



# Heat-Related Illness in the Outdoor Environment



**WSU-TFREC**

WASHINGTON STATE  
 UNIVERSITY

*World Class. Face to Face.*





# Objectives

Protect employees from outdoor heat hazards by:

- Identifying, evaluating and controlling potential risk factors
- Providing information and training to supervisors and employees
- Proper response to heat-related illnesses





# When do employees need to be protected?

- When the outdoor temperatures reach these action levels:

PPE or Clothing Worn	Temp
Non-breathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52 °F
Double-layer woven clothes including coveralls, jackets and sweatshirts	77 °F
All other clothing	89 °F





# When do employees need to be protected?

- When employees are assigned to work outdoors on a regular basis
- When there is a sudden and significant increase in temperature and employees have not had time to acclimate





# Supervisor Responsibilities

- Implement a written outdoor heat stress program\* and follow this training program
- Evaluate and control outdoor heat stress factors
- Train employees
- Encourage frequent water consumption
  - ~ 1 cup every 15 minutes
  - ~ 1 quart per employee per hour
- Employ proper response to heat-related illness



\* For written program, see:

[http://www.tfrec.wsu.edu/TFREOnly/safety/13 heat and cold stress.pdf](http://www.tfrec.wsu.edu/TFREOnly/safety/13%20heat%20and%20cold%20stress.pdf)



# Employee Responsibilities



- Wear PPE (hat, sunglasses, cooling vest, bandana, sunscreen)
- Monitor personal factors for heat-related illness
- Drink water frequently
- Report signs and symptoms of heat-related illness to your supervisor





# Environmental Risk Factors

## Weather



### **Direct sun, heat and humidity**

- More direct sun = greater risk

### **Limited air movement**

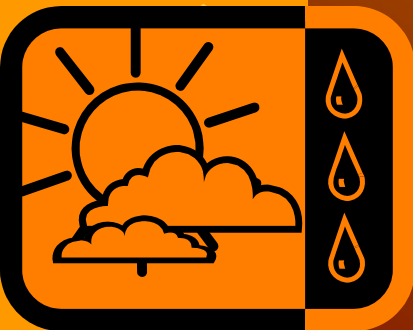
- Low or no wind the greater the risk



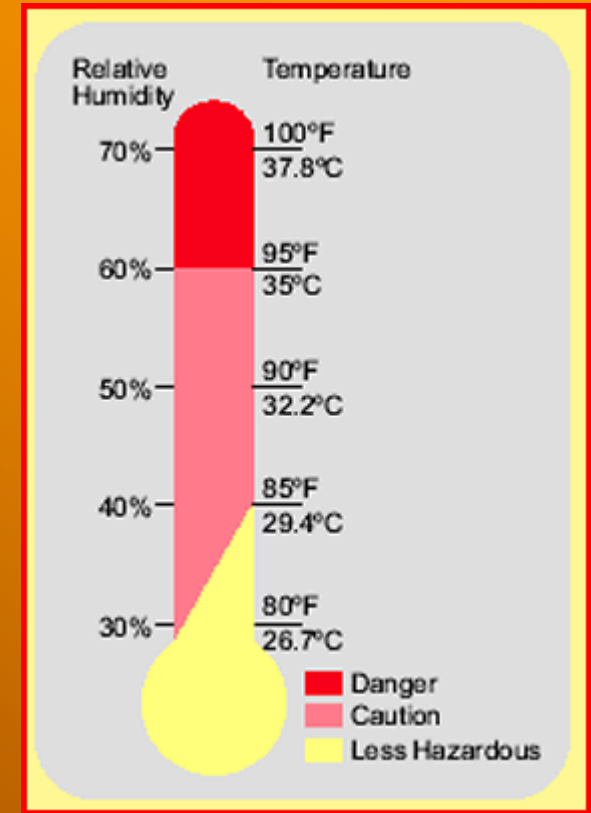


# Environmental Risk Factors

## Heat and Humidity



- Humidity (moisture in the air) interferes w/sweat evaporating from the skin and cooling of the body
- Higher humidity:
  - = less evaporation
  - = less cooling
  - = greater chance of heat-related illness







# Heat Index Warnings

Heat + Humidity = Heat Index



May feel effects at 80 °F



Implement controls at 90 °F or lower



Heat Index	Effect with Prolonged Exposure & Physical Activity
<b>Caution</b> 80 - 89 °F	Fatigue possible
<b>Extreme Caution</b> 90 – 104 °F	Heat cramps, heat exhaustion and heat stroke possible
<b>Danger</b> 105 – 129 °F	Heat cramps, and heat exhaustion likely; heat stroke possible
<b>Extreme Danger</b> 130 °F or higher	Heat stroke highly likely



# Environmental Risk Factors

## Radiant & Conductive Heat

### Hot equipment

- Engines add heat

### Reflected heat

- From ground or objects



Radiant heat may add 15 °F to Heat Index



# Risk Factors

## Physical Exertion

**Physical exertion produces internal heat in the body**

- What kind of work will be performed?
- How hard is the work?
- How long is the work task/period?





# Risk Factors

## Clothing Type and Amount

Clothing traps body heat and inhibits perspiration

Especially:

- Personal protective equipment (PPE)
  - Vapor barrier
  - Respirator
  - Chemical resistant suit
- Heavy clothing
- Multiple clothing layers
- Dark-colored clothing which absorbs heat







# Risk Factors

Age, Weight Physical Fitness

- Age, weight, and personal fitness
- Medical conditions
  - Heart conditions
  - Diabetes
  - High blood pressure
- Certain medications

**Couch  
Potato**



- Illness, fever or hangover







# Risk Factors

## Medications

- Some medications can make a person more sensitive to the effects of heat (*many contribute to body dehydration*)
  - Allergy medicines (antihistamines)
  - Cough and cold medicines
  - Blood pressure and heart medicines
  - Irritable bladder or bowel medicines
  - Laxatives
  - Mental health medicines
  - Seizure medicines
  - Thyroid pills
  - Water pills (diuretics)



*Consult your health care provider or pharmacist for more information*



# Preventing Heat-Related Illness

## Work Smart



- Schedule the hardest work for the cooler parts of the day
  - Alternate heavy work with light work when possible
  - Pace yourself
  - Keep hydrated
- Increase breaks when:
- Conditions are very hot
  - Work requires high exertion levels
  - Protective clothing limits evaporative cooling



# Preventing Heat-Related Illness

## Work Smart

### ESTABLISH A BUDDY SYSTEM!



Keep an eye on co-workers for symptoms of heat illness such as crankiness and denial





# Preventing Heat-Related Illness

## Work Smart

Work in the shade or out of direct sun

Avoid sunburn



Photos courtesy USDA-ARS

### Wear proper clothing

- Light colored
- Light weight
- Natural fibers
- Hat with a brim
- Cooling vest or bandanas may be helpful





# Preventing Heat-Related Illness

Work Smart

## Slow Down!

Find shade to rest, drink fluids, take a break



## Stay Cool!

Remove PPE and excess clothing during breaks







# Preventing Heat-Related Illness

Work Smart

**Ditch that “Macho” Attitude!**



*Slow down, pace yourself, and take breaks, especially on hot days!*





# Preventing Heat-Related Illness

## Stay Hydrated

- Drink small quantities of water throughout the day
- One quart per hour (1 cup every 15 min) may be necessary when it is hot and you are sweating more than usual
- Supervisors are responsible for encouraging water consumption
- Employees are responsible for monitoring their own personal factors for heat-related illness
  - Drink before you feel thirsty
  - Incorporate electrolytes into your daily fluid intake





# Preventing Heat-Related Illness

## Stay Hydrated

### DO

- Start work well hydrated
- Drink plenty of water throughout the day
- Replace your electrolytes using sports drinks when sweating a lot

### AVOID

- Sugary drinks
- Heavy foods
- Alcohol
- Nicotine
- Caffeinated drinks
- Waiting until you are thirsty





# Preventing Heat-Related Illness

## Stay Hydrated

### Drinking water sources:

- Drinking fountains
- Bottled water
- Closeable containers with tap (provide individual cups)
- Hydration packs



Water should be cool  
(60 °F or less)



Hydration pack



Worker wearing  
hydration pack







# Preventing Heat-Related Illness

## Acclimatize

- Acclimate: plan extra time (several days) to adjust to hotter working conditions
- Gradually build up exposure time and adjust work routines to increase heat tolerance



### **Pay special attention to employees**

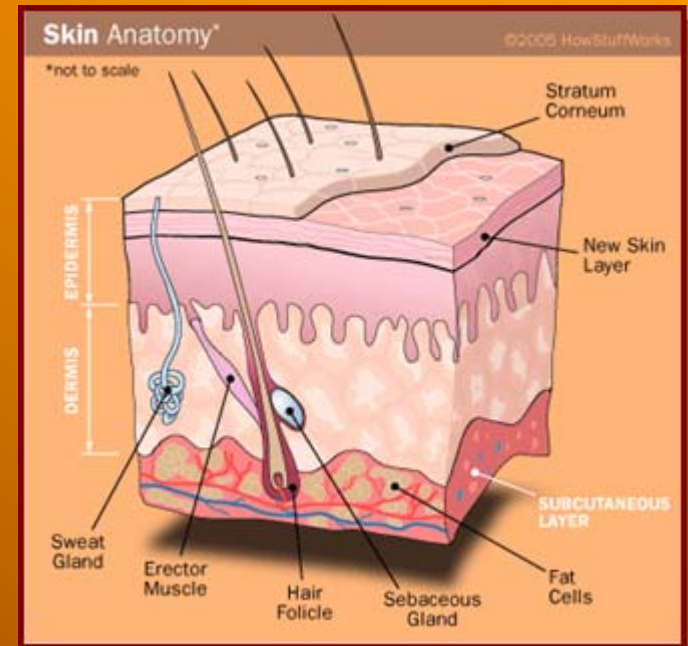
- ❖ That are new
- ❖ Just returned from being sick
- ❖ Have been absent for > 2 weeks
- ❖ Just moved from a cooler climate
- ❖ During heat-wave events





# How We-Stay Cool!

- When body core temperature rises:
  - Blood flow to skin increases
  - Sweating increases
  - Heart rate increases to move blood and heat to the skin
- When this works:
  - Sweat evaporates
  - Core temperature drops or stabilizes at a safe level



**2.6 million sweat glands  
in the body**

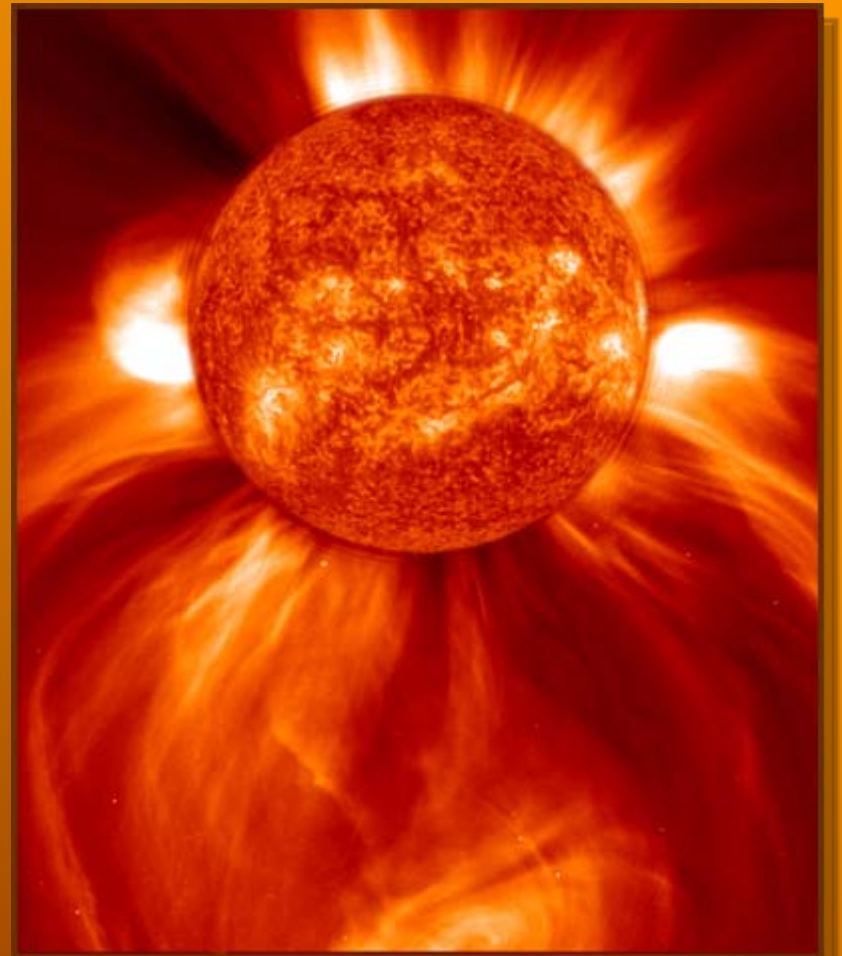




# Heat-Related Illness

Why is it important to know about heat illness?

- Heat illness can affect anyone
- Heat illness is dangerous
- Heat illness can kill
- Heat illness is preventable





# Heat-Related Illness

## Causes

- So much sweat is lost that
  - Dehydration results
  - The body cannot cool itself by sweating and the core temperature rises
- Salt loss causes heat cramps
- So much blood flow goes to the skin that other organs cannot function properly
- The body is subject to more heat than it can cope with and heat exhaustion or heat stroke can occur





# STOP!

All Activity if you become

- Light-headed
- Confused
- Weak
- Faint
- Have a pounding heart or trouble breathing



Notify Supervisor immediately if you or a co-worker experience symptoms of heat-related illness

Take a Break and Rest in a cool place

- Drink fluids
- Loosen or shed unnecessary clothing
- Lie down



# Heat-Related Illness

## Heat Rash



**Causes:** Likely to occur in hot, humid environments where sweat is not easily removed from the surface of the skin by evaporation and the skin remains wet most of the time.

**Symptoms:** The sweat ducts become plugged, and a **skin rash** soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance.

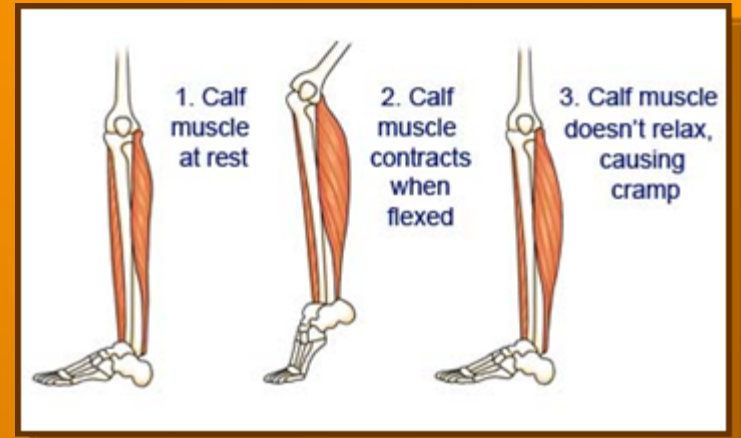
**Treatment:** The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.





# Heat-Related Illness

## Heat Cramps



**Causes:** This normally happens after exercise. Most often to people who are not used to the heat, who sweat a lot or don't drink enough fluids.

**Symptoms:** Severe **pain and cramps** in legs and abdomen, fainting or dizziness, weakness, profuse sweating and headaches.

**Treatment:** Increase fluid intake, rest and move to a cool place. Get medical attention if cramps persist.



# Heat-Related Illness

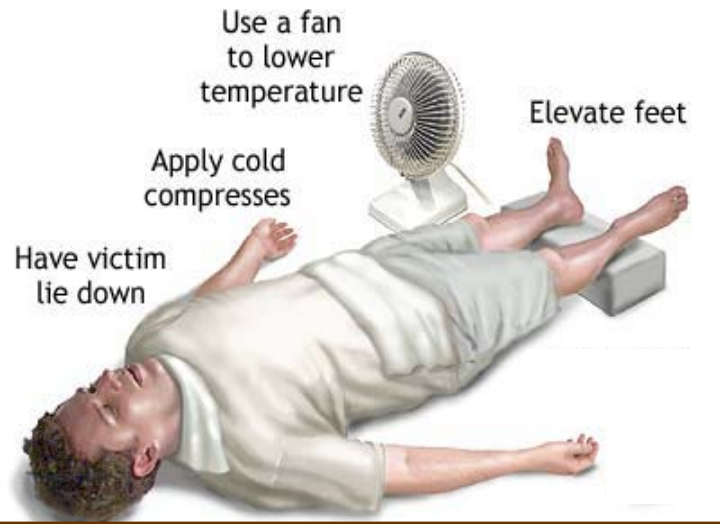
## Heat Exhaustion



**Causes:** Loss of body fluids and salts due to over-exposure to high temperatures and humidity causes dehydration.

**Symptoms:** Headache, nausea, fatigue, dizziness, profuse sweating, irritability, **pale clammy skin**, pupils become dilated. Victim is usually conscious but may faint, may have a fever.

**Treatment:** Call 911, provide EMS with directions to work site. **Get to the shade, cool off, apply cold wet towels or ice, fan, elevate legs above heart, loosen clothing.** If the person is alert, provide cool water, juice, sports drinks or non-caffeinated soft drinks--don't give any alcohol or caffeine. If left untreated Heat Exhaustion can lead to HEAT STROKE.



# Heat-Related Illness

## Heat Stroke

**Causes:** Heat stroke is a medical emergency and a life threatening condition caused by the failure of the heat-regulating mechanisms of the body due to high heat/humidity.

**Symptoms:** Headache, nausea, dizziness, **hot dry skin**, red face, chills, rapid pulse, small pupils, high fever of 105 °F, disorientation, fainting, convulsions, may resemble heart attack

**Treatment:** Call 911, provide EMS with directions to site. **Move to shade, loosen clothing, apply cool/tepid water (spray with water from a garden hose), place ice packs under armpits and groin, use a fan to promote sweating and evaporation.** DO NOT give fluids or medication for fever.



# Heat Stroke or Heat Exhaustion

Telling the Difference!

Mental confusion/disorientation occurs in ALL heat stroke victims

Ask the person these 3 questions:

1. "What is your name?"
2. "What day is this?"
3. "Where are we?"



If the person can't answer these questions, assume it is heat stroke!





# Get Help on the Way!

## Call 911!

When person does not feel better in about 15 minutes, or sooner, if they show signs of heat stroke



### *SECONDS COUNT!*





# In Summary: Work Smart!

- Stay hydrated! Drink water/fluids frequently!
- Know the signs and symptoms of heat related illnesses and take them seriously
- Consider sports drinks when sweating a lot
- Avoid alcohol, caffeinated drinks, and heavy meals before or during work
- Plan work tasks for heat relief
- Wear appropriate clothing
- Pace yourself
- Acclimatize
- Take regular breaks
- Keep an eye on your buddy!





# A Word About Ultraviolet Radiation (UV)

- Ultraviolet radiation is energy from the sun
- Responsible for sunburn and skin cancers
- Three types of UV rays come from the sun:
  - UVA - passes through ozone layer, not blocked by glass or most sunscreens, penetrates deep into the skin
  - UVB - some absorbed in ozone layer, thought to cause most sunburns, blocked by glass and some sunscreen
  - UVC - absorbed by the ozone layer
- Track UV intensity levels (UV Index): [www.epa.gov/sunwise/uvindex.html](http://www.epa.gov/sunwise/uvindex.html)
  - Enter zip code for UV index of interest
  - Sign up for UV email alerts for your area





# UV Index



The UV index provides a daily (next-day) forecast by zip code of the expected risk of overexposure to the sun. The index takes into account clouds and other local conditions and predicts UV intensity levels on a scale of 1 to 11+.

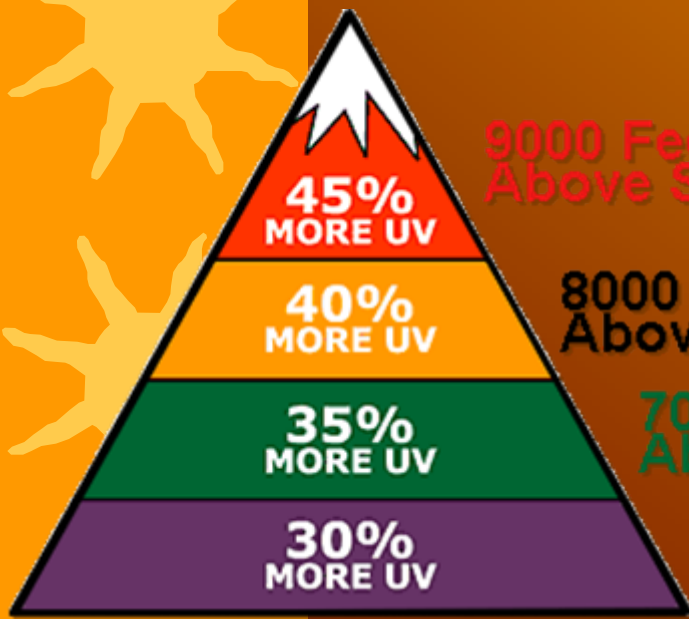
UV Index	Exposure Level
0 to 2	Low
3 to 5	Moderate
6 to 7	High
8 to 10	Very High
11+	Extreme

[www.epa.gov/sunwise/uvindex.html](http://www.epa.gov/sunwise/uvindex.html)



# Health Effects of UV Over-Exposure

- **Sunburn**: inflammation caused by UV radiation from the sun or UV tanning lamps
- **Skin Damage**: scarring, freckling, drying out or premature wrinkling of the skin
- **Skin Cancer**: is directly linked to UV exposure
- **Eye Damage**: corneal burns, increased risk of macular degeneration (a leading cause of blindness), and cataracts



9000 Feet  
Above Sea Level

8000 Feet  
Above Sea Level

7000 Feet  
Above Sea Level

6000 Feet  
Above Sea Level

- **Immune System Damage**: potential to cause immune system damage





# Skin Cancer



- Skin cancer is the most common form of human cancer  
(~ **1 million new cases occur annually**)
- About half of all Americans who live to age 65 will develop skin cancer at least once
- The most common warning sign is a change in appearance of the skin: , such as a new growth or a sore that will not heal
  - A change in the size, shape, or color of an existing mole
  - The appearance of a new, abnormal, or "ugly-looking" mole.
  - The texture of an existing mole changes and becomes hard, lumpy, or scaly.
  - A mole may feel different and itch, ooze, or bleed, but it usually is not painful

**Basal cell carcinoma**

**Squamous cell carcinoma**

**Melanoma**  
most serious cancer - can metastasize and spread quickly throughout the body



# Recognizing Melanoma



## Watch moles for:

- **A** Asymmetry - The shape of one side doesn't match the other
- **B** Border - The edges are ragged, notched, or blurred
- **C** Color - The color is uneven: shades of black, brown, and tan, or areas of white, gray, red, or blue
- **D** Diameter - There is a change in size

Melanoma causes ~75% of skin cancer deaths  
1 in 4 people that develop melanoma are under 40





**A**



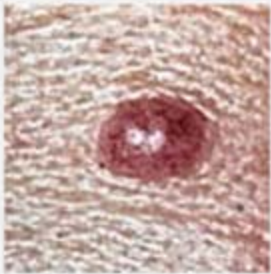
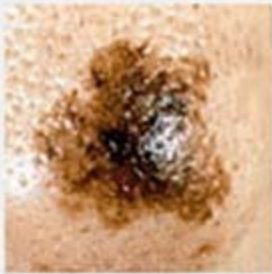




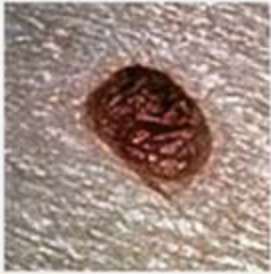

**B**



**C**



**D**

Normal Mole	Melanoma	Sign	Characteristic
		Asymmetry	when half of the mole does not match the other half
		Border	when the border (edges) of the mole are ragged or irregular
		Color	when the color of the mole varies throughout
		Diameter	if the mole's diameter is larger than a pencil's eraser



# UV Protection Guidelines



- Minimize midday sun exposure (10 AM to 4 PM)
- Incorporate heat-related illness prevention guidelines
- Use broad spectrum sunscreen SPF15 or higher (UVA & UVB protection)
- Reapply sunscreen every 2 hours
- Wear a broad brimmed hat (at least 2" to 3" brim all around), and long sleeve shirts and pants
- Wear sunglasses that are labeled to block 99 to 100% of UVA and UVB radiation



**No UV Label-No Buy!**





# Stay Cool!

