

# Chapter 10: Understanding the Potential Dangers of Adverse Environmental Conditions

- Environmental stress can adversely impact an athlete's performance and pose serious health threats
- Areas of concern
  - Hyperthermia
  - Hypothermia
  - Lightening storms
  - Overexposure to the sun

# Hyperthermia

- Hyperthermia = increase in body temperature

# How is heat gained or lost?

- Heat can be lost or gained by:
  - Conduction (direct contact)
  - Convection (contact with cool air or water mass)
  - Radiation (heat generated from metabolism)
  - Evaporation (sweat evaporating from the skin)
    - Majority of body heat is dissipated through evaporation



# What can help regulate practices to prevent heat illnesses?

- Digital and/or sling psychrometers
- WBGT (wet bulb globe temperature)
- Weather apps on smart phones
  - Weather bug
  - Radar now
  - [www.wral.com](http://www.wral.com)
  - [www.noaa.org](http://www.noaa.org)

# Heat Illnesses

- Heat Syncope
- Heat Cramps
- Heat Exhaustion
- Heat Stroke

# Heat Syncope

- Heat Collapse from exercising in the heat
- The athlete faints from getting too hot.
- Treatment: cool them down, give them something to drink (if conscious)



# Heat Cramps

- Painful muscle spasms (calf, abdominal) due to excessive water loss and electrolyte imbalance
- Treatment
  - Prevent by consuming extra fluids and maintaining electrolyte balance
  - Treat with fluid ingestion, light stretching, ice massage
  - Return to play unlikely due to continued cramping

# Heat Exhaustion

- Severe dehydration
- Will exhibit signs of profuse sweating, pale skin, mildly elevated temperature, dizziness, hyperventilation and rapid pulse
- May develop heat cramps or become faint/dizzy
- Core temperature will be  $\sim 102^{\circ}$
- Performance may decrease
- Immediate treatment includes fluid ingestion (intravenous replacement, ultimately), place in cool environment

# Heatstroke

- Serious life-threatening condition
- Characterized by sudden onset - sudden collapse, LOC (loss of consciousness), flushed hot skin, minimal sweating, shallow breathing, strong rapid pulse, and core temperature of  $\geq 104^{\circ}\text{F}$
- Temperature must be lowered within 45 minutes
- Drastic measures must be taken to cool athlete
  - Strip clothing
  - Sponge with cool water
  - Transport to hospital immediately

# Preventing Heat Illness

- Common sense and precaution
  - Consume fluids and stay cool
  - Hydration levels can be monitored by urine color and volume
- Weight records
  - A loss of 3-5% = reduced blood volume and could be a health threat
- Fluid and Electrolyte Replacement
  - Drink 20 oz of fluid for every lb lost in sweat
  - Sports drinks are more effective than water.
    - Sodium helps retain water.



# More Preventative Techniques

- Gradual Acclimatization
  - Most effective method of avoiding heat stress
  - Involves becoming accustomed to heat and exercising in heat
  - Early pre-season training and graded intensity changes are recommended with progressive exposure over 7-10 day period

# More Preventative Techniques

- Identifying Susceptible Individuals
  - Athletes with large muscle mass
  - Overweight athletes
  - Athlete with increased fluid loss
  - Athletes consuming medications or supplements
  - Athletes with a history of heat issues
- Uniform/Clothing Selection
  - Wear light colors and breathable materials

# What's the difference?

- Hyperthermia-increase in body temperature
- Hypothermia-decrease in body temperature



# What causes Hypothermia?

- Cold weather vs. nature of particular sport
- Temperature in conjunction with wind chill and dampness or wetness can increase chances of hypothermia
- Drop in core temp stimulates shivering but shivering stops after temp drops below 85-90°F
- Death is imminent when temp falls below 77-85°F.

# FROST NIP

- Involves, ears, nose, chin, fingers, and toes
- Occurs with high wind and/or severe cold
- Skin appears firm with cold painless areas that may peel and blister (24-72 hours)
- Treat with firm pressure, blowing warm air or hands in armpits (if fingers involved)
- Do not rub

# Frostnip



# Frostbite

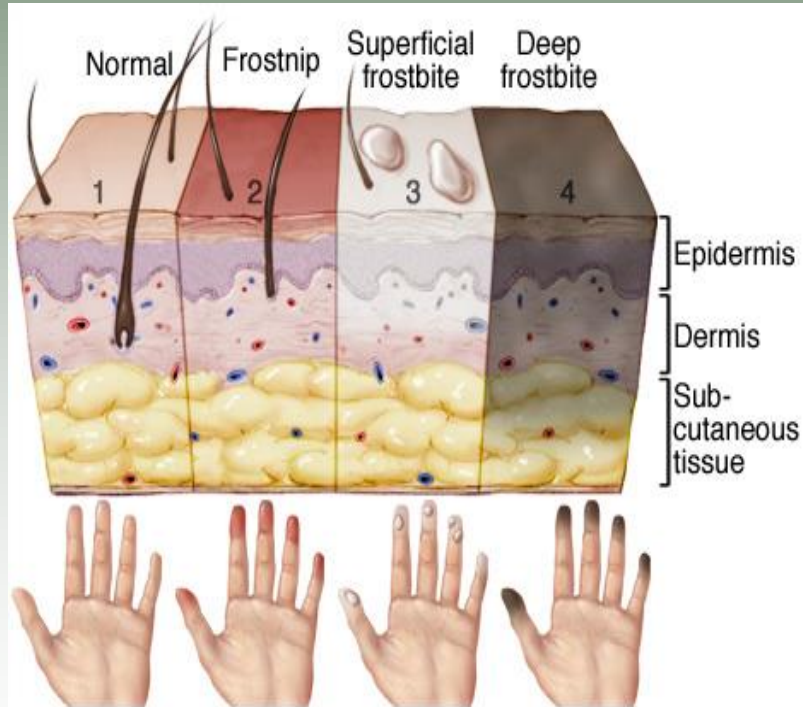
-*Superficial Frostbite* involves only skin and subcutaneous tissue

- Appears pale, hard, cold and waxy
- When re-warming, the area will feel numb, then sting and burn
- It may blister and be painful for several weeks

– *Deep Frostbite* indicates frozen skin requiring hospitalization

- Rapid re-warming is necessary (100-110°F)
- Tissue will become blotchy red, swollen, painful and may become gangrenous

# Frostbite



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# More Images of Frostbite



# Prevention of Cold Illness

Wear apparel (clothing) geared for weather

- Waterproof and windproof fabrics that allow passage of heat and sweat and allow movement
- Layers and adjusting them are key to maintaining body temperature

May be useful to monitor weight of athletes training in cold temperatures

Fluid replacement is critical even under colder environmental conditions

# Overexposure to Sun

- Long Term Effects on Skin
  - Premature aging and skin cancer due to ultraviolet exposure
  - Premature aging is characterized by dryness, cracking and inelasticity of the skin
  - Skin cancer is the most common malignant tumor found in humans



# Preventing Over Exposure

- Using Sunscreen
  - Can help prevent damaging effects on skin
  - Sunscreen effectiveness is expressed as SPF (sun protection factor)
    - Indicates how many times longer an individual can be exposed to the sun with vs. without sunscreen before skin turns red.
  - Should be worn by all but **ESPECIALLY** those who are outside a considerable amount, and/or have fair complexion, light hair, blue eyes, or skin that burns easily

# More on SUNSCREEN

- Sunscreen use is at its highest March - November but should be used year round (particularly between the hours of 10am-4pm)
- It should be applied 15-30 minutes before exposure and re-applied after exposure to water, excess sweating, rubbing skin with clothing or a towel
- A white t-shirt has an SPF of 5.

# Safety in Lightning and Thunderstorms

- Emergency action plans must be ready for this type of event
  - Involving chain of command, monitoring of weather service, decision-making regarding removal and return to field

# What to do????

- In the event of a storm, seek shelter indoors should be obtained
- Other guidelines
  - Avoid large trees, flag/light poles, standing water, telephones, pools, showers, and metal objects (bleachers, equipment, umbrellas)
  - Last resorts: find car, ravine, ditch or valley for safety
  - If hair stands up on hand you are in imminent danger and should get down on the ground but not flat as that increases surface area

# More Guidelines

- If you SEE IT, FLEE IT!
- If you HEAR IT, CLEAR IT!
- Flash-to-bang methods estimates distance away for the storm
  - Count time from which lightning is sighted to the clap of thunder and divide by 5 to calculate the number of miles away
- NATA and National Weather Service suggest waiting 30 minutes after no thunder/lightning before returning to play.

- Lightning Detectors and APPS
  - Hand-held instrument with electronic system to detect presence and distance of lightning/thunderstorm activity (w/in 40 miles)
  - Can determine level of activity and direction of movement
  - Provides audible and visual warning signals
  - Inexpensive alternative to contracting weather services

