

HELPING FIELD WORKERS *Battle Heat Stress*

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Rising temperatures at the onset of summer prompt many of us to think about and remind employees about the dangers of heat stress. Heat is a fact of life in the fields, a common work condition in most regions at least part of the year.

When a heat-related tragedy, such as the recent death of a grape harvester in Kern County, makes headlines, concern about this hazard intensifies. But heat stress causes an enormous amount of harm short of fatalities and by no means limited to warm-weather seasons. Just because it isn't in the newspaper doesn't mean that it isn't hurting workers and business operations.

What can managers in agriculture do to minimize the impacts of heat stress, besides keeping the igloos full and reciting the familiar litany of advice to drink lots of water, beware of stress symptoms, and rest when necessary?

How Heat Hurts

Humans can do amazing things as long as their internal organs and biochemical reactions are working, but they are very sensitive to temperature. While "feeling hot" often causes people discomfort and distraction, greater dangers are a by-product of the body's natural means for maintaining a normal temperature range or of a heat load that they simply cannot handle.

Sets of symptoms regarded as "heat illnesses" disturb physical and cognitive functions, reduce performance, lead to injury-causing accidents, and even threaten lives. The accompanying box details common symptoms of and treatment guidelines for several – heat rash, edema, syncope, cramps, exhaustion, and stroke.

Although some of the heat that people have to deal with comes from solar radiation and very hot air, their own bodies generate most. At rest the body produces little heat, but at work it demands more energy and faster metabolism, which greatly increases internal heat production.

When core body temperature exceeds 98.6 degrees, it triggers mechanisms to dissipate excess heat. First the heart pumps faster and blood vessels dilate (i.e., expand) to bring more blood to surface layers of skin, from which the heat it carries is radiated and conducted to the cooler environment. If a body cannot cool fast enough this way alone, or when surrounding air is warmer than the skin, it resorts to sweating, its most efficient means for getting rid of excess heat. Sweat glands draw water, carrying heat, from the bloodstream and send it out as sweat through pores onto the skin surface, from which the heat transfers more easily to the air. Because high humidity decreases the sweat evaporation rate, it slows cooling.

These cooling mechanisms are not without cost. Increasing blood flow to the body surface reduces the volume available to carry oxygen and nutrients to muscles, brain, and other internal organs, which in turn impairs strength, diminishes alertness, and accelerates fatigue. The loss of water volume through sweating also impairs the body's ability to cool itself later, and the related depletion of electrolytes in the sweat can touch off muscle cramps.

The longer the sweating goes on, the less the remaining blood volume and the greater the risk of heat stress symptoms. A 150-lb. man performing moderately active work in warm weather, for example, would lose about 3/4 quart of water, or 1% of his body

weight, per hour. At that rate, without replacing the lost fluid, he would likely experience notable loss of energy and endurance after three hours, serious fatigue and nausea after six, and even loss of consciousness after eight.

Key to Prevention

Research in sports, exercise, military and some industrial settings has yielded lessons about heat stress that are very applicable but not widely understood or easily applied in agricultural workplaces. Not surprisingly, the single most important measure that these studies suggest for reducing risks of heat stress is to steadily replenish fluids that the body loses in dissipating heat, and not to rely on thirst as the cue for when to drink. People generally sense thirst only after reaching a water deficit of about 2 percent of body weight, so drinking based on what we know is a safer strategy than drinking based on what we feel.

The amount of water needed to replace sweat loss is a function of workload, weather, and personal physical attributes. Military guidelines recommend drinking one quart per hour when performing hard work in 90+ degree temperatures and resting for 50 minutes per hour! For moderate work in temperatures of 82-90 degrees, the standard is about 3/4 quart and only 20 minutes of rest per hour.

Few if any businesses can afford to follow those rest guidelines, but all can realistically strive to help workers meet the fluid replenishment advice. At most farms, ranches, dairies, nurseries, and other agricultural workplaces, drinking water is provided in an "igloo" container available to employees throughout the day. Observations from two field studies that I conducted and many managers that I have spoken with, however, are that workers tend to visit the igloo infrequently, when they are quite thirsty, and drink large quantities on each visit, all resulting in a very substandard rate of fluid replenishment over the whole day.

Why don't hard working production employees drink as much as they need? My best hunches are that they see the cost of access as too high and the value of fluid replacement as too low to start drinking more frequently and abundantly. Elements of the "cost" to access the igloo may include physical effort, supervisory or co-worker scorn, and foregone earnings opportunity when on a piece-rate. Regarding the value of fluids, the issue is that most workers, supervisors, and managers alike do not understand the basic physiology of how the body generates and copes with excess heat. Many would never suspect a connection between their hypohydration and non-specific symptoms of heat illness. Without knowing the reasons behind exhortations to drink water frequently, workers are neither as equipped nor as motivated as they could be to do their part in combating heat stress.

Partners against Heat Stress

So what can managers do to better control the risks of harm from heat stress in their operations? If my hunches are right, they can first look for ways to reduce real and perceived costs of access to the drinking water they provide. Though circumstances vary, of course, most agricultural workers have to walk a short distance from where they are working to get to the water container. Distance to the igloo varies with differences in field layout, proximity of equipment

used in conjunction with tasks being performed, and particular arrangements made by employers. The igloo may be attached to a tractor or gondola only a few strides away, or it may sit in a truck far from the action. In row operations that do not use machines in the field, water containers and cups are typically located at the ends the rows. To get to them, workers have to break from their tasks and take a hike of from several yards to perhaps a quarter mile.

Crews sometimes ease farther away from the water and other sanitation facilities as they progress through a field. In such cases and others, there are often opportunities for an alert foreman to move the water closer to workers' current center of activity. If managers explain that they want foremen to place and keep the water as close as possible, and why, workers will end up with less of a physical price to pay for going to it and probably less concern about supervisory disapproval as well.

On the understanding front, since agricultural workers are just as inclined as anyone else to make reasonable decisions based on what they know, managers could effectively promote better hydration by helping workers learn how the body regulates its temperature and what part water plays in that. Accompanying this article is a list of sixteen key points to use as a guide. They can be delivered and discussed in orientations, tailgate meetings, company handbooks, and even paycheck envelopes. Everybody in an agricultural business is better off when all join in understanding, recognizing, and battling heat stress.

Heat Illness Symptoms and First Aid

Heat rash: Acute skin inflammation and clogging of sweat ducts. Regarded as the least severe of heat illnesses. Though it usually causes only temporary discomfort, it can give rise to a bacterial infection that shuts down function of sweat glands.

Rx: Cleanse the affected area thoroughly and dry completely. Calamine or other soothing lotion may help relieve the discomfort.

Heat syncope: Loss of consciousness, generally sudden, due to lack of sufficient blood and oxygen to the brain. Greatest danger is secondary injury from a fall. Most likely to affect people not acclimatized to work in hot environments. Heat stress can cause it by diverting blood to extremities or lower body or at the expense of the brain.

Rx: Rest, drink plenty of water or electrolyte fluids, ventilate.

Heat cramps: Symptoms include painful, involuntary muscle contractions – most commonly in calves, thighs, arms, and abdomen – heavy sweating, and thirst. Often extremely uncomfortable and can be completely disabling. Typically occur during or after hard work and are induced by electrolyte deficiencies that result from extended periods of intense sweating.

Rx: Rest and drink plenty of water or electrolyte fluids.

Heat exhaustion: Symptoms include fatigue, headache, dizziness, muscle weakness, nausea, and chills, tingling of hands or feet, confusion, loss of coordination, fainting and collapse. Occurs during work and results from dehydration, lack of acclimatization, reduction of blood in circulation, strain on circulatory system, and reduced flow of blood to the brain.

Rx: Rest in the shade or cool place. Drink plenty of water (preferred) or electrolyte fluids.

Heat stroke: The most extreme state of heat stress, a medical emergency. The body is typically hotter than 104 degrees and no longer able to cool itself. Brain damage and death can result. Can occur suddenly if heat exhaustion is not treated.

Rx: A person suffering heat stroke needs immediate attention and should be taken to a medical facility as soon as possible. Douse the body continuously with a cool liquid and summon or rush to medical aid immediately.

Key Points for Workers about Heat Stress

1. Your body normally operates best at a temperature of 98.6 degrees, and its organs require oxygen and nutrients delivered through the blood stream.
2. Both heat and the body's processes for getting rid of excess heat have effects on your comfort, performance, accident risks, and longer-term health.
3. Heat stress is a build-up of heat in the body that threatens its functioning. Heat injury or illness is a disruption of physical or mental functions caused by the body's response to heat stress.
4. When you are working, most of the heat load in your body comes from its own metabolism. About three-fourths of the stored calories you draw on to move muscles turn into heat rather than motion.
5. The harder you work, the faster you convert your stored energy, the more heat you generate, and the more you need to get rid of.
6. Hot weather and high humidity increase your heat stress risks mainly by slowing down the movement of heat from your body to the environment.
7. Your body naturally radiates heat to cooler environments (below 98.6). When it produces heat fast or the air is not cool enough, it uses additional means to keep a normal temperature.
8. When your body temperature is above normal, your heart rate increases and blood vessels expand to bring blood carrying heat close to the body surface, from which it radiates to the environment.
9. Increasing blood flow to your body surface for cooling diverts some of the flow that brings oxygen and nutrients to your muscles, brain, and other internal organs.
10. If your body can't release excess heat fast enough though radiation, your sweat glands activate and draw water from the bloodstream to carry heat through pores onto the skin surface, where it moves more easily to the environment.
11. The loss of fluid as sweat not only decreases the volume of blood to supply your organs but also reduces your ability to get rid of excess heat later.
12. Losing fluid and continuing to produce heat over time increases risks of feeling heat illness symptoms – weakness, poor concentration, loss of stamina and coordination, muscle pain, blurry vision, headache, confusion, dizziness, nausea, fatigue, and unconsciousness.
13. If you notice these symptoms in yourself or a co-worker, get rest, fluids, and attention from your supervisor as soon as possible.
14. The single best measure for reducing risks of heat stress is to drink water frequently throughout the day to replace the fluid you lose as sweat – as much as 1 liter per hour during strenuous work in warm weather.
15. Most people do not feel thirsty until their fluid loss is 2% or more of body weight and is already hurting their performance, so it is important to drink based on what you know and not wait to feel the need. By the time you sense thirst, you have been too dry for too long.
16. If fluid loss approaches 8% of your body weight, there is serious risk of heat stroke – a life-threatening medical emergency in which the body can no longer cool itself and the brain is deprived of oxygen. Don't let it get this far! But if it does, get medical help immediately.