

Fact Sheet

Heat-Related Illnesses

Exposure to heat and the resulting heat-related illnesses are undoubtedly some of the most commonly overlooked safety issues for University employees. Heat-related illness is a serious concern for any employee who works in both outdoor settings such as farms and indoor settings such as foundries, kitchens, or laundries.

Introduction

Heat stress is a concern for any employee who works in conditions where heat, high humidity, lack of ventilation, and heavy physical workload are present.

Due to the perception of Minnesota being a cold climate, heat stress is often overlooked as a safety concern. In reality, heat stress is a major issue in Minnesota--Minnesotans may not have the opportunity to become and stay acclimatized to heat in climates such as Minnesota's, where daily high temperatures can vary up to 30 degrees from one day to the next during the summer.

Relevant Minnesota OSHA regulations

There are two major OSHA regulations in Minnesota which apply to heat stress.

First, Minnesota Rule 5205.0110, subpart 2a is the Minnesota OSHA standard for heat exposure. The standard is based on the wet bulb globe temperature (WBGT) and level of work activity.

Secondly, Minnesota's Employee Right to Know Act (MERTKA) is specified in Minnesota Rules 5206.0700, subparts 1 and 3, "Training Program for

Harmful Physical Agents." Minnesota Rules 5206.1100, "Labeling Harmful Physical Agents; Label Content," also apply.

Under the MERTKA rule, all covered employees must be trained, at the employer's expense. Other requirements under MERTKA include a complete written MERTKA program which includes heat, the availability of a data sheet describing the same information as covered in the training program, and signs identifying those areas in the facility where exposures approach the limits in the heat stress standard.

Heat-Related Illnesses (HRIs)

Heat stroke. Heat stroke occurs when the victim's body becomes completely dehydrated and the body loses the ability to cool itself through its main self-defense mechanism, evaporative cooling. *Heat stroke is a life or death medical emergency and must be treated as such.*

Symptoms are as follows:

- Profuse sweating followed by a complete lack of sweating which occurs due to total dehydration.

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- Skin may be hot, dry, red, mottled or bluish.
- Mental effects such as confusion, disorientation, loss of coordination, loss of consciousness, etc.
- Nausea, vomiting
- Headache
- Symptoms of heat stroke may mimic a heart attack due to the profuse sweating, changes in skin color, difficulty breathing, etc.

Heat stroke must be treated as a medical emergency.

- Call 9-1-1 immediately.
- Move victim to a cool or shaded area.
- Remove or loosen tight clothing that is restricting air flow over the body.
- Soak clothing and skin with cool water. Place cool wet towels on the head, in the armpits, and on the groin.
- Use a fan to create air movement.

Heat exhaustion. Heat exhaustion is caused by dehydration, and more specifically, the consequential decrease in blood volume. This occurs as a precursor to heat stroke, and therefore must be recognized and treated immediately.

Symptoms may include:

- Fatigue, weakness, dizziness, faintness
- Nausea/vomiting
- Headache
- Moist, clammy skin; pale or flushed
- Rapid pulse

- Normal or slightly elevated temperature

To treat heat exhaustion, have victim rest in a cool area and drink fluids. Again, it's important to recognize heat exhaustion as a precursor to heat stroke, and respond accordingly.

Heat cramps. The nature and causes of heat cramps is not well understood, but it appears to be related to loss of electrolytes through the process of perspiration.

Symptoms may include painful muscle spasms or cramps that usually affect the arms, legs, or abdomen during or after hard physical work.

Heat stress is treated with rest, and hydration with water and electrolyte replacement drinks such as Gatorade.

Heat rash. Heat rash appears as an area of reddened, tiny, raised blisters. It usually occurs on parts of the body which are covered by clothing, where skin is constantly wet from sweat. The sweat gland ducts become plugged, leading to inflammation. This is sometimes referred to as "prickly heat."

Skin should always be kept clean and dry.

Preventing heat-related illnesses

There are two major means of controlling heat-related hazards: acclimatization and hydration. Both of these methods are important because they allow the body to cool itself through evaporative

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cooling. This ability is often lost as a result of some of the heat-related illnesses described above.

When acclimatization and hydration fail to completely control the hazard, the employer must implement feasible engineering and administrative controls. These are discussed later in this fact sheet.

Hydration. The most important factor in preventing heat illnesses is adequate water intake. Proper hydration with water and/or electrolyte replacement drinks such as Gatorade will prevent dehydration and allow the body's defense mechanisms (evaporative cooling) to function efficiently.

- Employees should not wait to feel thirsty before hydrating. The sensation of thirst is unreliable, and may not appear until dehydration is well underway.
- Once the body becomes dehydrated, it is more difficult to rehydrate because the gut does not absorb water as well when dehydrated.
- Workers should drink at least five to seven ounces of cool water every 15-20 minutes. Ample supplies of cool, clean drinking water must be provided in locations where it is immediately available.
- Salt tablets are not recommended, as they may upset the stomach and cause vomiting, which results in further dehydration.

Acclimatization. Acclimatization is a biological process in which a person can increase his or her tolerance to heat with repeated exposure to hot

environments. However, the ability to acclimatize varies among workers. Generally, individuals in good physical condition acclimatize more rapidly than those in poor condition.

Approximately one week of gradually increasing the workload and time spent in the hot environment will usually lead to full acclimatization.

- On the first day of the process, the employee should work approximately half of the day in the hot environment, with the remainder of the day spent out of the heat.
- Each successive day, the employee should spend an additional 10 percent of the normal workload and time in the hot environment.
- This process continues until the employee is working full days in the work environment.
- The exposure time should be at least two hours per day for acclimatization to occur.
- Acclimatization is lost when exposure to hot environments does not occur for several days.
- After a one week absence, a worker needs to reacclimatize by following a schedule similar to that for initial acclimatization. The acclimatization will occur more rapidly, so increases in workload and time can increase by approximately 20 percent each day after the first day, reaching normal work conditions by day four.

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Engineering and Administrative controls and Personal Protective Equipment (PPE)

When/if employees' exposure to heat exceeds the applicable limits (see "relevant Minnesota regulations" on page 1 of this fact sheet), then the employer must implement steps to reduce the hazards faced by the employees. The steps used to reduce these hazards to acceptable levels are known as "controls." Every control fits into one of three categories:

Engineering controls. Engineering controls are controls which actually remove the hazard from the work process. For this reason, engineering controls are always the preferred means of controlling any type of hazard. In the case of heat stress, examples of engineering controls may include actually changing the temperature of the work area by adding air conditioning, ventilation, or other such means.

Administrative controls. An administrative control is a means of controlling a hazard through policy, procedure, work rule, training, etc. Administrative controls should only be implemented after it has been determined that engineering controls are not feasible, or when they fail to control the hazard adequately. In the case of heat stress, administrative controls may include:

- Providing additional breaks for employees who work in hot environments.
- Work rotation programs that limit the amount of time the employee may spend in a hot environment.

- Employee training
- Changing the work procedure to reduce the burden on the employee or to reduce the amount of work that the employee is expected to perform.

Personal Protective Equipment (PPE). Personal Protective Equipment is the "last resort" in the hierarchy of hazard controls. Having employees wear PPE is the least desirable method of controlling any hazard, and therefore it should only be applied after engineering and administrative controls have been shown to be infeasible or when they fail to control the hazard adequately.

Options for PPE to control heat exposure are limited, but products such as ice vests, cooling headbands, etc. are available from most major safety suppliers.

Training

Supervisors and workers who may be exposed to hot environments must receive training.

Under Minnesota's Employee Right to Know Rules (Minnesota Rules 5206.0700, subparts 1 and 3), employers are required to provide training on the hazards of exposure to heat if exposures are expected to approach the limits in the heat stress standard. At a minimum, training should include applicable legal limits on heat exposure, signs and symptoms of heat-related illnesses, appropriate medical treatment, and any necessary precautions or measures to be taken for protection against heat.

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This training must be conducted before an employee is exposed to heat approaching the limits in the heat stress standard, and refresher training must be conducted at least annually.

Questions

If you have questions on this topic, please contact the Office of Occupational Health and Safety at (612) 626-5008 or uohs@umn.edu, or see the website at <http://www.ohs.umn.edu>.