**XXXXXXXX Program**

Course Content

1 Introduction

* 1. OSHA
	2. Environmental Heat Differences (Indoor vs Outdoor)
	3. Heat Illness vs Heat Injury
	4. Effects on the Human Body – Medical Terminology
1. Heat Abatement and Technology
2. Heat-Related Illness Prevention Program

3.1-2.9 XXXX

2.10 XXXX

**1 Introduction:**

Heat-related hazards can lead to heat-related incidents and are often overlooked in the workplace. Did you know that the Occupational Safety and Health Administration (**OSHA**) cites heat as “the leading cause of death among all hazardous weather conditions in the United States?” (1) Assessments must be conducted to identify heat hazards that workers are exposed to. This program will help you implement a **Heat Injury and Illness Prevention Plan** (**HIIPP**) in your workforce.

*The goal of the XXXX is to help you understand heat stress and heat-related illnesses, minimize risks on the job, and recognize signs and symptoms so that you can respond accordingly when they occur.*

 - - - - - - -

**1.1 OSHA:**

Many companies have a ‘less than stringent’ heat-stress program and simply argue their case using the OSH Act of 1970’s General Duty Clause.

Section 5. Duties:

Each employer –

1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

2) shall comply with occupational safety and health standards promulgated under this Act.

Ask yourself - is Section 5 of the General Duty Clause enough?

Due to the call for something more to be done to help workers who face heat hazards in the U.S., OSHA has been conducting in-depth analysis and information gathering to use that affirms their argument for a proposed rule to prevent work-related heat injuries and illnesses. Most recently, they announced the August 30, 2024, publication in the Federal Register of a ‘Notice of Proposed Rulemaking (**NPRM**) for Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings. This is a greatly needed step toward implementing a Federal heat standard that will help reduce the number of workers who succumb to heat illness, injury, and death. You can read it here - <https://federalregister.gov/d/2024-14824>. (22).

Before the proposed new rule, OSHA’s approach to such heat-related hazards merely attempted to provide recommendations and guidance. Aside from the previous references, there is no specific heat standard, so employers refer to the OSH Act's General Duty Clause (GDC) concerning worker protection against heat hazards. The GDC has a stigma for being a “gray ruling,” prompting controversy that certainly needs improvement and clarity.

XXX

**The First Scene**:

Picture this: Robert, a 29-year-old male construction worker, is transporting boxes of supplies up and down three flights of stairs on a new-build high-rise project. He has also been lifting smaller but heavy tools, moving the boxes, and sweeping stairwells all morning. He has only taken two short breaks since starting. (It is the middle of Summer, and there has been a heatwave for the past three days. Clouds are forming in the distance, threatening a thunderstorm. It is very humid, and the temperature is 98 degrees Fahrenheit). When Robert arrived at the job site, he was alert, energetic, and in a good mood. However, near noon, he was showing signs of exhaustion. His shirt was drenched in sweat, and his face was bright red. A co-worker commented on his appearance, and he snapped back, “Hey, what do you expect? I’m working my tail off, and it’s hot out.”

By 3:30 in the afternoon, he was working in the construction yard, sorting supplies, when he began to feel dizzy. He took a quick water break, had a few bites of a protein bar, and then returned to work. About an hour later, he almost tripped on a flat surface. Another co-worker noticed that Robert was acting “strange” and approached him. By then, Robert was clammy-looking and said he had a bad headache.

The co-worker called XXX, who immediately instructed the workers to move Robert to a shaded area and give him some cool water. XXX then took Robert to the onsite clinic, where he was treated for heat exhaustion.

Pause for a minute to reflect on the hypothetical scenario, although it has most likely been an actual occurrence on a construction job at some time. What came to mind? Was Robert’s behavior typical of someone working on a hot and humid day? What could he have done to prevent the heat exhaustion? What would you have done if you were Robert’s co-worker?

Unfortunately, heat incidents are all too common in the workplace. And unfortunately, misconceptions about heat-related illness are all too common as well. Here are some examples:

1. “Heat Exhaustion and Heat Stroke are the same thing.” The misconception is that people mention each interchangeably. In reality, they are different, as heat exhaustion is less severe and heat stroke is a medical emergency. Knowing what differentiates them is critical, as life-saying actions depend on it.
2. “You can only get heat illness during extreme weather, like a scorching heat wave.” This is a misconception; people think heat illness only occurs during heat waves. The reality is - that heat can be dangerous even at moderate temperatures, especially when the humidity is high.

1. “You only need to drink water when you are thirsty, even if it is hot out.” The misconception is that thirst is a reliable indicator that you need to drink water. When someone is thirsty, they may already be dehydrated, which adds to heat stress.
2. “Firemen, soldiers, and other emergency responders don’t usually get heat stress.” The misconception is that they have been trained to work in hazardous environments and should be used to the dangers of heat. However, even professionally trained responders can become overwhelmed by heat stress. Their uniforms and equipment can cause a physical burden, especially when exposed to extreme heat. Their bodies do not always have adequate time to adjust when the environment becomes too dangerous, e.g., when firefighters are caught in a ring of smoke and flames.

What other misconceptions have you heard or thought yourself?

XXX…

We will talk about the specific sectors later.

**Heat-Related Illnesses versus Heat-Related Injuries:**

Next, we will review heat-related illness and heat-related injuries, as there are differences. For instance, how they affect the body, the contributing factors, and recommended actions to take in each situation. *Heat-related illnesses are preventable and most often treatable medical conditions caused by the body’s inability to cope with excessive heat.* In other words, if the core body temperature rises above healthy levels, the body cannot regulate it correctly. The heat stress conditions disrupt it, and internal mechanisms that keep the body healthy begin to weaken. Inflammatory agents are released in the body, initiating a “systemic inflammatory response” that can lead to death.

Our bodies sweat to stay cool, and our heart rates increase when experiencing Heat Stress—it’s how our bodies respond to keep the core temperature at healthy levels. However, our bodies overheat when the natural sweating mechanism struggles to keep up during humidity and high-temperature environments. Some signs and symptoms are minor, but they could become severe and life-threatening if medical treatment is not administered as soon as possible.

You might be familiar with “heat strain” and “heat stress.” In simplistic terms, **Heat Strain** is the body’s physiological response to heat stress (e.g., the core temperature rises and the body sweats).

**Heat Stress** is the net heat load a worker is exposed to. XXX Being aware of the environment in which you (and your team) work is essential to adequately manage the workload and physical requirements. Heat illness can occur in outdoor and indoor settings, so it is necessary to monitor air quality conditions and temperatures at all times.

XXX

Environmental factors such as air temperature, circulation, and humidity can impact outside workers in agriculture, construction, infrastructure, and utilities. Even professional athletes can be affected by the environment’s changing temperature and conditions. Skies won’t always be clear, and the temperatures on most job sites will not always be pleasant. That is why it is important to understand factors that contribute to heat-related illnesses.

A heat-related illness or exposure can initiate a heat-related injury. It is essential to consider the following outside environmental factors for heat-related illnesses, as a change in them could negatively impact the health of **outside** workers:

1. High-temperature exposure can shock the body and lead to elevated levels of heat strain, causing dehydration, heat illness, heat exhaustion, and, in some cases, heatstroke. Prolonged exposure to the sun's ultraviolet rays can also lead to skin damage, including sunburn, which makes the body warmer.

2. Poor air quality from wildfires, smoke, dust, pollution, and even the spread of pollen, along with high temperatures, can cause respiratory stress, making breathing difficult. When people have difficulty breathing, their mental awareness and gross motor skills can become altered.

[Gross motor skills are movements of large legs, arms, and torso muscles. We use gross motor skills daily at home and work. When mental clarity and gross motor skills are altered due to poor temperature and air quality, making the correct decision to remediate the heat-related condition can become challenging. One’s mental acuity can be hindered, and their bodily movement slow to respond.]

High temperatures and humidity can also contribute to heat-related stress and illness when working inside buildings, confined spaces, and factories. Heat-generating equipment, machinery, and processes contribute to higher temperatures in indoor work settings, thus putting workers at risk for heat-related illnesses.

XXX

**Human Body Effects:**

When the body temperature is elevated, it becomes overwhelmed, and the natural cooling mechanisms fail to engage. Depending on the severity of the exposure and the temperature, a person can suffer stress, fatigue, dehydration, or, worse, heat exhaustion or heat stroke.

Most people's body temperature is around 98.6 degrees Fahrenheit, give or take a few points (98.7, 98.5, etc.). However, core body temperatures change based on the physical activity and the temperatures in which the activity is conducted. Even when the body’s internal cooling mechanism works correctly, the effects of coping with heat stress become compromised, leading to a risk of illness and injury. The cooling mechanism is an internal heat regulation system that produces heat and releases it through several physiological processes, including sweating.

When the outside temperature rises, the regulating system sends signals to the brain’s **hypothalamus** (pronounced - hypo-tha-luh-mus) – the thermostat. The hypothalamus makes the needed physiological adjustments in response to the signals it receives to keep the body at a regular temperature.

Have you heard of **thermoregulation** (pronounced – thermo-regu-laeshun)? It is a medical term and a critical component of our body's internal system. Thermoregulation is the process that helps our bodies keep a healthy core temperature.

MedicalNewsToday.com defines thermoregulation as the “biological mechanism responsible for maintaining a steady internal body temperature…and the three mechanisms are efferent responses, afferent sensing, and central control.”(2) These mechanisms are components of the nervous system—the neurons that help with thermoregulation in the body.

**Efferent neurons** carry signals away from the central nervous system, the organs, and other body parts like glands and muscles to prompt an action. **Afferent neurons** carry signals to the central nervous system. In other words, both are neuron action descriptors that transport signals back and forth throughout the body (from the central sensory system) to their specific recipients, promoting a response. The direction of the signal transmissions is the primary difference between the two responses.

Think of it like this: there are roads or paths to and from our body’s nervous system. The incoming road brings essential information to the central control center, also known as – the **Central Nervous System**, where it is processed. And…the outgoing road transports commands requiring adjustment or motion that the body responds to.

The afferent neurons are tasked with transmitting signals that provide information about the body's internal and external status. The signals are transmitted from the skin, ears, eyes, tongue, nose, and internal organs. The efferent neurons carry information about the body’s motor system, prompting muscles and glands to take a specific action, thus responding to the sensory transmission. Muscles relax or contract. Glands secrete hormones in response.

XXX

When the Efferent and Afferent pathways work together…

**Hyperthermia**, also called “overheating,” occurs when the body temperature rises and the thermoregulation mechanism fails. If the body does not regulate its internal temperature correctly, it could overheat, which causes hyperthermia.

Hyperthermia can affect all of the major organs. It reduces blood flow, disrupts the body’s metabolic system, and causes cellular stress. Heat-related illness can lead to systemic organ failure and, in some cases – death. (We will discuss response and treatment to heat-related illnesses and injuries later).

Did you know a high body temperature can affect the brain, heart, lungs, liver, gastrointestinal tract, and kidneys?

Here’s how:

* **Brain** - a neurological dysfunction that can present as confusion, seizures, brain damage, and coma due to injury and stress of the cellular and neurological systems. Anyone experiencing neurological dysfunction should see a neurological specialist.
* **Heart** - an increased heart rate. When the body responds to heat stress, its heart rates increase, and the electrical activity is disrupted, which can cause arrhythmias. Arrhythmia is a severe heart condition that a cardiologist should address, as it can lead to heart failure and cardiac arrest in cases of intense and prolonged hyperthermia.
* **Lungs** - hyperventilation occurs when the body’s temperature is too high, and breathing is too fast, making it hard to cool down. The increased respiration and excessive exchange of carbon dioxide and oxygen cause lightheadedness, dizziness, and shortness of breath…
* **Gastrointestinal Tract** - GI Distress occurs when the body’s blood flow is compromised. In other words, when experiencing heat illness, the body cools itself down by directing blood to the skin and away from the stomach and intestines. This causes ischemia to the lining of the GI tract. (Ischemia is reduced oxygen supply.)

A leaky gut can result if the intestinal lining suffers from heat stressors too often. It happens when toxins and bacteria enter the bloodstream through a compromised GI tract. During a heat-related illness, the intestines can become very inflamed.

* **Kidneys** - dehydration caused by fluid loss and electrolyte imbalance. Fluid loss occurs with profound sweating. If the victim is suffering from heat stroke, acute kidney failure can result from reduced blood flow.

It is critical to understand how the body copes with heat and how to address any signs and symptoms of it. People react and respond differently to heat illness based on their overall health, the environment, and any training they have received. Some may experience just a few mild symptoms (heat cramps and heat rash), and others may be affected by more intense symptoms (heat stroke) that could result in death.

XXX

Getting proper medical attention as quickly as possible is vital when someone suffers from heat-related illness. Doing so can help reduce the possibility of heat stroke or worse. Now, take some time to review the following heat-related illnesses and the medical response recommended for each. You probably are aware of most of them:

* **Sunburn** - red, inflamed skin that can be painful – especially when touched, is caused by prolonged exposure to the sun. Extreme cases of sunburn result in red blotches and blistering on the skin.

Treatment- Stay out of the direct sun until the sunburn heals. Gently pat the sunburned area with damp and cool cloths to reduce the inflammation. Apply lotion specifically for sunburned skin (aloe vera gel or soothing ointment) to the affected areas. Do not rub or break blisters.

* **Dehydration** is classified as a heat-related illness and can progress to a severe condition if not cared for as soon as possible. It happens when the body loses more fluids than it takes in, and the sodium (salt) levels are reduced. For example, in hot environments, the body sweats to cool itself down, thus losing water and electrolytes. If the fluid loss is not replenished, dehydration sets in. Signs and symptoms include fatigue, weakness, and dry mouth.

Treatment - Simply put, stay hydrated with water and electrolyte drinks. Eating snacks and foods with salt and minerals also helps to replenish electrolytes. Avoid consuming caffeine and alcohol when suffering from dehydration and any form of heat stress.

* **Heat Rash** - itchiness, redness, and skin irritation in the form of red clusters and small blisters. It’s also called “prickly heat” because of its stinging sensation. It is exasperated by excessive sweating and heat exposure.

Treatment - Go to an area with cooler temperatures and less humidity. Keep all areas with heat rash dry, and use a powder to soothe the rash. Monitor the areas with heat rash, and if conditions worsen, seek medical attention.

* **Heat Syncope** (pronounced sink-uh-pee), also known as fainting or a sense of being lightheaded due to prolonged heat exposure, is a temporary loss of consciousness that occurs when there is a sudden drop in blood flow to the brain. This causes the heart rate to change and the blood pressure to drop. Heat-related syncope is usually a short-term incident. Heat syncope is common in hot environments, mainly when the body has not acclimated to the heat.

Treatment - Move the person experiencing heat syncope to a cooler area away from direct sunlight. Loosen tight clothing and have them lie flat on their back with their legs elevated above the heart. This increases blood flow and sends it back to the brain. If possible, fans and cool, damp cloths should be used to reduce body temperature. Spritzing the skin with cool water can also help, but avoid spraying the face. Do not let the person drink alcohol or beverages with caffeine; provide water or electrolyte sports slowly to quench the thirst and rehydrate the body – but only if they are fully conscious and can swallow liquids. Monitor the person, allowing them to rest until they have fully recovered. Seek medical attention if symptoms worsen.

* **Rhabdomyolysis** (pronounced rab-do-my-al-is-sis) is a severe medical condition in which muscle tissues break down and release harmful myoglobin proteins from the muscle cells into the bloodstream. The release causes extreme kidney damage. The kidneys become stressed while going into overdrive, filtering out the excess myoglobin and cellular debris.

Rhabdomyolysis is often provoked during strenuous physical activity in hot environments and usually presents with swelling, weakness, and muscle pain during heat stress or heat illness. Urination will be dark-colored due to myoglobin in the urine, and elevated creatine kinase (CK) levels will show in the bloodwork as a marker for muscle injury.

Treatment - Rhabdomyolysis is a medical emergency that should be addressed immediately. Higher-level emergency medical professionals must treat the person. Fluid resuscitation through Intravenous (IV) methods will most likely be administered, which will increase high urine production. Early intervention is essential.

* **Heat Stroke**, the most serious of heat stress disorders, is a life-threatening illness that occurs when the body becomes dehydrated and its temperature quickly rises from 103 degrees to 106 degrees Fahrenheit or higher. Sweating can lessen while the pulse increases. As the temperature control system starts to fail (cooling down the body through sweating), there is a high probability of irrational behavior, convulsions, loss of consciousness, severe damage to the brain and internal organs, and even death.

Treatment - heatstroke is a medical emergency! Call 911 as it is life-threatening. Move the person to a shaded, cool, or air-conditioned area immediately. Begin rapid cooling measures to lower their body temperature, such as applying icepacks and cold cloths on the neck, groin, and armpits, eventually covering as much of the body as possible…

XXX

…Do not give the person anything to drink, as medical professionals will likely administer IV fluids. Monitor the symptoms and do not leave the person alone – stay with them until advanced medical responders take over the care.

With all heat-related illnesses, there are preventative measures you can take…

XXX

A cursory overview focuses on lowering the temperature and humidity where workers are, increasing air movement, and protecting workers from radiant heat sources and…

XXX

**OSHA’s Heat-Related Campaigns:**

We have mentioned OSHA and other government agencies throughout this program and referenced many of its resources for good reason. OSHA offers free, confidential on-site consultations that help employers identify workplace hazards. They advise compliance and assist businesses that want to improve their safety and health plans. Many companies utilize the resources to help them implement a Heat Abatement Plan. An OSHA Technical Manual (**OTM**) is also available to support enforcement and outreach activities in the workplace…