

# COLORADO ENVIRONMENTAL PESTICIDE EDUCATION PROGRAM

Pesticide Fact Sheet #133  
CEPEP 10/01  
Updated 6/06

## HEAT STRESS

E.J. Buffington  
S.K. McDonald

This fact sheet describes what heat stress is and how to control it.

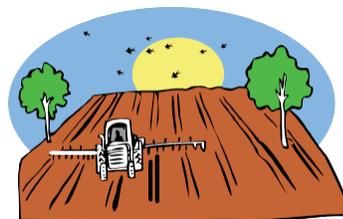
<http://www.cepep.colostate.edu>

## Heat Stress

### What is heat stress?

**Heat stress** is the build up of heat in our bodies generated by the muscles during work and of heat coming from warm and hot environments. **Heat exhaustion** and **heat stroke** result when the body is subjected to more heat than it can cope with.

When the body becomes overheated, less blood goes to the active muscles, the brain, and other internal organs. Workers get weaker, become tired sooner, and may be less alert, less able to use good judgment, and less able to do their jobs well.



Heat stroke is a very serious illness. Its effects can include confusion, irrational behavior, convulsions, coma, and even death. Heat stroke can make survivors very sensitive to heat for months and cause varying degrees of brain and kidney damage. More than 20% of people afflicted by heat stroke die, even young and healthy adults. An average of nearly 500 people are killed each year in the United States by the effects of heat.

### Controlling Heat Stress

#### Key Elements

- **Water.** Make sure workers drink enough water to replace body fluid lost through sweating.
- **Acclimatization.** Have workers gradually adjust to working in the heat.
- **Rest breaks.** Have workers take periodic breaks in a shaded or air-conditioned area whenever possible.
- **Monitoring environmental conditions and workers.** Check temperature and humidity at least hourly when workers are working in hot environments and monitor workers' response to working in the heat.

#### Basic Steps

- **Train workers and supervisors** in how to control heat stress and to recognize, prevent, and treat heat illnesses.
- **Take into account the weather, workload, protective gear to be worn, and conditions of the workers.**
  - *Weather.* The danger of heat stress increases with higher temperature and humidity and with direct sunlight (sun without cloud cover). The full heating effect of the sun can equal an increase of up to 13°F in air temperature. Wind reduces the risk of heat illness by increasing the evaporation of sweat when work clothing is worn.
  - *Workload.* The body generates more heat during heavy work than during light or moderate work.

Applying pesticides on foot generates more body heat than applying pesticides from a tractor or truck.

- *Clothing and protective equipment.* The evaporation of sweat on the skin helps cool a person. The more clothes a person wears, the slower sweat evaporates and the longer it takes to cool off. Coated and non-woven synthetic protective garments effectively block evaporation of sweat. When pesticide handlers and early entry workers wear protective garments, they get hotter than when they wear normal work clothes.
- *The age and physical conditions of the workers.* Younger workers, well-rested workers, and physically-fit workers are less likely to suffer heat illness than other workers. But even workers in good shape can become seriously ill from heat. Many drugs, including alcohol and cold and allergy medications containing antihistamines, increase the risk of heat illness.
- *Whether the workers are used to working in the heat.* Workers who have gradually adjusted to working in a warm or hot environment are less likely to become ill.
- **Determine minimum amounts of water workers should drink.** Estimates of water requirements for persons doing moderate work in temperate regions during the summer range from 6-10 quarts per person per day. On a hot day, it is possible for a worker to lose as much as 3 gallons of perspiration. Thirst does not give a good indication of how much water a person needs to drink.
  - *Provide sufficient amounts of cool drinking water.* On average, a total of 2-3 gallons per worker on a hot day should be enough, but specific needs will vary.
- **Adjust work practices for the conditions of each day.**
  - *Schedule heavy work and pesticide handling requiring protective garments and equipment for the cooler hours of the day whenever possible.*
  - *Set up work/rest cycles so that workers work and rest for specific periods of time.*

By following these steps, you will control many heat stress problems. But you should also be prepared for times when, regardless of your efforts, you or your workers get too hot. When this happens, you must:

- **Shorten the length of work periods and increase the length of rest periods.**
- **Give workers shade or cooling** by various means, such as cooling vests, canopies, awnings, and air conditioning. Wearing a brimmed hat to shade the head can be particularly helpful.
- **Reassign workers** who are less fit to lighter work.
- **Halt work altogether under extreme conditions.**

Even using these procedures, some work under certain conditions will always make workers hot. A heat stress control program, however, will help prevent extreme situations from arising and enable you to handle those situations which do arise.

- **Give first aid when workers become ill.** Early recognition and immediate treatment are key to first aid for heat illness. Mild overheating and heat exhaustion can quickly lead to heat stroke, which is a life-threatening medical emergency.

Treatment for overheating includes rest in a cool, shaded area and drinking plenty of water. Even after the skin has cooled and a person feels comfortable, internal body temperature can remain high. Once a worker has become overheated, internal body cooling requires 30 minutes or more.

## Heat Illness and Pesticide Poisoning

When a pesticide handler becomes ill from working with organophosphate or carbamate insecticides in warm and hot environments, it can be hard to tell whether the handler is suffering from heat exhaustion or from pesticide poisoning (see Pesticide Fact Sheet [Recognizing Pesticide Poisoning](#)). While these illnesses share some similar symptoms, their treatments differ.

Comparison of Symptoms of Heat Exhaustion and Organophosphate/Carbamate Poisoning	
Heat Exhaustion	Organophosphate/Carbamate Poisoning
Sweating	Sweating
Headache	Headache
Fatigue	Fatigue
DRY membranes	MOIST membranes
Dry mouth	Salivation
No tears	Tears
No spit present	Spit present in mouth
FAST pulse (slow if person has fainted)	SLOW pulse
Nausea	Nausea and diarrhea
DILATED pupils	Possible SMALL pupils
Central nervous system depression	Central nervous system depression
Loss of coordination	Loss of coordination
Confusion	Confusion
Fainting (recovery prompt)	Coma (can't waken)

Combined problems of heat illness and pesticide poisoning may also occur. If there is any doubt about what the illness is, get medical help immediately. Both pesticide poisoning and heat stroke can be life-threatening and require prompt treatment.

### References and Resources

*A Guide to Heat Stress in Agriculture*. 1994. U.S. Environmental Protection Agency and Occupational Safety and Health Administration, Doc. #055-000-00474-9. Washington, D.C.

*Controlling Heat Stress in Agriculture*. 1996. U. S. Environmental Protection Agency, Doc. #055-000-00557-5, Washington, D.C.

[CEPEP Home Page](#)