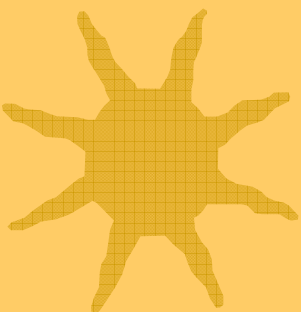
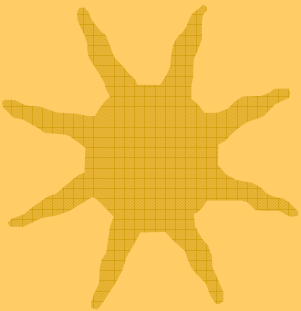
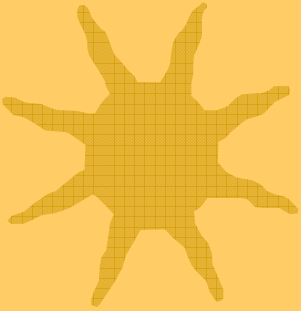




# Heat-Related Illness in the Outdoor Environment



# Heat-Related Illness

Why is it important to know about heat illness?

- Heat illness can effect anyone
- Heat illness is dangerous
- Heat illness can kill
- **Heat illness is preventable**



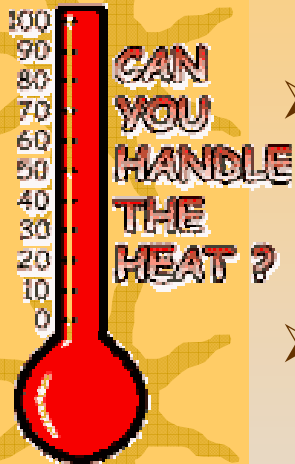


# Presentation Outline

- What is a heat-related illness
- Types of heat-related illness
- Signs & symptoms
- Contributing risk-factors
- Prevention
- Emergency response procedures

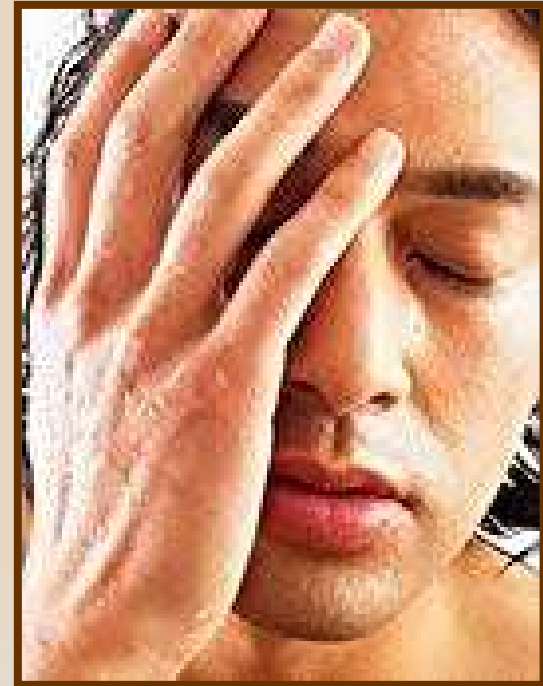
# Heat-Related Illness

- Heat stress is the buildup in the body of heat generated by the muscles during work, plus heat coming from warm and hot environments.
- When the body becomes overheated, less blood goes to the active muscles, the brain and other internal organs. Workers get weaker, become tired sooner, may be less alert, and less able to use good judgment.
- As the stress from heat becomes more severe, there can be a rapid rise in body temperature and heart rate.
- Heat exhaustion and heat stroke result when the body is subjected to more heat than it can cope with, causing decreased mental performance, organ damage, convulsions, and death.
- During hot weather, heat-illness can be the underlying cause of other injuries, such as heart attacks on-the-job, falls, and equipment accidents arising from poor judgment.



# Types of Heat-Related Illnesses

- Heat Rash
- Heat Cramps
- Heat Fatigue
- Heat Exhaustion
- Heat Stroke



# Heat Rash

What to look for:

- Red blister-like eruptions
- Itching or prickling

What to do:

- Get out of the sun to somewhere cool
- Keep skin dry
- Monitor for infection
- Consult physician



# Heat Cramps

- A heat cramp is an involuntarily and forcibly contracted muscle or fibers of a muscle that don't relax (i.e., a muscle spasm that doesn't relax).
- Heat cramps usually occur in the arm, leg or stomach muscles, and are very painful.
- Heat cramps can last a few seconds, 15 minutes, or more, and can occur multiple times, and without warning.



# Heat Cramps are Painful!

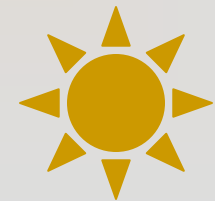
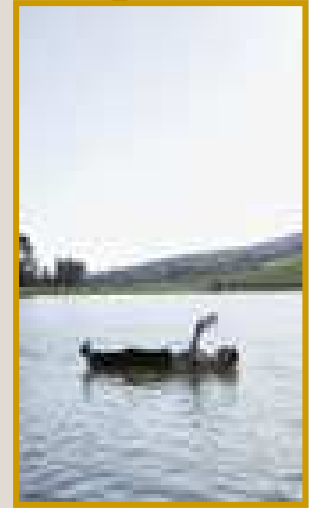
- Pain from heat cramps distract a worker, and may create serious consequences.
- A person's automatic reaction is to bend over in pain, fall down in pain, or reach for area in pain without thought of the result of moving quickly.
- This can be dangerous, if a person is operating machinery, driving, on a roof, etc. when a heat cramp occurs; a serious accident may result.





# Treatment of Heat Cramps

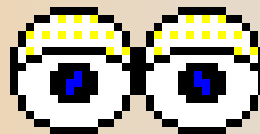
- Get out of the heat to a cool place.
- Rest!
- Drink electrolyte-containing fluids.
- Gently stretch the cramped muscle and hold the stretch for ~ 20 seconds, then gently massage the muscle. Repeat if necessary.
- Don't return to work in the heat this day.



# Heat Fatigue

Heat Fatigue signals a person is in trouble, and potentially headed towards heat exhaustion.

➤ What to look for:



- Impaired mental or sensorimotor performance
- Fainting

➤ What to do:



- ASAP: Stop work, get out of the heat, drink fluids, and seek medical aid before heat fatigue progresses to heat exhaustion.

# Heat Exhaustion

- Heat exhaustion is a more serious and advanced stage of heat-related illness than heat fatigue.

***Beware!***

- ***Untreated heat exhaustion can quickly progress to heat stroke.***



# Danger!

Heat Fatigue  
& Dehydration



Heat  
Exhaustion

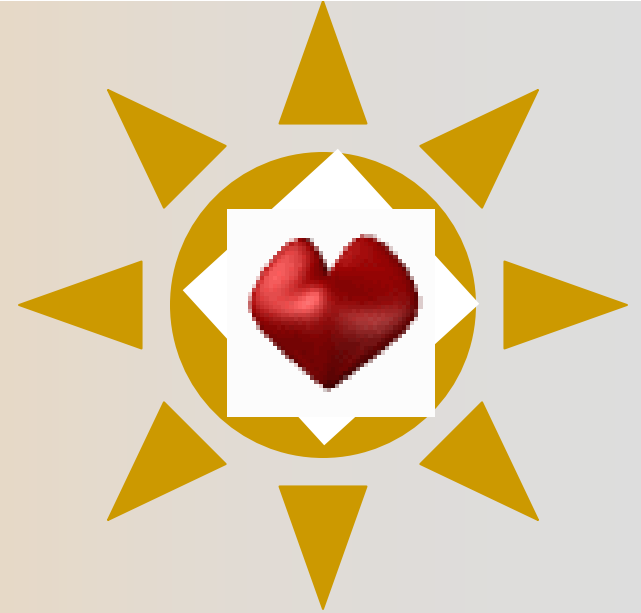


Heat  
Stroke



**Heat Stroke Can Be Fatal!**

# Heat Stroke IS A MEDICAL EMERGENCY



- The body becomes so stressed that it can no longer regulate its own temperature & it overheats.
- Potentially, when the body can't cool itself, body temp can reach 106° in 10-15 minutes.
- The body literally cooks itself.

# Prevent Heat-Related Illness

To prevent injury, learn to recognize the signs and symptoms of heat exhaustion and heat stroke.

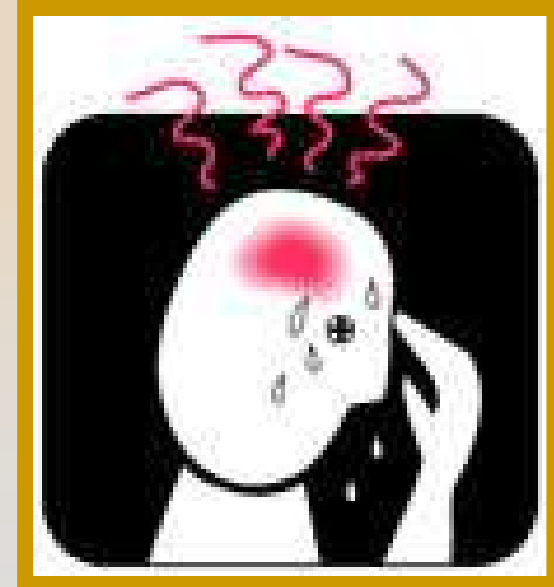


# Signs & Symptoms

## Heat Exhaustion & Heat Stroke

**Both** heat exhaustion and stroke may exhibit:

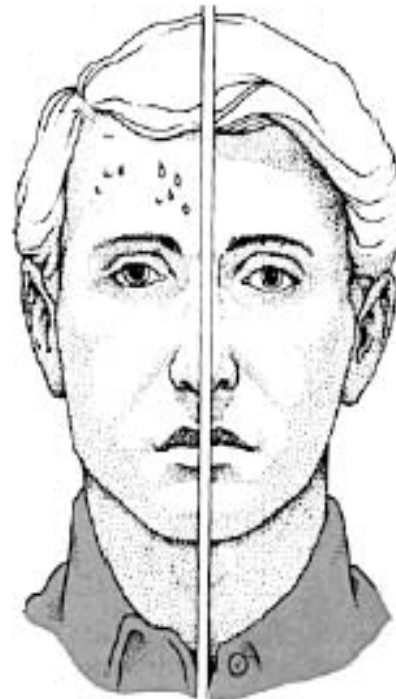
- Red Face
- Mood changes, irritability, agitation, or confusion
- Nausea/Vomiting
- Unsteady gait
- Fainting
- Erratic behavior
- Rapid pulse
- Fatigue and weakness
- Dizzy or light-headed



# Knowing the Difference Can Save a Life!

## HEAT EXHAUSTION

- Extreme sweating or pale, clammy skin
- Normal to slightly elevated temperature



## HEAT STROKE

- Hot, dry skin/face that is flushed, but not sweating
- High temperature ( $\geq 104^{\circ}$  F)

### Only in Heat Stroke

- Chills/Shivering
- Convulsions and/or seizures
- Loss of consciousness
- Coma
- May resemble a heart attack



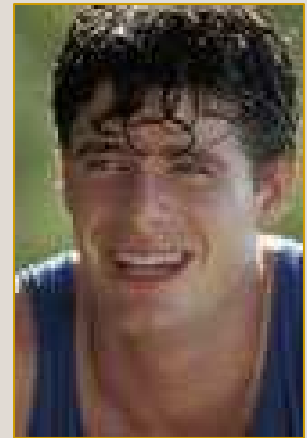
# Heat Exhaustion and Heat Stroke



Stop work, get out of the heat, drink electrolyte-containing fluids, and seek medical aid

# How The Body Stays Cool!

- The body's **thermostat** is the Hypothalamus gland, which is located in the brain, and controls body heat.
- The hypothalamus signals blood to flow to surface of the skin to cool itself.
- The body sweats.
- Sweat evaporates off skin and has a cooling effect on the blood and thus the body.
- Many things can interfere with the body's cooling processes or contribute to body heat production.



# Contributing Factors to Heat-Related Illness

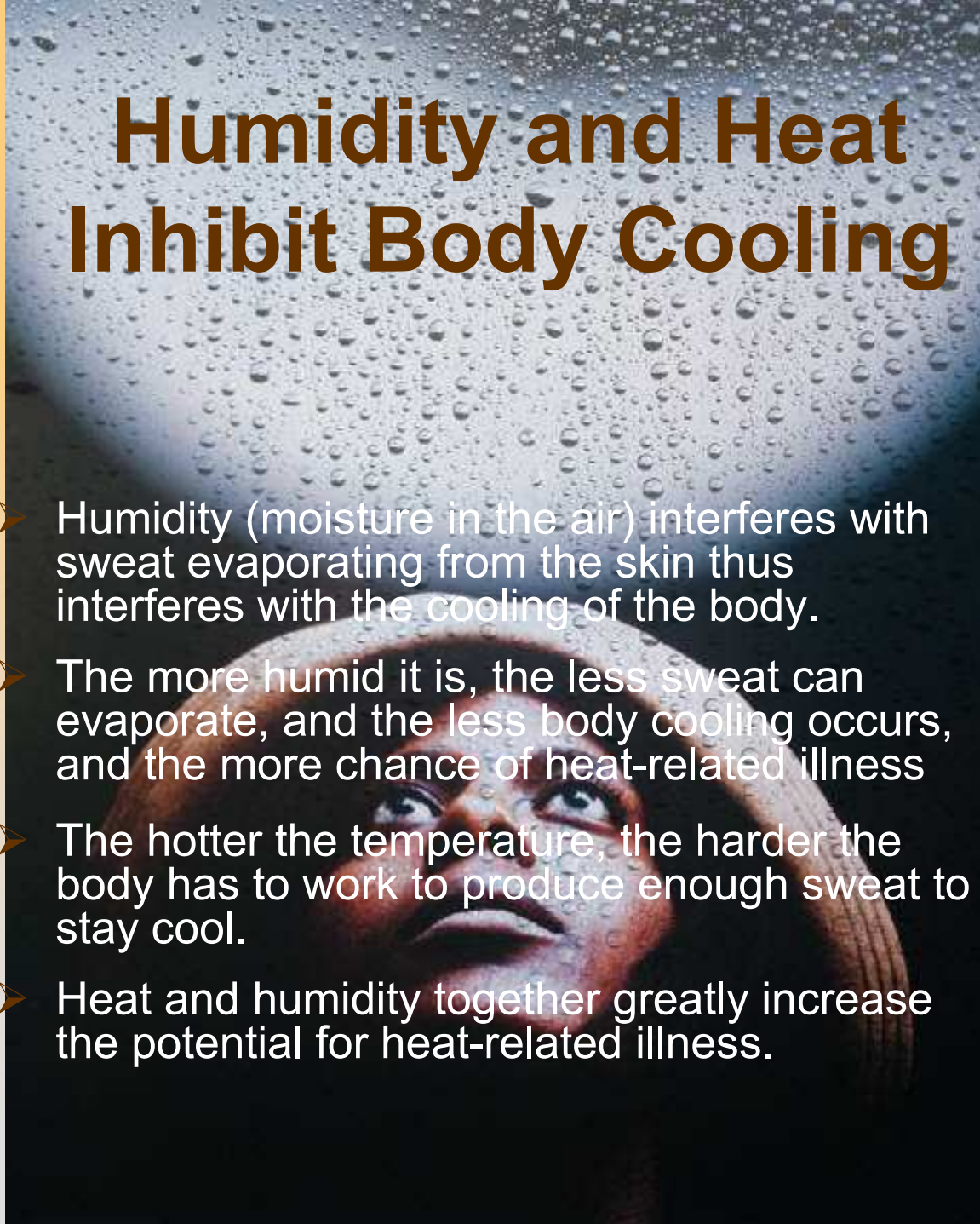
Heat + Humidity + Other (*Internal & External*) Factors =

**Total Heat Burden on the Body**





# Humidity and Heat Inhibit Body Cooling

- 
- Humidity (moisture in the air) interferes with sweat evaporating from the skin thus interferes with the cooling of the body.
  - The more humid it is, the less sweat can evaporate, and the less body cooling occurs, and the more chance of heat-related illness
  - The hotter the temperature, the harder the body has to work to produce enough sweat to stay cool.
  - Heat and humidity together greatly increase the potential for heat-related illness.

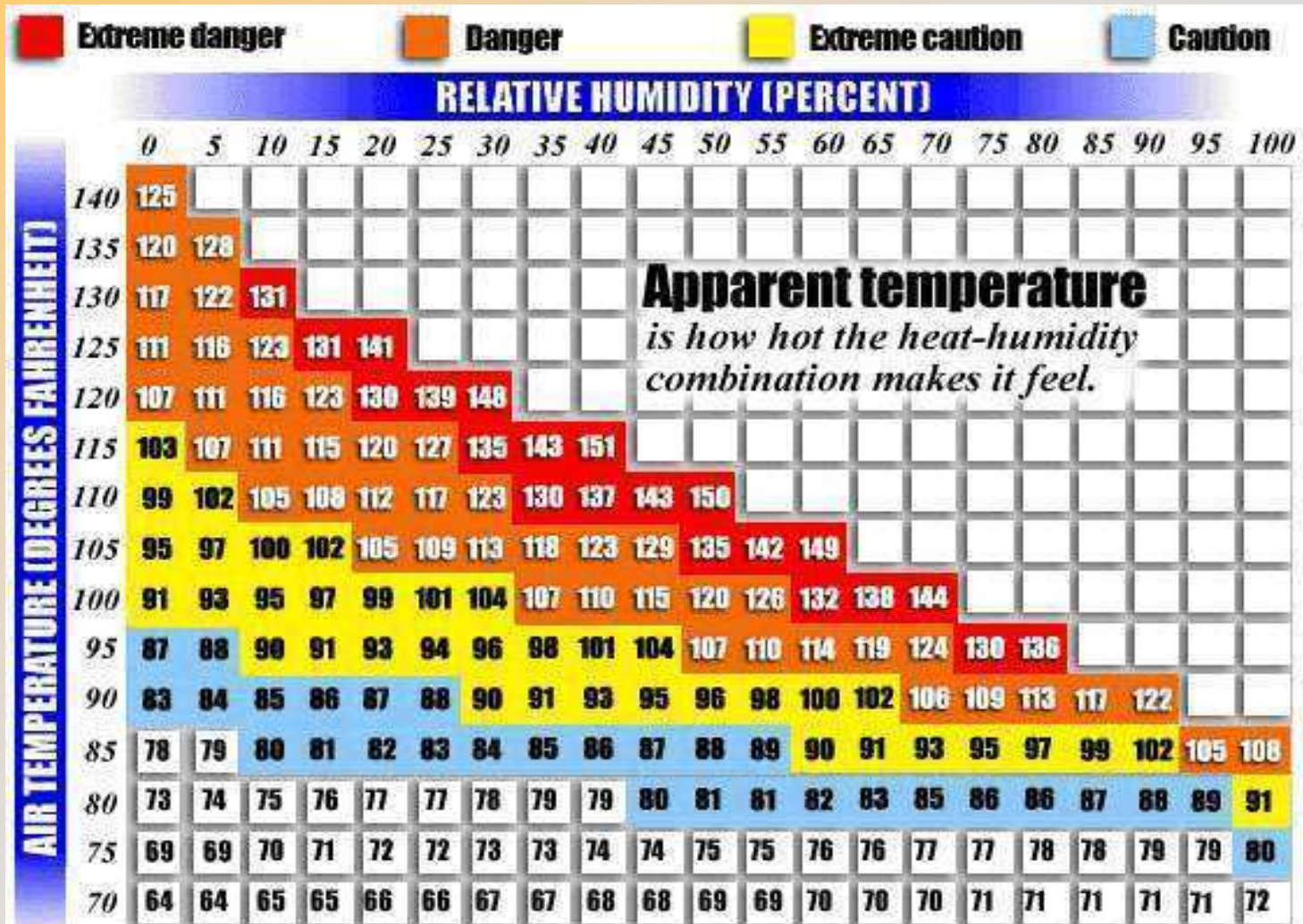
# Heat Index Used to Monitor Heat + Humidity

- Heat + humidity values = Heat Index
- The higher the temperature and humidity the higher the Heat Index.
- The Heat Index gives an “Apparent” Temperature.
- The Apparent Temperature is a higher value than temperature alone as it factors in humidity.
- Monitor the Heat Index on-line and/or by using a Heat Index Chart *(see next slide)*.



# Heat Index Chart

## Heat + Humidity = Heat Index



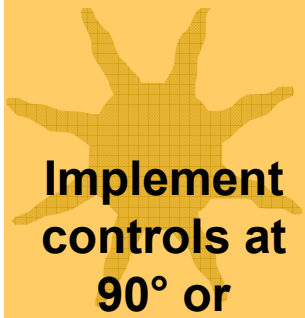
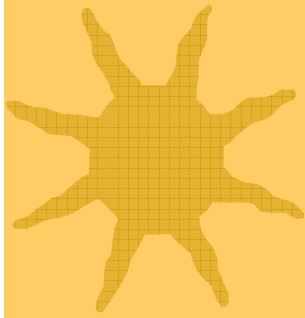
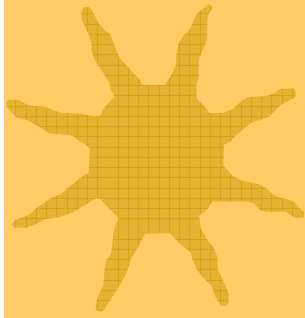
Source: National Oceanic and Atmospheric Administration

Implement controls at 90° or before

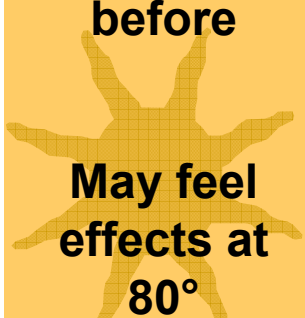
May feel effects at 80°

# Heat Index Warnings

## Heat + Humidity = Heat Index



Implement  
controls at  
90° or  
before

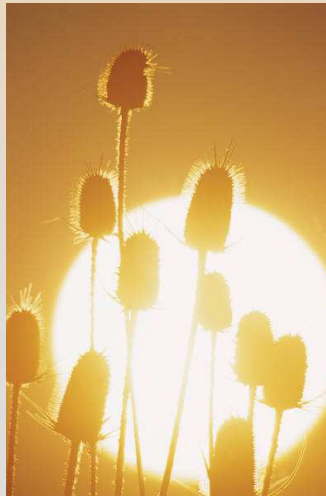


May feel  
effects at  
80°

| Heat Index                              | General Effect of Heat + Humidity with Prolonged Exposure & Physical Activity         |
|-----------------------------------------|---------------------------------------------------------------------------------------|
| <b>Extreme Danger<br/>130 or higher</b> | <b>Heat stroke highly likely</b>                                                      |
| <b>Danger<br/>105-129</b>               | <b>Heat stroke, heat cramps, and heat exhaustion likely, and heat stroke possible</b> |
| <b>Extreme Caution<br/>90-104</b>       | <b>Heat stroke, heat cramps, and heat exhaustion possible</b>                         |
| <b>Caution<br/>80-89</b>                | <b>Fatigue possible</b>                                                               |

# Risk Factors: Direct Sun

- The more direct sun, the hotter the environment.
- Shield yourself or stay out of the direct sun as much as possible.
- Sunlight is at its peak between 10AM-2PM daily; a good time to stay out of the sun.





# Risk Factors: Radiant Heat

Radiant heat is the transfer of heat energy through the air from sun and other sources such as, asphalt, engines, and dark surfaces.

**Radiant heat can add 15° to Heat Index**



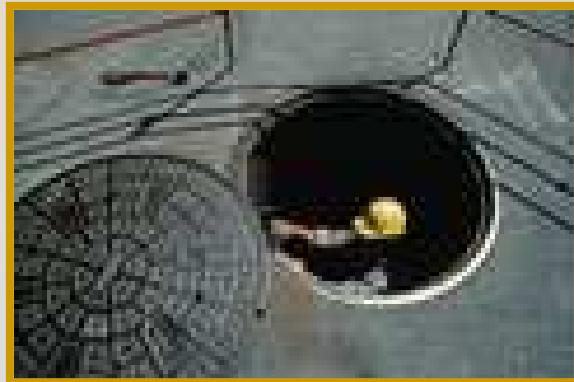
# Risk Factors: Conductive Heat

Conductive heat transfers heat to worker by direct contact with heat sources such as tools, equipment, and machinery.



# Risk Factors: Limited Air Movement

- Limited air movement, such when there is little or no wind, creates a hotter environment as the less the air moves, the less cooling of the body can occur.
- For example, there is limited air movement while working in a trench, a partially enclosed area, vehicle cab, or on the leeward side of a structure.



# Risk Factors: Physical Exertion

- The harder and longer you work, the hotter you become.
- Physical exertion increases the chance of dehydration.



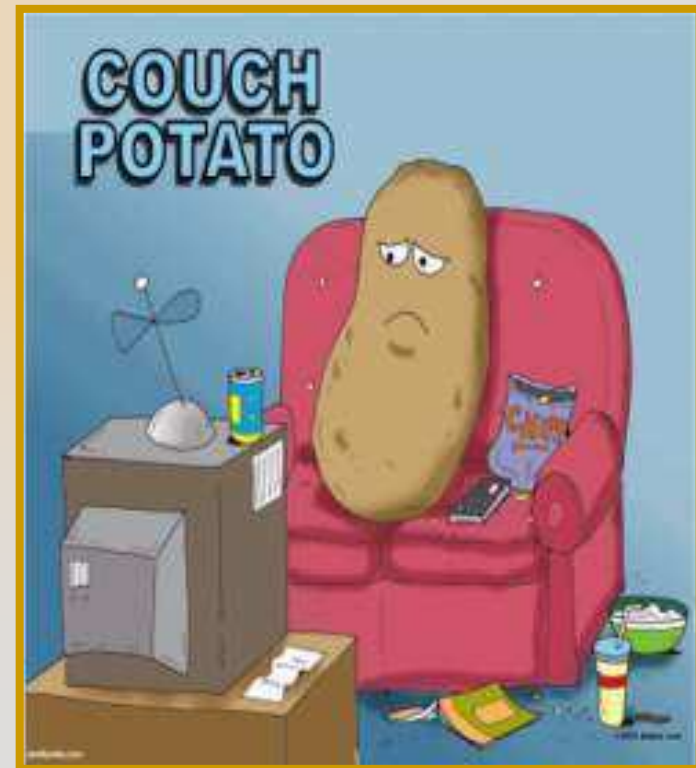
# Risk Factors: Protective Clothing

Wearing PPE such as non-breathable spray suits, gloves, boots, rain gear or respirators can hold heat to the body and inhibit cooling.



# Risk Factors: Personal

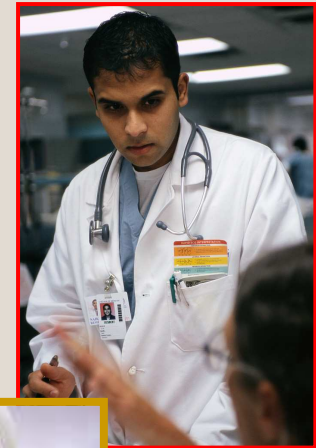
- Age: the young and over-50 are more susceptible to heat-related illness
- Poor fitness: use more physical exertion and energy to do a job
- Over-weight: the body holds heat more easily and is stressed by extra weight



# Risk Factors: Certain Medications

*Some medications can make a person more sensitive to the effects of heat and many contribute to body dehydration; examples are:*

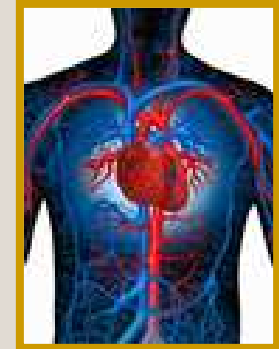
- Allergy medicines (antihistamines)
- Cough/cold medicines
- Blood pressure/heart medicines
- Irritable bladder/bowel medicines
- Laxatives
- Mental health medicines
- Seizure medicines
- Thyroid pills
- Water pills (diuretics)



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

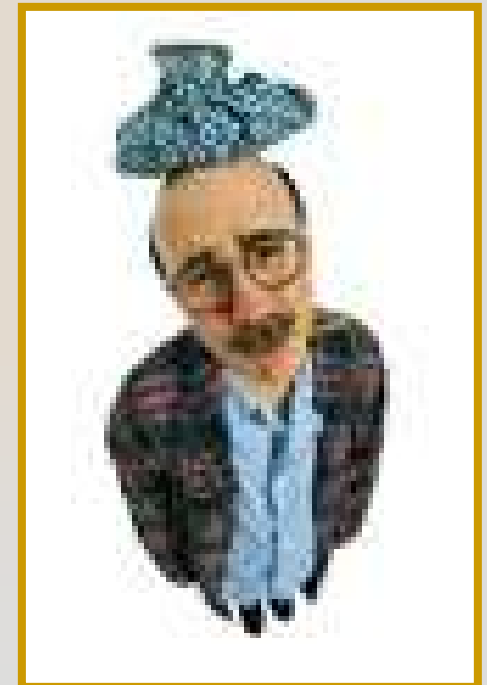
# Risk Factors: Medical Conditions or Illnesses

- Heart conditions, diabetes, high blood pressure, etc.



- Illness or fever

- Hangover





# Risk Factors: DIET MATTERS!

Before working in the heat:

- No heavy foods
  - Harder to digest & increases metabolic heat
- No alcohol or sugary drinks
  - Dehydrate the body
- No caffeinated drinks
  - Diuretic
- No carbonated drinks
  - Gas bubbles limit fluid intake
- No nicotine
  - Constricts blood vessels



# Risk Factors: Attitude

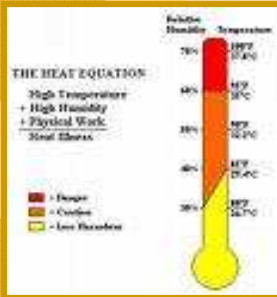
**Ditch that “Macho” Attitude!**



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

# Preventing Heat-Related Illness

***Supervisors prevent heat-related illness by:***

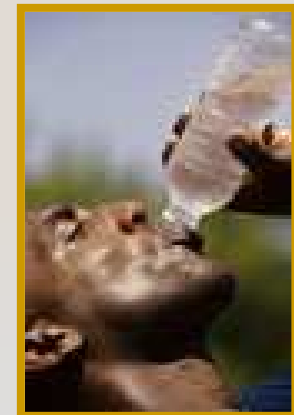


- ✓ Monitoring the work-day weather & heat index
- ✓ Scheduling tasks to minimize physical exertion
- ✓ Advising employees to pace themselves
- ✓ Encouraging frequent breaks on hot days
- ✓ Providing radio, pager, or cell phone to keep in contact with base and each other
- ✓ Rotating job tasks

# Preventing Heat-Related Illness

## *Supervisors prevent heat-related illness :*

- By providing annual heat-related illness awareness training
- By providing CPR and First Aid training
- By providing easy access to water via water bottles, coolers, hydration packs, and transportation to base water supply

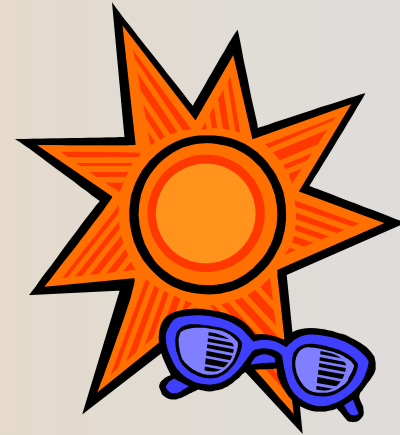


# Preventing Heat-Related Illness



***Supervisors prevent heat-related illness by:***

- Providing appropriate PPE
  - Cooling vests & bandanas
  - Hats
  - UVA/UVB rated sun glasses



- Providing sun screen (SPF 15 or greater & UVA/UVB effective)

**Work Smart  
Learn how to  
Keep Cool!**



# Preventing Heat-Related Illness

## Work Smart

Clothing traps body heat and inhibits perspiration

*Especially:*

- Personal protective equipment (PPE)
- Heavy clothing
- Multiple clothing layers
- Dark-colored clothing absorbs heat

*Hot!*



## Stay Cool!

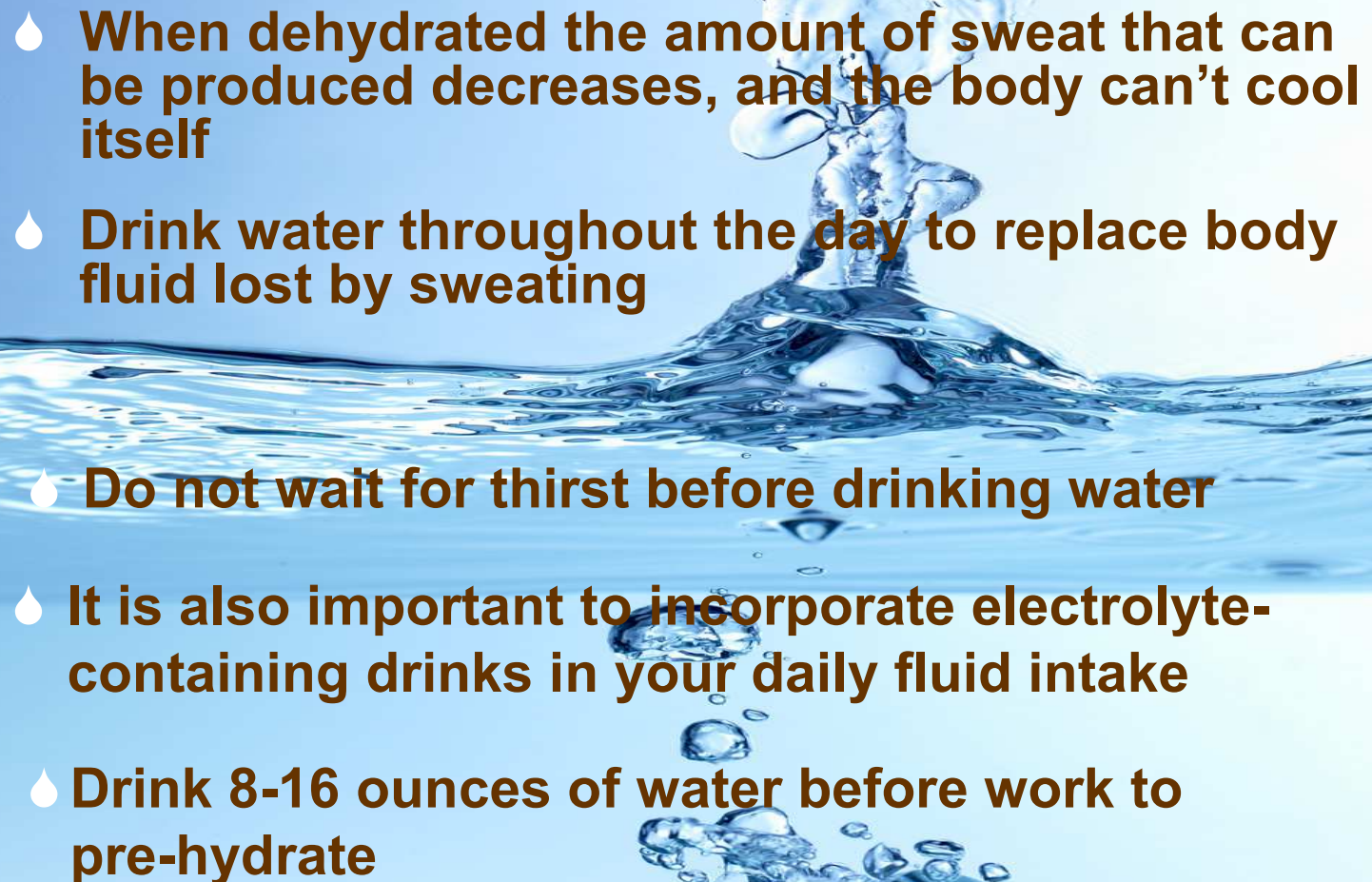
**Remove PPE & excess clothing during breaks**



# Preventing Heat-Related Illness

## Work Smart: **Stay Hydrated**

Proper hydration is key to preventing heat illness

- 
- 💧 When dehydrated the amount of sweat that can be produced decreases, and the body can't cool itself
  - 💧 Drink water throughout the day to replace body fluid lost by sweating
  - 💧 Do not wait for thirst before drinking water
  - 💧 It is also important to incorporate electrolyte-containing drinks in your daily fluid intake
  - 💧 Drink 8-16 ounces of water before work to pre-hydrate



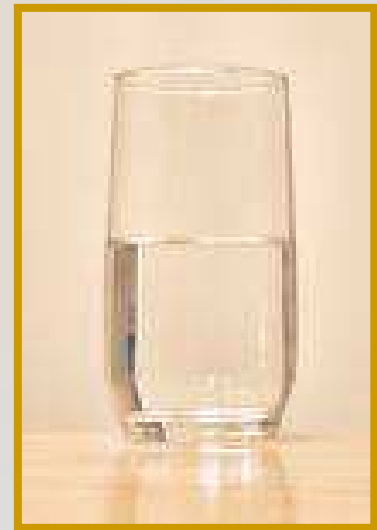
# Preventing Heat-Related Illness

## Work Smart: **Stay Hydrated**

- ☉ Drink 1 quart or more of water over the course of an hour when the work environment is hot, and a person sweats more than usual
- ☉ This is to replace the 2 quarts of sweat per hour the body can produce in hot environments

**~1 cup every 15 minutes**

*Persons who are on restricted fluids, or with medical conditions that heat or bright light effect consult a physician before working in the heat*



# Preventing Heat-Related Illness

## Work Smart: **Stay Hydrated**

### Drinking water sources:

- 💧 Be closeable & have a tap
- 💧 Clearly marked
- 💧 Suitably cool
- 💧 Individual cups provided
- 💧 Bottled water
- 💧 Hydration packs called camelbacks
  - users sip water through a tube



Photo credit: UC Davis



Hydration pack



Worker wearing hydration pack

# Having Trouble in the Heat?



## All Activity

If you become:

- Light-headed
- Weak
- Have a pounding heart
- Confused
- Faint
- Trouble breathing



## Notify Supervisor



## Take a Break and Rest

- In a cool place
- Drink fluids
- Loosen or shed unnecessary clothing
- Lie down

# If a Co-Worker Is Having Trouble in the Heat

- Transport the person to base, or to a cooler, shaded area so the person can rest and lay down.
- Get help on the way: **call 911**, or have base call 911, and then alert the supervisor.
- **Do not leave person alone!**
- Loosen and remove heavy clothing that restricts evaporation and cooling.
- If person is alert and not nauseated, provide fluids such as cool water, juice, sports drinks, or non-caffeinated soft drinks.
- Fan the person, spray or mist with cool water, apply wet cloth to skin.
- Do not further expose the person to heat any more that day.



**Get Help on the Way!**

**Call 911!**



***SECONDS COUNT!***

# If You Suspect Heat Stroke

***WHILE WAITING FOR MEDICAL HELP TO ARRIVE***

**Cool the person using whatever methods available**

- Apply ice packs under arms & to the groin area
- Place the person in a cool shower
- Spray them with cool water from a hose
- Sponge the person with cool water
- If the humidity is low, wrap person in a cool wet sheet and fan them vigorously
- Immerse the person in a tub of cool water

**Do not try to give unconscious persons fluids to drink.**



# In Summary: Work Smart!

- ✓ Know the signs and symptoms of heat related illnesses and take them seriously
- ✓ Stay hydrated - Drink water/fluids frequently
- ✓ Consider sports drinks when sweating a lot
- ✓ Monitor Heat Index
- ✓ Avoid alcohol, caffeinated drinks, and heavy meals before or during work

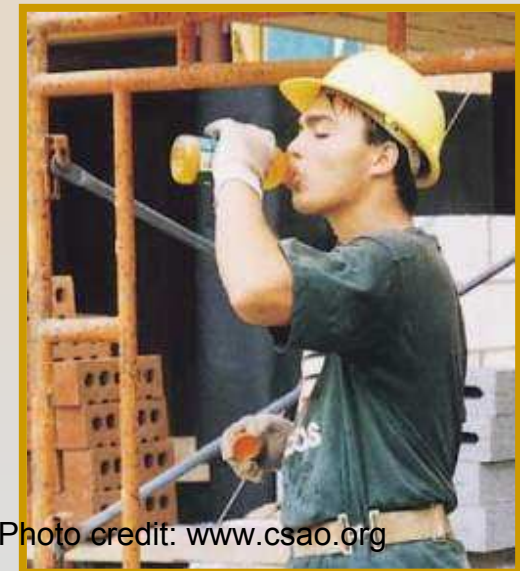


Photo credit: [www.csao.org](http://www.csao.org)

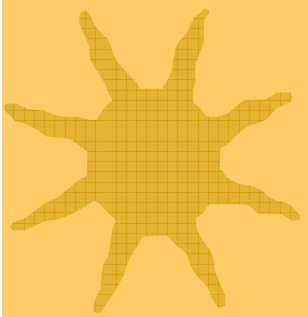
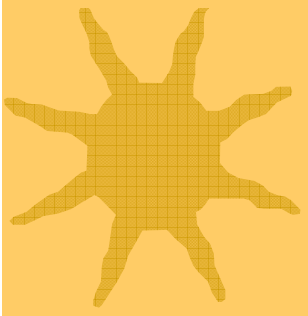
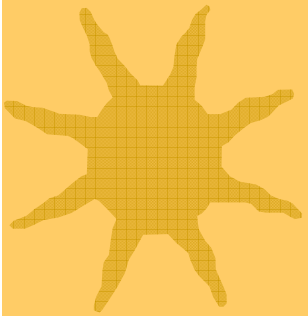
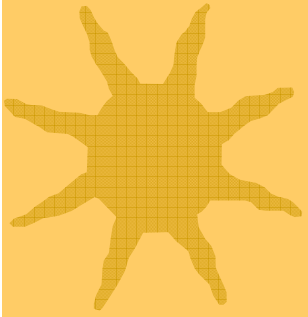
# In Summary: Work Smart!

- ✓ Plan work tasks for heat relief
- ✓ Pace yourself
- ✓ Acclimatize
- ✓ Wear appropriate clothing
- ✓ Keep an eye on your buddy
- ✓ Take breaks





**Stay Cool!**





# Quiz

1. Untreated heat exhaustion can quickly progress to heat \_\_\_\_\_.
2. A symptom of heat stroke is hot dry skin that is flushed and \_\_\_\_\_
  - a. not sweating
  - b. has excessive sweating
  - c. a slight elevation of body temperature
3. Heat transfer by direct contact with heat sources is \_\_\_\_\_
  - a. Convection
  - b. Radiation
  - c. Conduction
4. Prevention of heat related illness includes \_\_\_\_\_
  - a. staying hydrated
  - b. eating a large meal before work
  - c. working faster and avoid taking breaks

