Heat Stress



INCIDENT

In Georgia, Miguel Angel Guzman Chavez, a 24-year-old farmworker, died of heatstroke while working the field last month when the heat index reached 105 degrees Fahrenheit. Earlier this month, 52-year-old Cruz Urias-Beltran was found dead in a cornfield in Nebraska after temperatures topped 100°F. Postal worker Peggy Frank died in her mail truck near Los Angeles on July 6, when the temperature reached 117°F. She was 63.

NEED TO KNOW

Any worker exposed to hot and humid conditions is at risk of heat illness, especially those doing heavy work tasks or using bulky protective clothing and equipment. Some workers might be at greater risk than others if they have not built up a tolerance to hot conditions, including new workers, temporary workers, or those returning to work after a week or more off. All workers are at risk during a heat wave.

The three main heat related illnesses are heat stroke, heat exhaustion, and heat cramps. Heat stroke can be fatal and heat exhaustion and heat cramps can quickly lead to heat stroke if left untreated.

Heat Rash. Heat rash is generally misunderstood to be an affliction for babies, but heat rash can affect adults, too, especially during hot, humid weather. Heat rash develops when blocked pores, or sweat ducts, trap perspiration under your skin.

Symptoms. Adults usually develop heat rash in skin folds where clothing causes friction. Symptoms include superficial blisters and can even present as deep, red lumps. Some forms of heat rash can feel extremely itchy.

Treatment. Heat rash will usually clear on its own by cooling the skin and avoiding exposure to the heat that caused it. If symptoms such as increased pain, swelling, redness, or warmth extend for longer than a few days reach out to a doctor for specialized treatment.[2]

Heat Cramps. Heat cramps are painful, brief muscle cramps where the muscles may spasm or jerk involuntarily. These cramps can begin during the activity in the heat, or may start several hours later. Muscles that are most susceptible to heat cramps are those that are usually fatigued by heavy work such as calves, thighs and shoulders.

The exact cause of heat cramps is unknown, but medical professionals are able to boil it down to a chemical imbalance in the muscles—usually related to electrolytes. Electrolytes include various essential minerals, such as sodium, potassium, calcium and magnesium. They are involved in the chemical reactions of your muscles, and an

imbalance can cause issues.

Symptoms. Someone who is experiencing heat cramps will feel muscle spasms that are painful, involuntary, brief, intermittent and self-limited (meaning, they go away on their own).

Treatment. To treat heat cramps, begin with rest and a sports drink that includes electrolytes and salt or drink cool water. You can make your own salt solution by mixing a quarter to a half teaspoon of salt into a quart of water.[3]

Usually, heat cramps will dissipate on their own, but if you begin to see conditions worsen and the patient becomes dizzy, nauseous, experiences shortness of breath and a fast heartbeat, you should see a doctor. Heat cramps often accompany a more serious heat-related illness: heat exhaustion.

Heat Exhaustion. Heat exhaustion is a result of your body overheating and can cause heavy sweating, rapid pulse, dizziness and low blood pressure upon standing. Causes of heat exhaustion include exposure to high temperatures, particularly when combined with high humidity and vigorous physical activity.

Symptoms. Without prompt treatment, heat exhaustion can quickly lead to heat stroke, a life-threatening condition, so it is important to know the signs of someone who is likely suffering from heat exhaustion. Signs and symptoms may develop suddenly or over time and include cool, moist skin with goose bumps in the heat, heavy sweating, faintness, dizziness, fatigue, weak and rapid pulse, low blood pressure upon standing, headache, nausea and muscle cramps.

Treatment. If you see someone who might be experiencing heat exhaustion, instruct them to halt all activity and rest, move to a cooler place and drink cool water or a sports drink.

A doctor should be contacted if signs and symptoms worsen or if they don’t improve within one hour. A patient will need immediate cooling and urgent medical attention if their core body temperature reaches 104 Fahrenheit or higher. Those who exhibit confusion, agitation, loses consciousness or is unable to drink must also be taken to see a medical professional as soon as possible.[4]

Heat Stroke. Heat stroke is the most serious form of heat injury and can occur if your body temperature rises to 104 Fahrenheit or higher. Heat stroke requires emergency treatment, and if left untreated, can quickly damage the brain, heart, kidneys and muscles. Damage to internal organs worsens the longer treatment is delayed, increasing your risk of serious complications or death.

While anyone can develop heat stroke, there are several factors that can increase the risk of illness such as age, exertion in hot weather, a lack of cool air or air conditioning, certain medications and certain health conditions.

Symptoms. Heat stroke symptoms include high body temperature, altered mental state or behavior, alteration in sweating, nausea and vomiting, flushed skin, rapid breathing, racing heart rate and headache.

Treatment. Someone who is suffering from a heat stroke must take immediate action to cool down their body while waiting for emergency treatment. To do this, move to shade or indoors, remove excess clothing and cool with whatever means available (put in a cool tub of water or a cool shower, spray with a garden hose, sponge with cool water, fan while misting with cool water, or place ice packs or cold, wet towels on the person’s head, neck, armpits and groin).[5]

BUSINESS / REGULATIONS

There is a legal duty to guard workers against heat stress, even though OSHA doesn’t

have a specific standard on heat stress. The OSHA General Duty Clause (Section 5(a)(1) of the OSH Act) says that every employer must safeguard workers against "recognized hazards" that can cause great bodily harm or death. Heat stress can cause great bodily harm or death. And it's a recognized hazard. As a result, all employers must take steps to protect their workers against heat stress.

This isn't just abstract legal theory**. OSHA has Invoked the Duty to Protect Workers Against Heat Stress in Actual Cases.**

Example: An Ohio steel and iron castings manufacturer plant with 1,500 workers used molten metal containers that produced tremendous amounts of heat. During a heat wave, one of the workers who worked near a molten metal container collapsed twice from heat stress. After he passed out the first time, the employer tried to cool the work area with large fans and radiant heat shields. But the heat was still unbearable and workers complained to OSHA. An OSHA inspector took measurements and reported the temperature of the worker's workstation as 95° F. That was just too high in OSHA's opinion. So it fined the employer for failing to take adequate measures to reduce heat stress hazards in violation of the **General Duty Clause [Duriron Co. v. Secretary of Labor, 750 F.2d 28 (6th Cir. 1984)].**

The Duriron case isn't the only source of authority to show that there's an OSHA duty to protect against heat stress. In a 2001 **Interpretation Letter**, OSHA stated that it has the right to prosecute employers for not taking measures to deal with heat stress hazards [OSHA Interpretation Letter, Oct. 17, 2001]. The Letter also lists specific steps that employers can take to reduce such hazards including:

- Letting workers drink as much water as they want whenever they want while working in hot conditions;
- Scheduling short shifts and frequent breaks to limit how long workers exert themselves in the heat; and
- Developing a heat stress program that includes specific procedures to be followed for heat-related emergency situations.

In addition to the General Duty Clause, the **OSHA Hazardous Waste Operations and Emergency Response Standard**, arguably requires prevention of heat stress hazards. For example, it requires employers to adopt personal protective equipment programs that limit workers' exposures to temperature extremes and heat stress.

The Law of Heat Stress in Canada

Canadian OHS laws are generally clearer and more specific than OSHA about heat stress. At least seven jurisdictions—BC, NB, NL, PEI, QC, SK and YT—include specific measures that employers must take to protect workers against heat stress in their OHS regulations. For example, Part 7 of the BC OHS Regulation requires employers to:

- Limit workers' exposure to excessive heat;
- Conduct heat stress assessments to determine workers' risk of hazardous exposure;
- Put into place a heat stress exposure control plan; and
- Implement engineering and administrative controls.

The laws of the other provinces don't say anything specific about heat stress. But that doesn't mean employers in those provinces get a free ride. On the contrary, every province has a general duty clause that requires employers to take all reasonable precautions to protect workers against foreseeable risks that can cause death or great bodily harm like the U.S. OSHA statute.

Although the specifics vary slightly, all provinces require at a minimum that employers train employees about heat stress and adopt policies and procedures for working in high temperatures.

Some of the “general duty clause” provinces that don’t spell out specific heat stress measures in their regulations do so in guidelines or special alerts. In essence, these guidelines explain what the General Duty Clause requires respecting heat stress. For example, the Ontario Ministry of Labour has issued guidelines stating that Section 25(2)(h) of the OHS Act—the Ontario version of the general duty clause (which requires employers to “take every precaution reasonable in the circumstances for the protection of a worker”)—requires employers to “develop hot environment policies and procedures to protect workers in hot environments due to hot processes or hot weather.”

Employers Fined for Lack of Heat Stress Protection

As in the U.S., Canadian employers have been prosecuted for not doing enough to protect workers against heat stress. Two examples:

Ontario: A worker at a national bakery and food store died on the job from heat stress. The incident occurred on August 6, 2001, when southern Ontario was in the middle of a heat wave. With outdoor temperatures of 34° C, the temperature inside the bakery was 36°. The worker overheated and collapsed. The MOL charged the employer with failing to implement a heat stress management plan in violation of Sec. 25(2)(h). The employer pleaded guilty and was fined $215,000 [Weston Bakeries Limited, MOL News Release, Feb. 18, 2004].

New Brunswick: In 1992, a boilermaker who worked for a repair contractor collapsed and died after three days of repair work in a paper mill. The outside temperature was 30° C and the inside of the mill was even hotter. The contractor pleaded guilty to not instructing the worker how to deal with heat stress dangers (in violation of Sec. 23(1) of the NB OHS Regulations) and was fined $7,500 [R. v. Lorneville Mechanical Contractors Ltd., [1993] N.B.J. No. 633].

STATISTICS

Hot weather is dangerous in more subtle ways, and is an ominous signal of what increasing average temperatures and climate change portend for some of the most vulnerable who must endure the heat to earn a living**. According to the Bureau of Labor Statistics, more than 15 million people in the United States have jobs that require them to be outdoors at some point**, and rising temperatures are proving dangerous for them.

Worker protections from high temperatures are sorely lacking

However, when we’re talking about climate change, the financial impacts should be secondary to the consequences for human life. And millions of workers remain alarmingly vulnerable to high temperatures. The advocacy group Public Citizen reported that worker fatalities from heat stress show a close link to average annual temperatures in the United States:

States like Minnesota, California, and Washington do have some heat regulations in place. But according to Public Citizen, that still leaves 130 million workers across the country without these legal protections.

The group is trying to change that by cosigning with more than 130 environmental and labor groups. Public Citizen sent a **petition to the Occupational Safety and Health Administration** for a national workplace heat standard.

They’re asking for provisions including heat stress thresholds, mandatory rest breaks, protective equipment, and heat risk education programs.

If you’re getting hot at work, stay hydrated, take breaks (or a nap), and avoid the sun. Your paycheck, and your life, may depend on it.

Between 1992 and 2017, more than 815 workers were killed and 70,000 were seriously

injured by heat stress between 1992 and 2017, according to the Bureau of Labor Statistics. This begs the ever-important question: How can employers address heat dangers and keep workers safe?

In 2014 alone, 2,630 workers suffered from heat illness and 18 died from heat stroke and related causes on the job. Heat illnesses and deaths are preventable.

For farmworkers, delivery personnel, and construction crews, high temperatures can also mean **heat exhaustion and related maladies**. Between 1992 and 2016, excessive heat killed 783 US workers and seriously injured 69,374, according to the BLS.

As the climate changes, **heat waves** are poised to get longer and more intense. That means more workers will face triple-digit temperatures, often for single-digit wages, threatening lives and livelihoods.

While much of the rest of the workforce is in air-conditioned offices and stores, they're not immune to the economic blows from climate change. By 2028, climate change will cost the US $360 billion per year, about half the expected growth of the economy, according to the **Universal Ecological Fund**. Much of this is due to health costs.

Researchers are starting to realize just how costly high temperatures are, and workers are now fighting back for cooler conditions.

Extreme heat is costly for workers and the economy as a whole

A huge slice of the US economy requires workers being outdoors and vulnerable to extreme temperatures. There are almost **5 million employed in transportation and logistics**, more than **1.3 million farmworkers**, more than **7 million working in construction**, and more than **600,000 in mining**. (Both open pit mines and **shaft mines** can get extremely hot.)

Rising temperatures have an impact on productivity well before they become dangerous. Economist **R. Jisung Park** reported that **worker productivity declines by 2 percent** for every degree Celsius above room temperature. It's a **worldwide phenomenon**, with the hottest regions getting hit the hardest. The heat can dehydrate laborers, and higher temperatures demand more frequent breaks.

A 2014 study from the **Rhodium Group** found that the largest economic losses from climate change in the United States will come in the form of lost labor productivity.

According to the **Environmental Protection Agency**, the United States will lose 1.8 billion labor hours across the workforce in the year 2100 due to extreme temperatures under a business-as-usual climate change scenario. That adds up to $170 billion in lost wages.

But laborers aren't the only ones vulnerable to heat. Researchers at the **London School of Economics** found that urban areas also pay a price for high temperatures, even among indoor office workers. They found that in London, a warm year could cost the city's economy upward of 2.3 billion euros in productivity. Workers make more mistakes and **act more slowly** as temperatures rise above their optimal range. You can also see this effect in **factories**.

RECOMMENDATIONS

OSHA has provided the following recommendations to prevent the ill – effects of heat stress.

- Protect new workers during the first tow weeks on the job. Make sure they take plenty of rest breaks and drink enough fluids.
- Never leave workers alone when they complain of heat-related symptoms. Their conditions can worsen quickly! Take them to a cool location and provide first

aid. Even a brief delay in first aid can make the difference between life and death.
- Temperatures do not have to be extremely hot to cause heat stroke in workers. Remember, total heat stress is a combination of environmental heat and workload. Air temperatures in the 80s (°F) are high enough to result in a Heat Index value of 90°F. They are also high enough to kill some workers.
- Even experienced workers are vulnerable to heat-related illness when the weather becomes warmer. Throughout the first week of warmer conditions, treat all workers as if they need to adapt to working in the heat. Take extra precautions to protect them from heat-related illnesses.
- Make sure workers drink enough fluids during warm or hot weather.
- Heat-related illness can occur indoors. The risk is not limited to outdoor workers.
- Some types of work clothing prevent the release of heat from the body. Environmental heat measurements underestimate the risk of heat-related illness in these situations.
- Workers are at risk of heat-related illness when they are reassigned to warmer job tasks.

PREVENTION

Heat cramps are painful but not life-threatening: They most often occur in the leg and stomach muscles, and are caused by an imbalance of water and salt in the body. Water, rest and a lightly salted snack will help.

Heat exhaustion is more serious: It can be caused by either too little water or loss of salt through sweat. The first symptoms are dizziness, sweating, headache, weakness, tiredness and nausea. As this condition progresses, symptoms are reduced mental alertness, blurred vision, pale and wet skin and shallow rapid breathing.

If someone is suffering from heat exhaustion:

- Move the person to a cooler place.
- Loosen restrictive clothing.
- If the victim is conscious, have him drink a solution of one teaspoon of salt per pint of water.
- Lay the victim down.
- Raise the person’s feet and legs slightly higher than his head.
- Fan the victim.
- Sponge with lukewarm water to encourage heat loss but don’t chill the victim.
- Call for medical help.

Heat stroke is serious: Heat stroke is a life-threatening medical emergency. The body has lost its ability to sweat and the inner temperature has risen dangerously. The symptoms are similar to heat exhaustion but the skin will be hot and dry, and breathing will be deep and fast as if the victim has been running. He or she might complain that the muscles feel as if they are on fire. The person may collapse with little or no warning.

If someone is suffering from heat stroke:

- Call for medical assistance immediately.
- If the person is not breathing and you are properly trained, begin rescue breathing procedures.
- It is important to lower the inner body temperature rapidly because damage to the brain, kidneys and heart can occur. Remove the person’s clothing and cover with a wet blanket or spray gently with water. Fan the person to increase heat loss.

These tips can help prevent heat stress in any form:

- Drink plenty of water or one of the commercially prepared drinks designed to replace fluids and minerals.
- Take rest breaks in a cooler area.
- Eat light, cool meals.
- Dress lightly, in layers, so that you can adjust as the temperature changes.
- Gradually get used to working in the heat.

Heat and humidity, either courtesy of mother nature or from man-made equipment and environments are hard on workers. Working in hot environments can easily fatigue workers and quickly lead to serious heat-related illness if not properly managed.

Step 1: Conduct Heat Stress Assessment

Are workers exposed to direct sunlight; is the humidity high along with the temperature; do workers wear PPE or protective clothing (respirators, fire-resistant clothing, and even hard hats); are there heat-producing equipment or processes?

Step 2: Measure Heat Exposure

The WetBulb Globe Temperature (WBGT) is a measure of the heat stress in direct sunlight, which considers temperature, humidity, wind speed, sun angle and cloud cover (solar radiation). This differs from the heat index, which takes into consideration temperature and humidity and is calculated for shady areas.

Step 3: Allow for Acclimatization

The body will get used to working in a hot environment gradually – it can take anywhere from 7-14 days. This is known as acclimatization or acclimating to the heat. What that means is the body becomes better at cooling itself down – it redirects blood to the skin's surface; the heart becomes more efficient; sweating starts sooner, there is more of it and the sweat contains less salt.

During this adjustment period, symptoms of fatigue, dizziness, heat rash, and stomach discomfort are common. Dehydration can cancel the benefits of acclimatization so providing and allowing for frequent intake of water and sports drinks is a must.

And while acclimatized workers will generally be able to work longer in a hot environment than unacclimated workers, caution must still be taken, and heat stress is still possible.

Step 4: Prevent Dehydration

Extreme temps and high humidity can make workers more susceptible to becoming dehydrated. Symptoms of dehydration include thirst, fatigue, muscle cramps, nausea, dizziness or confusion, excessive perspiration, and hot, dry skin.

Provide water nearby on the job site and ensure everyone drinks ***even if they're not thirsty***. As a general guideline, the recommended amount of water intake is one quart per hour of active work or exercise for the average adult. That is the equivalent of 128 ounces (3.78 liters) every four hours at minimum. It is also suggested that the water intake be distributed over a period of time, such as every 15-30 minutes per shift.

Step 5: Manage Heat Exposure

In addition to allowing for acclimatization and preventing dehydration, there are other steps you can take to help workers manage heat exposure. Establish a first-aid response system with trained first-aid providers and a way to record and report heat stress incidents. Use the buddy system so workers can look out early signs of heat stress in each other. Provide shaded shelter and allow for frequent breaks.

Provide lift aids for material handling – dollies, carts, lifting devices – to reduce

physical activity. Organize the work to reduce the pace of activity – if possible, postpone strenuous work until a cooler time of the day. Another option is to use job rotation and rotate workers in and out of hot areas.

Fans can be helpful under certain conditions – since fans do not cool the air, so air currents flowing over the body must be cooler than your body temperature to cool you down. So, provide fans when air temperature is below skin temperature (98.6°F/ 35°C) and the humidity is below 70%. Consider cooling or dehumidifying the workplace. When the temperature exceeds 98.6°F/ 35°C and the relative humidity is above 70%, the use of fans will increase worker's temperature because there will be little evaporation of sweat.

Step 6: Provide Training

Train workers on the different types of heat-related illnesses, their signs and symptoms, and response and treatment. Educate them on the importance of staying hydrated and that thirst is not an indicator of hydration – which is why they must drink fluids regularly even if they aren't thirsty. Finally, make sure they understand that medications they take, and activities done outside of work, including drinking alcohol, can affect their response to heat.

Be on the Lookout

Before understanding the steps needed to address heat-related illnesses, you must first be aware of what kinds of injuries and illnesses can occur in the summers' extreme heat. Like mentioned before, the chances of a worker suffering from heat rash, heat cramps, heat exhaustion and heat stroke are significantly higher when the temperature begins to soar. Here are the most common heat illnesses, their symptoms and how to treat them.