Exposure to

PHYSICAL HAZARDS

Extremes of Temperature

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HOW A BODY RELEASES HEAT

1. Radiation: transfer of heat from a hotter object to a cooler object though space by radiant energy

2. Conduction: transfer of heat from molecule to molecule of adjacent objects

3. Convection: transfer of heat in liquids or gases in which molecules are free to move

4. Evaporation: heat loss involves the changing of a substance from its liquid state to its gaseous form

How does the human body regulate body temperature?

The body regulates body temperature by circulating blood near the surface of the skin, by exhaling warm, humidified air, and by evaporating sweat.

The body can survive only at a narrow range of core temperatures

Body temperature regulation is governed by:

- Central autonomic responses to core temperature changes to the hypothalamus.

- Central and peripheral responses to skin temperature changes which facilitate the loss or preservation of body heat.

Body temperature processes function best when ambient temperature is around (21°C -23°C) (70°F – 74°F)

Where we feel most comfortable

OSHA's recommendations for workplace air treatment set federal standards for temperature and humidity levels.

Regardless of business size, the minimum temperature for indoor workplaces is 20^{o} Celsius and the maximum is 24^{o} Celsius.

Acclimatization التأقلم

Acclimatization is the **beneficial physiological adaptations** that occur during repeated exposure **to a hot environment**.

Acclimatization requires 4- 6days

Acclimatization is accomplished by regular exposure to heated environment of increasing (intensity & duration).

The acclimatized person adjusts to heat by decreasing the blood flow to the skin, increase the quantity of sweat, diminish sweat salt content, increasing the plasma volume, cardiac output and stroke volume while the heart rate decreases also increase blood supply to muscles.

INFLUENCING FACTORS

1. Air temperature
2. Temperature of surrounding objects
3. Sun’s radiant heat
4. Relative humidity
5. Air movement
6. Amount and type of clothing worn
7. Heat produced by the body

Heat injury (in order of decreasing severity):

1. Heat stroke
2. Heat exhaustion
3. Heat cramps
4. Heat syncope
5. Skin disorders (heat rash, erythema, intertrigo and heat urticaria).

Workers at risk

Smelters, steel workers, glass blowers, farmers, fishermen, construction workers, military troops, athletes, pilgrims.






Heat Injury

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Predisposing Factors

- Overweight and fatigue
- Heavy meals and hot food
- Alcohol and drugs (Drugs that inhibit sweating are atropine, antihistamines, some tranquilizers, cold medicine and some antidiarrheal medicines)
- Fevers
- Tight clothing

HEAT SYNCOPE اغماء الحرارة

- ✓ <u>It is a potential problem for workers who must stand for long periods in hot environment causing sudden unconsciousness.</u>
- ✓ Episodes are observed in absence of substantial exertion in unacclimatized person to heat .
- ✓ It results from cutaneous vasodilatation with consequent systemic & cerebral hypotension (ABP < 100 mmHg).
- ✓ Prior to loss of consciousness pulse rate is elevated but core temperature is not, skin is cool &moist.
- ✓ Treatment consists of recumbence, cooling and fluid by mouth.

Heat Syncope "Fainting"

***Mechanism:**

Increase body temperature

↓

Vasodilatation

↓

Decreases blood pressure

↓

Decrease blood flow to brain

↓

Syncope

***Treatment:**

-Remove the patient from hot environment.

-Heat must be lowered.

-Raise the patient`s feet to maintain blood flow to the brain.

-Supply fluids when patient regain his consciousness.

Heat Cramps

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Heat Cramps تشنجات حرارية

- Excessive salt lose
- Painful cramps of muscles usually in arms, legs and stomach area
- Heat exhaustion may be present
- Body temperature may be normal
- Avoided by proper nutrition and hydration

Heat Exhaustion

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Heat Exhaustion الإنهاك الحراري

- **Excessive salt and water loss**

- **Skin is cool and moist**; pulse is rapid and blood pressure may be low

- Other symptoms are profuse sweating, headaches, tingling in hands and feet, paleness, difficulty breathing, irregular heart beat, **loss of appetite, nausea and vomiting**

Heat Exhaustion الإنهاك الحراري

- Oral temperature may be lower than normal if the person is hyperventilating

- Trembling, weakness, lack of coordination and a slight clouding of senses to momentary loss of consciousness complete the classic picture

- Avoided by proper work/rest cycles and **good hydration**

Heat Stroke

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ضربة شمس HEAT STROKE

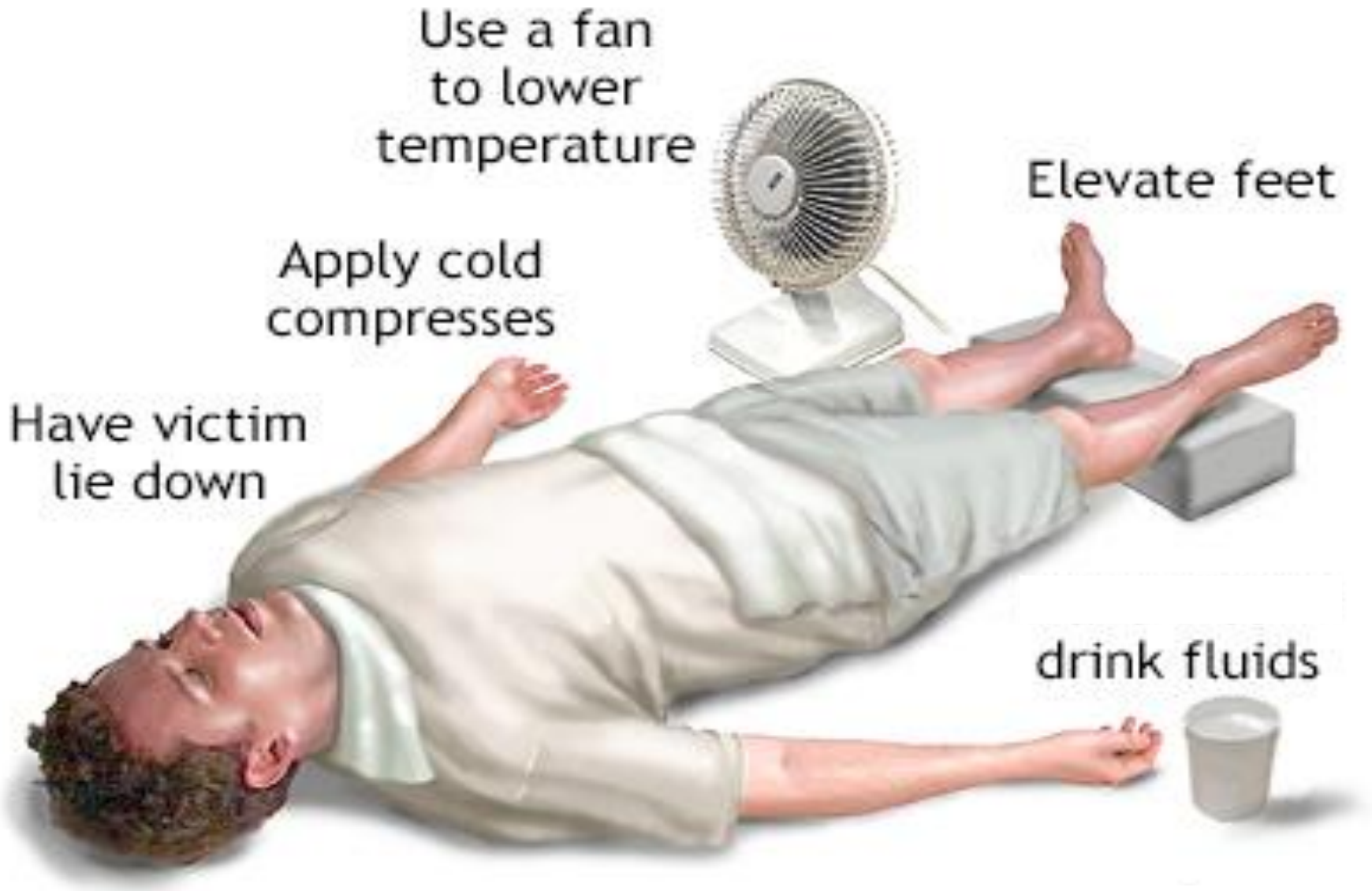
- **A medical emergency and death rate is high**
- **The body's heat regulatory mechanism stops functioning and the main avenue of heat loss is blocked**
- Early signs are headache, dizziness, delirium, weakness, nausea, vomiting and excessive warmth
- Skin is usually hot, red and dry
- Body temperature may be as high as 41 – 42^{o}C

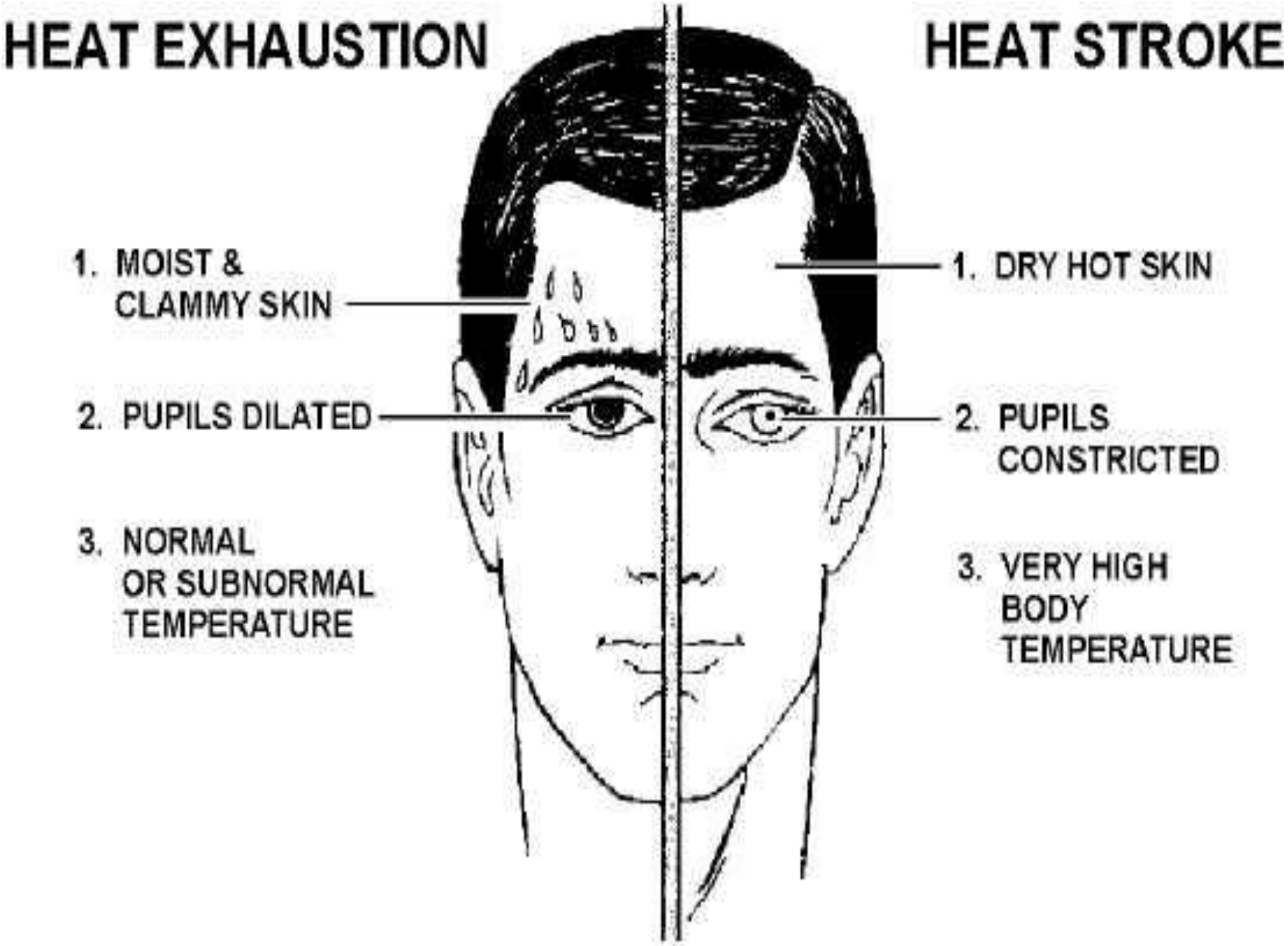
ضربة شمس HEAT STROKE

- The casualty may go through heat cramps or heat exhaustion; a sudden collapse and loss of consciousness followed by coma and convulsions may occur
- Sweating may or may not be present
- Avoided by proper work/rest cycles and full hydration

First aid for heat cramps and exhaustion

- Move the victim to a shady area and loosen clothing if possible
- Slowly give large amounts of cool water
- Pour water on victim and fan
- Elevate legs for exhaustion
- Watch the victim, if possible release from the strenuous activity
- Get medical help if symptoms continue


Use a fan
to lower
temperature
Elevate feet
Apply cold
compresses
Have victim
lie down
drink fluids


HEAT EXHAUSTION
HEAT STROKE
1. MOIST & CLAMMY SKIN
2. PUPILS DILATED
3. NORMAL OR SUBNORMAL TEMPERATURE
1. DRY HOT SKIN
2. PUPILS CONSTRICTED
3. VERY HIGH BODY TEMPERATURE

First aid for heat stroke

- Lower the victim's body temperature ASAP
- Elevate soldier's legs
- Have soldier drink water if possible
- **GET MEDICAL HELP**

Preventing Heat Injuries

- Replace water loss (provide adequate water at all times).
- Maintain acclimatization
  - Begin acclimatization with first exposure
  - Continue with two 50 minutes periods daily
  - Limit intensity and time of exposure for those not acclimatized
  - Acclimatization can be lost if remove from the hot environment for 1 month

Preventing Heat Injuries

- **Establish a good work/rest schedule**
  - Work in cooler hours
  - Provide comfortable working conditions
  - Avoid working in direct sunlight
  - Slowly increase exposure to those becoming acclimatized
  - Use proper clothing

Frostbite

Frostbite

Frostbite is an injury caused by freezing of the skin and underlying tissues. In the earliest stage of frostbite, known as frostnip, there is no permanent damage to skin.

Most often affects the nose, ears, cheeks, chin, fingers, or toes.

Frostbite

Frostbite can permanently damage body tissues, and severe cases can lead to amputation.

In extremely cold temperatures, the risk of frostbite is increased in workers with reduced blood circulation and among workers who are not dressed properly.

Symptoms of frostbite include:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Numbness
- Tingling or stinging
- Aching
- Bluish or pail, waxy skin

First Aid

Workers suffering from frostbite should:

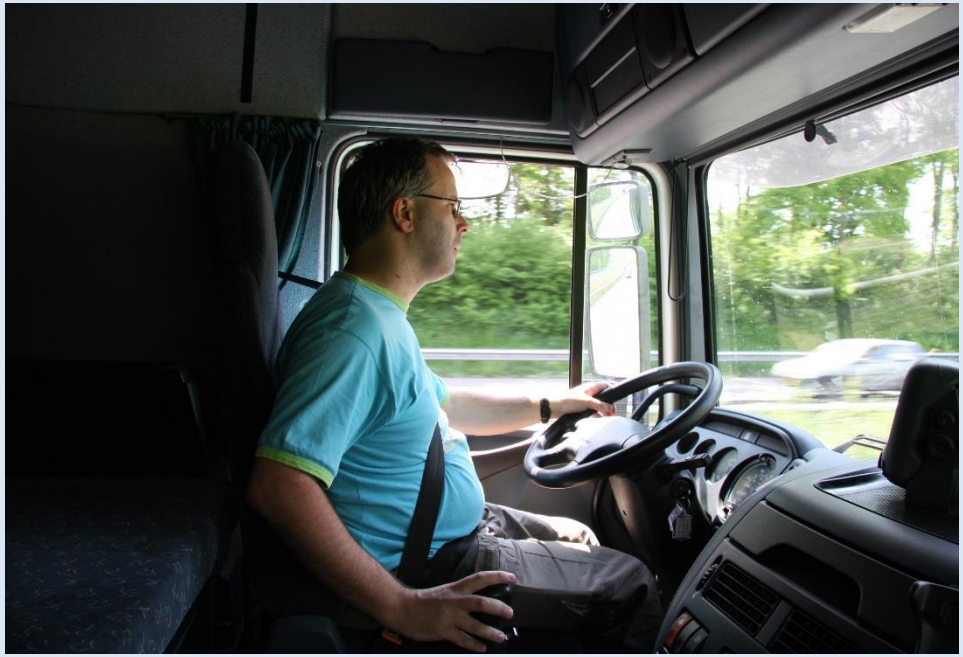
- Get into a warm room as soon as possible.
- Unless absolutely necessary, do not walk on frostbitten feet or toes-this increases the damage.
- Immerse the affected area in warm-not hot-water (the temperature should be comfortable to the touch for unaffected parts of the body).
- Warm the affected area using body heat; for example, the heat of an armpit can be used to warm frostbitten fingers.
- Do not rub or massage the frostbitten area; doing so may cause more damage.
- Do not use a heating pad, heat lamp, or the heat of a stove, fireplace, or radiator for warming. Affected areas are numb and can be easily burned.


Cold Wind

Bell’s Palsy

Bell's palsy, or facial palsy, is a paralysis or severe weakness of the facial muscles on one side of the face, causing it to droop or become stiff.

The exact cause is unknown. It's believed to be the result of swelling and inflammation of the nerve that controls the muscles on one side of the face. Or it might be a reaction that occurs after a viral infection.



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