



Heat-Related Illness Clinician's Guide

June 2021

Introduction

Agricultural workers are at significant risk for heat stress. Heat stress results when the body cannot get rid of excess heat and its core temperature rises.¹ Heat stress may lead to more severe heat illness including heat exhaustion, heat cramps, heat stroke, and even death if left untreated.² Agricultural work, which requires performing physically demanding work for long hours in hot and sometimes humid weather, places workers at high risk.

This guide provides information to clinicians on the prevention and treatment of heat-related illness. Since workers may not be familiar with all of the symptoms of heat stress, it is important that clinicians discuss heat illness symptoms and prevention with agricultural workers and others who are at risk.



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Causes of heat-related illness

High environmental temperatures, humidity, low or no-wind conditions, sun exposure, dehydration and physical exertion are all risk factors for heat illness.³ Consuming alcohol or drinks high in caffeine—such as energy drinks—may increase the risk even further.⁴ Personal factors such as age, weight, pregnancy, physical condition and use of certain medications may also put workers at greater risk (see *Importance of a thorough clinical history* on page 2). Serious heat illness is also more common among workers who are not accustomed to working in the heat. Approximately 50 to 70 percent of deaths attributed to outdoor heat exposure happen within the first few days of working in a warm or hot environment, due to lack of acclimatization.⁵

Recognizing and treating heat-related illness

Since environmental and work conditions put agricultural workers at increased risk of heat illness, it is important that clinicians discuss this risk with patients and remain vigilant for symptoms that might indicate a patient is suffering from heat illness. Table 1 shows the different types of heat illness and symptoms.

Table 1. Types of heat illness and their symptoms

| Heat stress | Heat exhaustion | Heat cramps | Heat stroke |
|--|--|---|--|
| <ul style="list-style-type: none"> • Feeling of discomfort • Physiologic strain (indicated by increases in core temperature and heart rate in response to heat strain) | <ul style="list-style-type: none"> • Rapid heartbeat • Heavy sweating • Extreme weakness or fatigue • Dizziness • Nausea, vomiting • Irritability • Fast, shallow breathing • Slightly elevated body temperature | <ul style="list-style-type: none"> • Muscle cramps, pain, or spasms in the abdomen, arms or legs | <ul style="list-style-type: none"> • High body temperature • Confusion • Loss of coordination (ataxia) • Hot, dry skin or profuse sweating • Throbbing headache • Seizures, coma |

Sources: Jardine DS. Heat illness and heat stroke. *Pediatr Rev.* 2007 Jul;28(7):249-58. doi: 10.1542/pir.28-7-249. Erratum in: *Pediatr Rev.* 2007 Dec;28(12):469 and National Institute for Occupational Safety and Health. (2010). *NIOSH Fast Facts: Protecting Yourself from Heat Stress.* (DHHS (NIOSH) Publication No. 2010-114). <https://www.cdc.gov/niosh/docs/2010-114/pdfs/2010-114.pdf>.

Chronic kidney disease of nontraditional origin (CKDnt):

Chronic heat stress may be associated with the development of CKDnt.⁶ CKDnt is a form of kidney disease in patients who do not have the usual risk factors such as diabetes, hypertension, cardiovascular disease, or old age.⁷ Some agricultural workers come to the U.S. from farms in Central America, where a CKDnt epidemic has killed tens of thousands of agricultural workers. The success of water-rest-shade interventions and the lack of CKDnt in subsistence farmers led researchers to conclude that occupational heat stress is the primary driver of the epidemic.⁸ While rates of CKDnt in the U.S. are unknown, acute kidney injury (AKI) appears to be relatively common among agricultural workers.⁹ Anecdotal information suggests that cases of illness consistent with CKDnt are increasingly being found in the U.S.¹⁰

CKDnt is typically asymptomatic except at advanced stages. Traditional clinical markers of kidney disease such as elevated serum creatinine, protein excretion and urinary albumin to creatinine ratio (ACR) may only develop when CKDnt is at an advanced stage, and there are currently no widely accepted reference standards for other biomarkers that might allow for early detection.¹¹ This underscores the importance of heat stress prevention among at-risk workers.

Importance of a thorough clinical history:

Risk factors such as past episodes of heat illness and medical conditions or medications that affect the body’s heat-regulation mechanism can make workers more susceptible to the effects of heat. Therefore, ascertaining a patient’s clinical history is a key step toward identifying those at higher risk. Tables 2 and 3 show some physiological and pharmacological risk factors associated with a greater risk of heat illness.

Table 2. Health conditions and individual factors that may increase workers’ risk of heat-related illness

| | | |
|-------------------------------|-------------------------------------|--------------------------------|
| • Advanced age | • Low physical fitness | • Recent fever, diarrhea, cold |
| • Altered cytokine production | • Lung disease | • Sickle cell trait |
| • Cardiovascular disease | • Malignant hyperthermia | • Small body size |
| • Diabetes | • Overweight/obesity | • Sunburn |
| • Hypohidrosis | • Pregnancy | • Sympathectomy |
| • Kidney disease | • Previous episodes of heat illness | • Type II fiber predominance |

Sources: Westwood CS, Fallowfield JL, Delves SK, Nunns M, Ogden HB, Layden JD. Individual risk factors associated with exertional heat illness: A systematic review. *Exp Physiol.* 2021 Jan;106(1):191-199. doi: 10.1113/EP088458. Epub 2020 May 8. Lundgren K, Kuklane K, Gao C, Holmér I. Effects of heat stress on working populations when facing climate change. *Ind Health.* 2013;51(1):3-15. doi: 10.2486/indhealth.2012-0089.

Table 3. Medications/drugs that may increase workers’ risk of heat-related illness

| | | |
|-----------------------------|----------------------------------|-----------------------------|
| • Alcohol | • Beta blockers | • Neuroleptics |
| • Alpha-adrenergic agonists | • Calcium channel blockers | • Phenothiazines |
| • Amphetamines | • Cocaine | • Stimulants |
| • Anticholinergics | • Diuretics | • Thyroid receptor agonists |
| • Antihistamines | • Ephedra-containing supplements | • Tricyclic antidepressants |
| • Benzodiazepines | • Laxatives | |

Source: Becker JA, Stewart LK. Heat-related illness. *Am Fam Physician.* 2011 Jun 1;83(11):1325-30.

Prevention:

Drinking water frequently, taking shade and rest breaks, and allowing for a period of acclimatization to working in the heat are key steps to prevent heat illness. The OSHA field sanitation standard requires employers with more than 10 workers to provide drinking water.¹² It is recommended that workers drink 1 cup (8 oz.) of water or other fluids every 15-20 minutes when working in hot conditions. Agricultural workers should also take rest/shade breaks, which should increase in duration and frequency according to the temperature and the intensity of their work activity.¹³ Other basic messages include to avoid alcohol and caffeinated drinks like soda or energy drinks and to opt for water instead; to wear clothing like loose-fitting, lightweight, light-colored cotton clothes, a wide-brimmed hat, and a bandana; and to monitor oneself and coworkers closely during heat events.



Agricultural workers may be paid by piece rate rather than by the hour, disincentivizing workers from taking time to get water and take rest/shade breaks. Clinicians should emphasize the importance of close monitoring of signs and symptoms in addition to strongly advocating for water, rest, and shade. Clinicians may also contact employers to encourage worker and supervisor training to prevent heat-related deaths.

Treatment and medical attention:

If the worker has symptoms of heat stress or heat exhaustion, he/she should be removed from the heat immediately, taken to a shaded, cool place and given fluids to drink. If the symptoms continue after 20 or 30 minutes, emergency medical attention may be needed. Any decline in mentation, regardless of core temperature, must be considered heat stroke. Emergency medical attention is needed if a person is experiencing heat stroke symptoms such as ataxia, confusion, seizures or loss of consciousness.¹⁴ While emergency medical services are summoned, the worker should be placed in a cool location, have excess clothing removed, and be wetted with cool water and fanned.¹⁵ Once under medical care, cooling—through external and/or internal methods—must take priority and should continue until the patient's core temperature is reduced to 38 °C (100.4 °F). Once the cooling process is underway, laboratory tests and monitoring of renal function may be performed.¹⁶

Post-treatment follow-up:

After counseling the worker on how to prevent the recurrence of heat illness, the clinician should provide the worker with a note for their employer indicating the reason the worker required medical treatment and any accommodations the employee may need upon their return to work. The U.S. Occupational Safety and Health Administration (OSHA) recommends that if a clinician determines that work conditions at a worksite are unsafe, they should discuss this with the employer while maintaining patient confidentiality. The clinician may also file a complaint with their [state OSHA Office](#). If the conditions at a worksite are life-threatening, they should be reported immediately through OSHA's emergency number: 1-800-321-OSHA.

Messaging to prevent heat-related illness:

While work conditions may not always provide an environment that is favorable to preventive practices, it is important that agricultural workers be aware of the need to drink water throughout the day and take regular shade and rest breaks without waiting to feel sick. The Centers for Disease Control and Prevention (CDC) has an [online resource](#) with answers to frequently asked questions about heat illness in English and Spanish.

Social determinants of health and heat stress

Agricultural workers face specific social determinants of health (SDOH) that place them at greater risk of developing heat illness. SDOH commonly affecting agricultural workers include lack of access to clean water, lack of air conditioning at home to cool off and recover after work, and socioeconomic vulnerability and language barriers that may prevent them from demanding safer work conditions from their employer. They may also fear retaliation from their employer for denouncing unsafe work conditions.



Other considerations around heat-related illness

There are additional factors to consider regarding heat-illness risks among agricultural workers. One of these is the amount of clothing and personal protective equipment (PPE) workers must wear while in the fields to protect themselves against COVID-19, dust inhalation, pesticide poisoning, and sunburn. PPE, although necessary, traps heat and can lead the body to overheat more quickly.

Current climate trends indicate that extreme heat events and average temperatures will continue to increase in the U.S. and with them the potential for heat illness. Another consequence of climate change is the increasing frequency of large wildfires. Even when burning hundreds of miles away from the agricultural worksite, wildfires can expose workers to the stress of wildfire smoke. In heavy smoke, many workers are encouraged to wear PPE to prevent smoke inhalation, increasing their risk of heat illness. Furthermore, heat stress may worsen the health effects of other environmental conditions such as air pollution.¹⁷

Heat-related illness and the law

There is no national heat standard to protect agricultural workers from the risk of heat illness. As of this writing, only three states—California, Minnesota and Washington—have workplace heat standards. Due to the lack of a national occupational heat standard and imperfect compliance in states that do have regulations in place, many workers are not afforded the opportunity to take basic preventive measures against heat stress.¹⁸

A bill introduced in the 117th Congress in 2021—the “[Asunción Valdivia Heat Illness and Fatality Prevention Act](#)”—would require OSHA to create a national heat standard mandating paid rest breaks in cool or shaded environments for outdoor workers, access to drinking water and worker training on heat stress, among other provisions.¹⁹ The bill was named after an agricultural worker who tragically died from heat stress. However, a bill is not needed for OSHA to take action at the agency level to issue a heat stress standard. More information on heat-related illness and pending legislation can be found on the Farmworker Justice website.

Clinician Resources

- [Heat-Related Illnesses](#), by R. Gauer and B.K. Meyers²⁰
- [Emergency Management of Heat-Related Illness](#), by W. Troyer and J. Kiel²¹
- [Heat Illness](#), by D. Leiva and B. Church²²
- [Evaluation and Management of Heat Stroke](#), by K. Li²³
- [Heatstroke](#), by Y. Epstein and R. Yanovich²⁴
- [Management of exertional heat stroke: a practical update for primary care physicians](#), by E. Walter and K. Steel²⁵
- [Management of Environmental Heat Injury in the ED](#), by S. Watts, P. Jackson and G. Chiampas²⁶
- [Management of Heatstroke and Heat Exhaustion](#), by J.L. Glazer²⁷

Patient Resources

The following are some useful resources designed specifically for workers on how to prevent, recognize and address heat illness in the workplace.

Centers for Disease Control and Prevention

- [Heat-Related Illnesses](#) (English)
- [Enfermedades Relacionadas con el Calor](#) (Spanish)

National Institute for Occupational Safety & Health

- [NIOSH Fast Facts](#) (English)
- [NIOSH Datos Breves](#) (Spanish)

Occupational Safety and Health Administration

- [Water. Rest. Shade. The Work Can't Get Done Without Them](#)
(Low literacy fact sheet)
- [Agua. Sombra. Descansos. Sin ellos no se puede trabajar](#) (Spanish)

Pacific Northwest Agricultural Safety and Health Center

- [Heat Illness Prevention](#)

Western Center for Agricultural Health and Safety

- [Heat Illness Prevention](#)

Association of Farmworker Opportunity Programs

- [Heat Stress Prevention](#)

Employer Resources

Clinicians may share resources with local employers.

Occupational Safety and Health Administration:

[Using the Heat Index: A Guide for Employers](#)

[Agua. Sombra. Descansos. Sin ellos no se puede trabajar](#) (Spanish)

California* Occupational Safety and Health Administration:

[Heat Illness Prevention](#)

[Prevención de Enfermedades Causadas por el Calor](#)

*California requires employers to provide trainings on heat illness prevention. However, much of these materials – including trainings, posters, and a pocket guide, are applicable to employers around the country to train workers.

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