

Heat exposure and health hazards

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Among the health hazards, exposure to excessive heat can significantly affect the safety, health and productivity of workers. Short-term, acute heat exposure can cause a rise in the core temperature of the human body, which can result in a heat-related illness or a combination of heat-related illnesses. Adverse long-term, chronic heat exposure can generate serious occupational heat-related illnesses, such as cardiovascular disease, mental health problems and chronic kidney disease. High core-body temperature, coupled with dehydration, can also generate negative behavioral effects, such as physical fatigue, irritability, lethargy, impaired judgment, loss of dexterity and loss of concentration.

Heat is a hazard that is underestimated in most operations. This is mainly because people are unaware of its effects due to the lack of education about heat and its salient consequences. Although most operations address heat exposure as a health hazard, there are several *safety* hazards also associated with heat exposure that have been neglected in safety and training programs. Assessment of the thermal environment is becoming more important due to the significant effects of excessive heat on the safety and health of miners.

Heat effects on the human body

There is a well-established mechanism that enables a human body to maintain thermal equilibrium when exposed to heat stresses. However, if the heat stress exceeds a certain level, this mechanism is no longer able to fully remove the metabolic heat. In situations when the human body is unable to effectively transfer heat to the ambient surroundings, the risk of heat-stress related illness and injury can drastically increase. The consequences of exposure to heat and humidity have an accumulative effect on the health and safety of mine workers. The longer workers are exposed to heat, the more their core-body temperature moves away from an acquired comfort level. In this state, heat storage in the body accumulates over time and the heat stress level increases. This can make heat a silent and dangerous health hazard, as its effects often are not exposed until life threatening health conditions develop. The ability of the human body to adjust to changing climatic conditions is the cause of this imminent danger.

Heat-related illness can range from thermal discomfort to serious problems, such as thermal stress, heat cramps, heat rash, heat exhaustion and heat stroke. The following simple actions can significantly reduce the risks of heat-related illness at workplaces:

- Hydration plan: Drink at least a cup of water every 15 to 20 minutes, thirsty or not. Avoid alcohol and caffeine when exposed to excessive heat.
- Acclimation program: Gradually increase the workload to allow your body to adjust to hot environment. Acclimation increases the body tolerance to excessive heat.
- Work-rest plan: Establish a proper work-rest schedule to decrease the severe effects of heat exposure. Rest in a cool, shaded location, preferably

where use of personal protective equipment (PPE) is not required.

- Training program: Regular site training helps workers recognize heat-related symptoms and know when to seek first aid or medical help.

It is important to note that the reaction of workers to excessive heat stress is different from person to person. Therefore, heat stress cannot be adequately controlled without considering the risks embedded in individual differences. Physical fitness, hydration, gender, anthropometric data, age, history of heat illness, previous difficulty in acclimating, drug use (prescription and narcotic) and alcohol consumption, hypertension, and body size and composition (high adiposity, small size) are relevant parameters that affect an individual's response to heat exposure.

Heat exposure and safety hazards

Another noticeable effect of high temperature and humidity is a reluctance or inability of a mine worker to perform active muscular work. This often begins as mere inertness supplemented by sleepiness. This effect may initially be resisted and passed off as a genuine condition of fatigue, which can ultimately lead to heat exhaustion and heat stroke. Several studies have shown that a worker is much less efficient in a warm and humid climate. In such conditions, the natural tendency of the nervous system is to become less active and for muscular work to diminish. Carelessness, loss of concentration, impaired mental capacity, inability to make decisions and the misapplication of PPE are among the safety hazards associated with heat exposure.

The following simple actions can be taken in order to minimize the risks of heat-related safety hazards at workplaces:

- Flexible work schedule: Vary job tasks in order to avoid repetition. When the working area is hot, schedule heavy tasks during shade and/or cooler temperature.
- Healthy diet: Eat well. Eat a healthy diet that provides sufficient energy throughout the shift. Avoid fatty foods and junk food.
- PPE application: Never remove or alter PPE when they are required. Workers must be trained how to properly use PPE.
- Communication: Develop a buddy system at the workplace. Communicate with coworkers and supervisors about possible health and safety hazards in working areas. ■

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