

# Cold Stress

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# Cold stress

- Normal body temperature - 98.6F
- Cold stress occurs when body temperature drops to < 95F



# Body heat loss

- Respiration
- Evaporation
- Conduction
- Radiation
- Convection



# Hypothermia

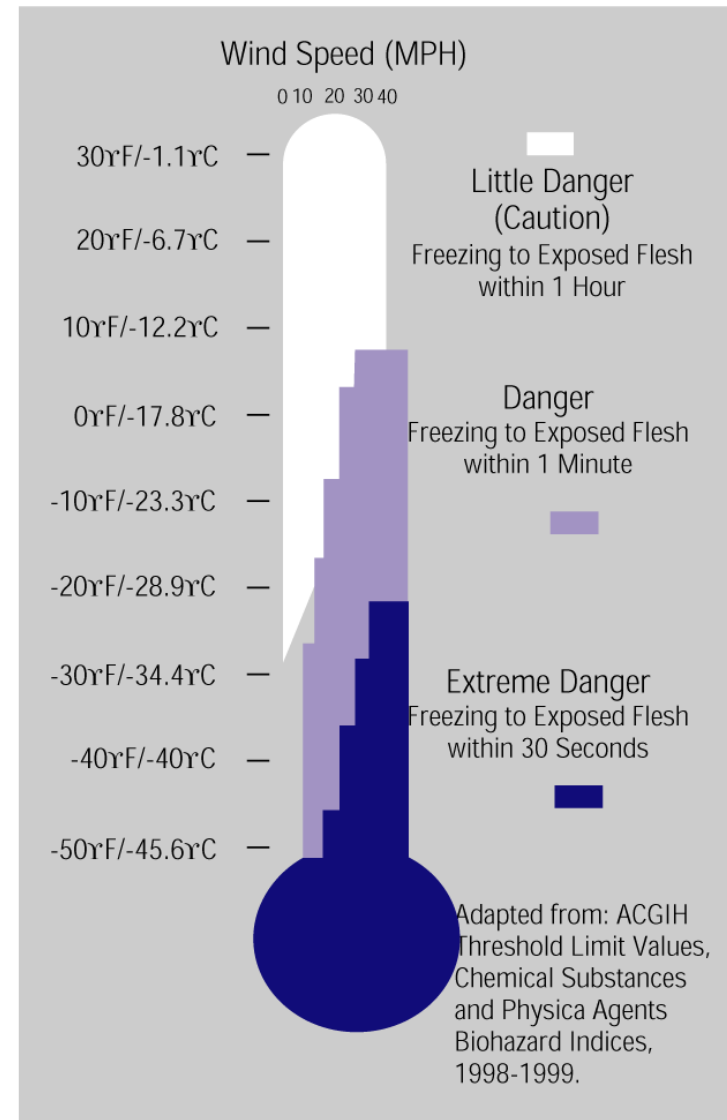
- Cold kills in 2 distinct steps
  - Exposure
    - cold
    - wind
  - Exhaustion

## THE COLD STRESS EQUATION

**LOW TEMPERATURE + WIND SPEED + WETNESS  
= INJURIES & ILLNESS**

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

**Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.





# Increased risk

- Predisposing health conditions
  - cardiovascular disease
  - diabetes
  - hypertension
- Medications
- Poor physical condition



# Mild hypothermia

- Body temperature 97F - 93F
- Shivering
- Alert
- Numbness in limbs, loss of dexterity, clumsiness
- Pain from cold



# Moderate hypothermia

- Body temperature 93F - 90F
- Same symptoms as mild hypothermia except: shivering may decrease or stop





# Severe hypothermia

- Body temperature 90 F - 82F
- Shivering decreased or stopped
- Confusion and loss of reasoning
- Slurred speech
- Semi to unconscious
- Muscular rigidity



# Critical hypothermia

- Body temperature < 82F
- Unconscious and may appear dead
- Little breathing
- Pulse slow
- Eyes dilated
- Body is rigid



# Mild hypothermia - First aid

- Prevent further heat loss
- Give warm sweet liquids
- Apply gentle heat source
- Exercise to generate heat
- Keep head and neck covered



# Moderate hypothermia - First aid

- Same as mild but limit exercise
- Sips of warm liquids if victim fully conscious
- No alcohol
- Checked by MD



# Severe hypothermia - First aid

- Victim is in serious trouble
- Treat for shock
- Apply external heat source
- Avoid jarring victim
- No food or drink
- Transport gently to hospital



# Critical hypothermia - First aid

- Don't give up
- Handle with extreme care
- Tilt head to open airway
- CPR
- Stabilize temperature with external heat source
- Hospitalization



# Frostbite

- Freezing of deep layers of skin
- Pale, waxy-white skin color
- Skin becomes hard and numb
- Usually affects:
  - Fingers and hands
  - Toes and feet
  - Ears and nose



# Frostbite - First aid

- Move victim to warm dry area
- Remove wet or tight clothing
- Do not rub affected areas
- Gently place affected area in warm water
- Seek medical attention





# Protection from hypothermia

- Wear warm head covering
- Wear layered clothing
- Protect feet and hands
- Drink plenty of fluids
- Pace yourself during activities in the cold



# How to protect workers

- Recognize conditions that lead to cold-induced injuries and illnesses
- Learn the signs and symptoms of cold-induced injuries and illnesses
- Train the workforce
- Select proper clothing and headwear
- Take frequent breaks in warm area



# How to protect workers

- Perform work in warmer part of day
- Avoid exhaustion and fatigue
- Use the buddy system
- Drink warm beverages. Avoid those with caffeine
- Eat warm, high calorie foods



# Hypothermia in water

- Body heat loss is 25 times faster in water than in cold air
- Swimming increases heat loss by 35%
- H. E. L. P. reduces heat loss
- HUDDLE extends survival time by 50%

# Water immersion survival

<b>Water Temperature</b>	<b>Exhaustion</b>	<b>Survival Time</b>
32.5	15 min	15 min to 45 min
32.5 - 40	15 to 30 min	30 min to 90 min
40 to 50	30 min to 1 hr	1 hr to 3 hrs
50 to 60	1 hr to 2 hrs	1 hr to 6 hrs
60 to 70	2 hrs to 7 hrs	2 hrs to 40 hrs
70 to 80	3 hrs to 12 hrs	3 hrs to indefinite
Over 80	Indefinite	indefinite

H. E. L. P.

- Heat Escape Lessening Posture



# HUDDLE

- Extends survival time by 50% over swimming or treading water

