oral temperature taken under the tongue exceeds 37.6ºC, shorten the next work cycle by one third.

Body water loss can be measured by weighing the worker on a scale at the beginning and the end of each work day. The workers weight loss should not exceed 1.5% of total body weight in a work day. If a weight loss exceeding this amount is observed then fluid intake should increase.

Heart Rate Recovery Pattern	P3	Difference Between P1 and P3
Satisfactory Recovery	<90	-----
High Recovery (conditions may require further study)	90	10
No Recovery (may indicate too much stress)	90	<10

Other Administrative Controls

The following administrative controls can be used to reduce heat stress:

- Reduce the physical demand of work, e.g., excessive lifting or digging with heavy objects.
- Provide recovery areas, e.g., air-conditioned enclosures and rooms.
- Use shifts, e.g., early morning, cool part of the day or night work.
- Use intermittent rest periods with water breaks.
- Use relief workers.
- Use worker pacing.
- Assign extra workers and limit worker occupancy or the number of workers present, especially in confined or enclosed spaces.