Heat Stress Hazards
In The Workplace

Presented By:
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Summary

- Heat Stress factors
- Heat Stress > Strain > Illness
- How to manage heat strain
- Heat Prevention program elements
  - Basics
  - Resources
- A Heat Fatality case
Dr. Thomas Adams
October 3, 1930 - August 17, 2011
Work Heat Exposure Fatalities:
30 deaths/year (2003 – 2009)

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Heat Stress Simulation

- Raising the room temperature
  1 degree F each 10 minutes

- Water and sports drinks available

- First Aid trained staff
Heat in the Workplace
Normal Temperature

Average Human temperature is

98.6 °F +/- 0.9 °F

or

37 °C +/- 0.5 °C
Daily Temperature

Graph showing daily temperature variations with time.
Heat Stress Factors

- **Environmental Factors**
  - Temperature
  - Humidity
  - Air movement
  - Radiant heat

- **Metabolic heat factor (work level)**

- **Age, weight, degree of physical fitness**

- **Degree of acclimatization**

- **Use of alcohol or drugs, and medical conditions**

- **Clothing factor**
Heat Stress causes Strain (illness)

- Heat Rash
- Heat Cramps
- Heat Syncope (light headed > faint)
- Heat Exhaustion

- Heat Stroke (Medical Emergency)
Physiology of Heat Stress

During both rest and activity, the human body tries to maintain an internal temperature of 98.6 F.
Physiology of Heat Stress

- Hot weather, heat sources, and hard work raise the body’s core temperature.
- Heated blood is pumped to the skin’s surface, where body heat transfers to the environment, if cooler.
- If heat has to be shed faster, sweat carries it outside skin and evaporates to aid cooling.
Physiology of Heat Stress

- During heavy work, a body can lose 1-2 liters of water per hour.

- After 2-3 hours of fluid loss, a person is likely to:
  - Lose endurance
  - Become uncomfortable
  - Feel hot
  - Become thirsty
Physiology of Heat Stress

- The longer a body sweats, the less blood there is to carry excess heat to skin or oxygen and nutrients to muscles.

- After 3 hours, a dehydrated worker may experience:
  - Headaches
  - Muscle fatigue
  - Loss of strength
  - Loss of accuracy and dexterity
  - Heat cramps
  - Reduced alertness
  - Nausea
Physiology of Heat Stress

- Water is key to cooling body and combatting heat stress.
- Without fluid replacement during an extended period of work, the body is at risk of exhaustion.
- Untreated heat exhaustion may lead to heat stroke.
Heat Stroke

- Heat Stroke is the most serious heat-related disorder.
- Body becomes unable to control its temperature.
  - Body temperature rapidly rises
  - Sweating mechanism fails
  - Body is unable to cool down
- Body temperature can rise to 106°F or higher in 10 to 15 minutes.
- Heat stroke can cause death or permanent disability if emergency treatment is not given.
Symptoms: Heat Stroke

- Hot, dry skin
- Hallucinations
- Throbbing headache
- High body temperature
- Confusion/dizziness
- Slurred speech
- Irrational behavior
- Loss of consciousness
- Convulsions
First Aid: Heat Stroke

- Call 911 and notify their supervisor.
- Move the sick worker to cool shaded area.
- Cool the worker using methods such as:
  - Soaking their clothes with water.
  - Spraying, sponging, showering them with water.
  - Apply ICE.
Heat Exhaustion

- Dehydration causes blood volume to decrease.
- The body’s response to excessive loss of water and salt.
- Usually through excessive sweating.
- Workers most prone to heat exhaustion are the elderly, employees with high blood pressure and those working in hot environments.
Symptoms: Heat Exhaustion

- Heavy sweating
- Extreme weakness or fatigue
- Dizziness
- Confusion
- Nausea
- Clammy, moist skin
- Pale or flushed complexion
- Muscle cramps
- Slightly elevated body temperature
- Fast and shallow breathing
First Aid: Heat Exhaustion

- Have employees rest in a cool, shaded or air-conditioned area.
- Have employees drink plenty of water or other cool, non-alcoholic or non-caffeine beverages.
- Have employees take cool shower, use cold wet towels.
Symptoms and First Aid: Heat Syncope

- **Symptoms:**
  - Light-headedness
  - Dizziness
  - Fainting

- **First Aid:**
  - Sit or lie down in a cool place
  - Slowly drink water, clear juice or a sports beverage
Symptoms and First Aid: Heat Cramps

- **Symptoms:**
  - Muscle pain or spasms usually in the abdomen, arm and legs.

- **First Aid:**
  - Stop all activities and sit in a cool place.
  - Drink clear juice or a sports beverage.
    - Water must be taken every 15 to 20 minutes in hot environments.
  - Do not return to strenuous work for a few hours after the cramps subside.
  - Seek medical attention if any of the following apply:
    - Worker has heart problems.
    - Worker is on a low-sodium diet.
    - Cramps do not subside within one hour.
Symptoms and First Aid: Heat Rash

**Symptoms:**
- Heat rash looks like a red cluster or pimples or small blisters.
- Occurs on neck and upper chest, in the groin, under the breasts and in elbow creases.

**First Aid:**
- Try to work in a cooler, less humid environment when possible.
- Keep the affected area dry.
- Dusting powder may be used to increase comfort.
Substances that inhibit cooling and cause dehydration

- Alcohol
- Caffeine
- Stimulants
- Medications
Medications

- Anti-psychotics (e.g. Seroquel)
- Medications for Parkinson’s disease
- Tranquilizers (e.g. Xanax)
- Antidepressants (e.g. Prozac)
- Diuretic medications or "water pills"
- Antihistamines (constriction of blood vessels) e.g. Benadryl,
- Beta Blockers, heart medication
Control of HEAT

- Engineering Controls
  - Ventilation
  - Air cooling
  - Fans
  - Shielding
  - Insulation
Administrative Controls & Work Practices

- Train employees on the hazards of heat stress,
- Recognition of predisposing factors, danger signs, and symptoms
- Awareness of first-aid procedures for and the potential health effects of, heat stroke
- Employee responsibilities in avoiding heat stress
- Dangers of using drugs and alcohol in hot work environments
- Use of protective clothing and equipment
- Coverage of environmental and medical surveillance programs
Standards

- MIOSHA and OSHA do not have a Heat standard.
- This would be handled by the General Duty Clause, Section 11(a) of Act 154
- In addition, American Conference of Governmental Industrial Hygienists (ACGIH) guidelines are used when conducting a compliance investigation.
Educational Resources

- MIOSHA website

- Federal OSHA website
  - Quick Card “Protecting Workers from Heat Stress”

- Centers for Disease Control (CDC)
Campaign to Prevent Heat Illness in Outdoor Workers

WATER. REST. SHADE. 
*The work can’t get done without them.*

Educational Resources  
Using the Heat Index  
Training  
Media Resources

Heat Smartphone App

- Drink water often
- Rest in the shade
- Report heat symptoms early
- Know what to do in an emergency
HEAT SAFETY TOOL [en Español]

By U.S. Department of Labor (DOL), Occupational Safety and Health Administration (OSHA)

When you’re working in the heat, safety comes first. With the OSHA Heat Safety Tool, you have vital safety information available whenever and wherever you need it — right on your mobile phone.

The App allows workers and supervisors to calculate the heat index for their worksite, and, based on the heat index, displays a risk level to outdoor workers. Then, with a simple “click,” you can get reminders about the protective measures that should be taken at that risk level to protect workers from heat-related illness—reminders about drinking enough fluids, scheduling rest breaks, planning for and knowing what to do in an emergency, adjusting work operations, gradually building up the workload for new workers, training on heat illness signs and symptoms, and monitoring each other for signs and symptoms of heat-related illness.

Stay informed and safe in the heat, check your risk level.

For more information about safety while working in the heat, see OSHA’s heat illness webpage, including new online guidance about using the heat index to protect workers.

The source code for this app is available for download:

- Android: English [7 MB ZIP*] | Spanish [5 MB ZIP*]
- iPhone: All-in-One [1 MB ZIP*]

Accessibility Assistance: Contact the OSHA Directorate of Technical Support and Emergency Management at (202) 693-2300 for assistance with accessing the application or ZIP materials.

*These files are provided for downloading.
Protecting Workers from Heat Stress

Heat Illness
Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness
- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

Symptoms of Heat Exhaustion
- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke
- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

To Prevent Heat Illness, Your Employer Should
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.

For more information:
OSHA
U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

Schedule frequent rest periods with water breaks in shaded or air-conditioned areas.
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.

How You Can Protect Yourself and Others
- Know signs/symptoms of heat illnesses; monitor yourself, use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.

What to Do When a Worker is Ill from the Heat
- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

If you have any questions or concerns, call OSHA at 1-800-321-OSHA (6742).
Heat Prevention Program

Recommendations for Employers

- Schedule maintenance and repair jobs in hot areas for cooler months.
- Schedule hot jobs for the cooler part of the day.
- Acclimatize workers by exposing them for progressively longer periods to hot work environments.
- Reduce the physical demands of the workers.
- Use relief workers or assign extra workers for physically demanding jobs.
- Provide cool water or liquids to workers (avoid drinks with caffeine, alcohol, or large amounts of sugar).
Heat Index

- The U.S. National Oceanographic and Atmospheric Administration (NOAA) developed the Heat Index system.

- Heat Index combines relative humidity with temperature to give an “apparent” temperature.

- What the conditions “feel” like.
## Heat Index

### Temperature (°F)

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### Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- **Caution**
- **Extreme Caution**
- **Danger**
- **External Danger**
Basic Heat Program

- Know your work environment
- Provide basic training to employees
- Monitor the heat level
- Monitor the employees for signs/symptoms
- Provide water or sports drinks
- Provide feasible controls
- Adjust work/rest schedule if HI > 90
Fatality Due to Heat

- Mike
- 39 year old Male
- Dishwasher in kitchen of a restaurant
- Died July 7
- Last exposure to heat July 3
Heat Stress
Employee Conditions

- 100 pounds over ideal weight (obese). 6’ and 280 lbs.
- Drank cola during all shifts (dehydrated)
- Drank beer after all shifts (dehydrated)
- Wore baseball hat (barrier)
- Wore a plastic apron (barrier)
- No training on heat illness or prevention
- Complained of heat, only took one brief break
- Red faced “Rambo,” sweating heavily
Work Conditions on July 3

- Outside temp. reached 88 °F, lowest RH was 72%
- Open doors to a patio
- Kitchen was 74%-87% humidity
- Kitchen was 95 – 105 °F
- HI ?
NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- Caution
- Extreme Caution
- Danger
- External Danger
Heat
Heat
Mike

- Left work 1 am
- On bicycle
- Crashed after 1 block
- Homeowners gave water, he collapsed
- Ambulance
- Thought he was drunk
- Never regained consciousness
- Died 3 days later
Heat Illness Prevention

- Have a plan
- Train on symptoms/signs, incl. medications
- Monitor temp. and humidity
- If the HEAT INDEX > 90 °F, then continuously
- Monitor employee signs and symptoms
- Consider effect of added clothing
- Provide extra water and sports drinks
- Provide cooler rest areas
- Provide shaded rest areas
- Provide extended break times
Any Questions