

## Nobody Likes It Hot

### Preventing Heat Stress in At-Risk Workers

**A**t 11 P.M. on April 20, 2010, the news broke that a BP oil rig in the Gulf of Mexico had exploded. By September 19, when officials formally declared an end to the worst oil spill in U.S. history, hundreds of workers had been deployed to clean up the oil that had fouled the waters and beaches of the Gulf states.

The cleanup work took place during the hottest months of the year, and the most common work-related illnesses among those workers were heat-related maladies. Occupational Safety and Health Administration (OSHA) reported that more than 738 incidents of heat-related illnesses were documented during the 2010 cleanup.<sup>1</sup> “We believe that more incidents of serious heat-related illnesses were prevented

through work/rest schedules and other preventive measures implemented by BP and safety officials of the Unified Area Command,” says Patricia Bray, M.D., M.P.H., Office of Occupational Medicine at OSHA. “Fortunately, there were no cases of heat stroke.”

### Health Care Workers and Heat

It’s not just cleanup workers who are at risk from heat stress. Between 2002 and 2006, 178 workers died of heat stroke in the United States.<sup>2</sup> “Many others are at risk for serious heat-related illnesses,” says Bray. Those include workers in construction, road work, agriculture, landscaping—and health care.

Nurses, physician assistants, and emergency workers often staff on-site clinics at outdoor work sites, camps, and large-scale sporting events. Not only are the other workers at risk, the health care workers themselves may be. If a case of heat stress is identified, health care workers can promote public health by determining whether this case represents a warning sign that changes in work processes are needed to prevent additional illnesses. Preventive measures for all workers—the health care workers, too—include scheduling more frequent breaks for rest, shade, and water.

Facilities and maintenance workers are in a unique position in a health care organization because their work often demands that they be outdoors, often at

### Facilities Workers and the Heat

Any outdoor jobs can take facilities workers out into the heat. Workers should be aware of heat dangers, take steps to keep hydrated and cool, and monitor each other for heat illness when they perform jobs, including the following, on hot days:

- Bulk materials storage, maintenance, and repair
- Outdoor generator testing and maintenance
- Parking lot maintenance
- Outdoor lighting upgrades
- Loading dock upgrades
- Exterior painting
- Landscaping
- Construction work



*Health care workers may be at risk for serious heat-related illnesses.*

a time not of their choosing. If an air-conditioning chiller or an outdoor generator breaks down, facilities workers must go out and fix it, regardless of the day’s heat index. Facilities workers as well as other health care workers need to be aware of the signs of heat illness and should be trained in prevention and treatment. (See “Facilities Workers and the Heat” above.)

Hazmat workers, first responders, firefighters, and other disaster management workers also face special—and serious—heat-related challenges. Often, protective clothing and gear designed to safeguard workers against dangerous

environments such as burning buildings or chemical spills also cause heat retention and increases workers' risks of dehydration and heat stroke.

Organizations should have plans in place to deal with situations that expose workers to the risk of heat stress. When properly trained, all health care workers can play a role in preventing, detecting, and treating heat-related illnesses. They can also help focus the attention of employers on their workers' vulnerability to heat stress.

## Varieties of Heat Illness

The first step in preventing and combating heat-related illness and death is knowing the range of maladies that can occur. There is a continuum of weather and exertion-related illness.

The following paragraphs discuss these heat-related illnesses, progressing from least serious to most serious.

Recognizing symptoms early in the continuum can help prevent an illness from progressing to the most serious—heat stroke, and possible death.

**HEAT RASHES** are the most common health effect in hot work environments. A feeling of prickly heat manifests as red papules, usually in parts of the body where clothing is restrictive and the skin is persistently moist. Heat rashes usually disappear when the affected individual returns to a cool environment.

**HEAT CRAMPS** usually happen when workers perform hard physical labor in a hot environment; the muscle cramps are triggered by dehydration and electrolyte imbalance. Drinking water—or, in some instances, carbohydrate-electrolyte replacement liquids—is effective in helping workers to recover.

**HEAT EXHAUSTION** is the body's response to an excessive loss of water and salt, usually through excessive sweating. Symptoms include headache, nausea, vertigo, weakness, thirst, and giddiness.



*Thirst can't be relied on as a guide to the need for water. Instead, workers in a hot environment should drink water every 15 to 20 minutes.*

Workers may experience **HEAT COLLAPSE** with loss of consciousness as blood pools in the extremities, leading to self-injury or injury to others, such as when the worker is operating machinery. Heat exhaustion and heat collapse may progress to heat stroke in a matter of minutes if the worker-turned-patient isn't treated immediately. Workers suffering from heat exhaustion or heat collapse should be removed from the hot environment and given fluid replacement. They should not be left alone until they have either completely recovered or have been sent for medical evaluation.

**HEAT STROKE** is a medical emergency that occurs when the body's system of temperature regulation fails and the individual's core body temperature rises to life-threatening levels. Signs and symptoms of heat stroke include confusion, irrational behavior, loss of consciousness, convulsions, and a high rectal body temperature of  $>40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ). "Heat stroke is an imminent, life-threatening emergency that is always associated with neurologic abnormalities, such as confusion, irrational actions, an unsteady gait, or loss of consciousness," says Bray. "Hot, dry skin and neurologic abnormalities are *always* cause for urgent action." Get the affected worker emergency medical attention immediately.

Although heat stroke is usually associated with a lack of sweating and hot, dry skin, a significant percentage of individuals with heat stroke related to physical exertion have moist (sweaty) skin. Also, high humidity conditions can prevent sweat from evaporating, so it can be difficult to determine whether someone has stopped sweating. "A lack of sweating is not necessary to diagnose heat stroke," says Bray. "Heat stroke may occur in someone who is sweating profusely, particularly with physical exertion. Heat exhaustion can progress to heat stroke within minutes." No employee suspected of being ill from heat stroke should be sent home or left unattended, and emergency medical care must be obtained.

Furthermore, certain risk factors can make some workers especially vulnerable to heat. Among these conditions are obesity, hypertension, diabetes, heart disease, viral infections, gastroenteritis, pregnancy, and the use of antihistamines, diuretics, and other medications. Other factors can also have an influence, including sleep deprivation and the consumption of alcohol or caffeine. Medical providers can give additional counseling on personal risk factors and individualized preventive measures.

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### Prevention and Treatment Tactics

Whenever possible, employers should schedule hot jobs for the cooler parts of the day, and they should schedule routine maintenance and repair work in hot areas for the cooler seasons of the year. Getting workers used to heat is another tactic. “It’s very important to acclimatize workers both to a hot environment as well as to strenuous physical exertion in a moderately warm environment,” says Bray. She points out that the human body is resilient to heat stress when given a week or two to develop tolerance. Further administrative controls include reducing the physical demands of work (for example, using machinery to perform heavy lifting) and providing recovery areas, such as air-conditioned enclosures and rooms or, at a minimum, shaded areas. Depending on the type of work and environmental conditions, such as ambient humidity, wetted clothing may be a simple and an inexpensive personal cooling technique.

Finally, supervisors and employers should schedule intermittent rest periods during very hot conditions, with water breaks at least hourly. Workers should have free access to cool water (50°F to 60°F if possible) and should understand the importance of drinking small amounts of fluids frequently, even when they are not thirsty.

The benefits of heat acclimatization can be decreased or nullified by sleep loss, infection, dehydration, and salt depletion.

“Those who work in hot environments may generate 6 to 8 liters of sweat during their workday,” says Bray. “The normal thirst mechanism isn’t sensitive enough to keep up with this fluid-loss rate. So those who work in moderately hot conditions should take in at least 1 pint of water per hour.” She recommends about 6 ounces—a medium glassful—

#### Educating Workers

Worker education is a key component of heat illness prevention. Training resources can be found at the following Web sites:

- OSHA’s “Quick Card” on heat stress can be found at <http://www.osha.gov/Publications/osha3154.pdf>.
- For educational materials in other languages and for low-literacy groups, go to <http://www.99calor.org/english.html>.

about every 20 minutes. But too many fluids can be as dangerous as not enough fluids. Bray points out that fatalities have occurred among endurance athletes and members of the military service following excessive water intake that resulted in severe electrolyte imbalance. “Fluid intake should not exceed 1.5 quarts an hour,” says Bray. “That means about 12 quarts of fluid a day.”

Facilities managers and other health care managers should consult with industrial engineers and safety professionals to develop plans for implementing preventive heat illness measures, such as designated air-conditioned rooms, cooling vests, and water stations.

### Worker Training

A major part of the worker protection equation is training. This training should focus on the following:

- Taking emergency action in case of severe heat-related illness or incapacitation
- Recognizing signs and symptoms of heat-related illness in self and others
- Requesting work modification based on predisposing factors
- Following work-site-specific procedures for reducing the risk of heat illness, such as taking mandatory rest breaks, drinking water, and spending time in air-conditioned break rooms

Workers should receive guidance on an appropriate amount of fluid to drink and monitoring the color of their urine, which can indicate dehydration.

Workers should be trained to identify serious heat illness and should know how to contact emergency medical services. Coworkers can initiate treatment by mov-

ing distressed workers out of the sun, removing extra clothing, and applying cold packs or ice wrapped in towels. Individuals can also be cooled with air movement (fans) and wet sheets or by using air-conditioning vents.

“Workers must be trained on specific hazards that are pertinent to their own jobs and on preventive measures available at each work site—such as where the first-aid kit is located and what to do in an emergency,” says Bray. “Also, employers who hire foreign-born workers must provide training that is understandable to them.” (See “Educating Workers,” above, for training resources.)

### Taking Heat Seriously

Bray concludes with a reminder for employers. “A single episode of heat-related illness should be a galvanizing event that warrants new prevention tactics,” says Bray, “along with follow-up measures to make sure that any failures are identified and corrected.” 

### References

1. Occupational Safety and Health Administration: *Gulf Oil Response and Heat*. <http://www.osha.gov/oilspills/heatstress.html> (accessed Mar. 11, 2011).
2. Bureau of Labor Statistics: *Occupational Injury and Illness Classification Manual*. <http://www.bls.gov/iif/oshioics.htm> (accessed Mar. 8, 2011).

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