

Sports and Hydration

Avoiding Heat Illness



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HEAT ILLNESS

- Introduction
- Physiology
- Types of Heat Illness
- Treatment
- Prevention



Heat Related Deaths

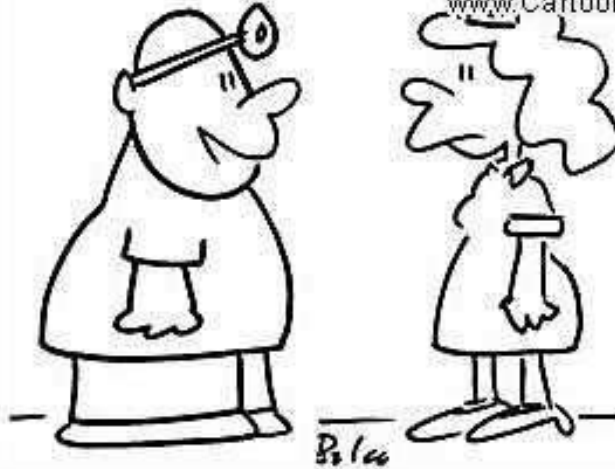
- 1960-1969 = 34
- 1970-1979 = 31
- 1980-1989 = 13
- 1990-1999 = 15
- 2000-2005 = 13
- 2006-2008 = 13

2008

4 High School Died
3 College Died

2011 Prestonwood Football Coach Died

Heat Illness is 100% preventable



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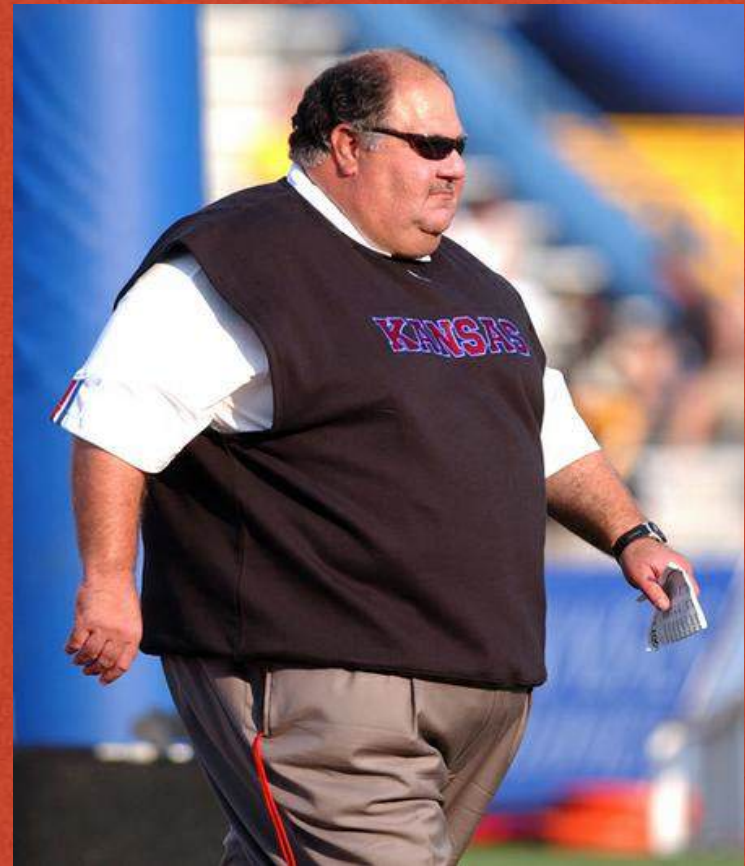
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"An ounce of prevention was worth
a pound of cure, but that was
before Medicare."

Risk of Heat Illness

Dehydration

- Obesity
- Heavy/Impermeable Clothing
- Poor Physical Fitness
- Lack of Acclimatization
- Cardiovascular Diseases(sickle cell)



How we get in Trouble

Kids sitting on the couch in air conditioning, eating chips, drinking soda and playing X-Box



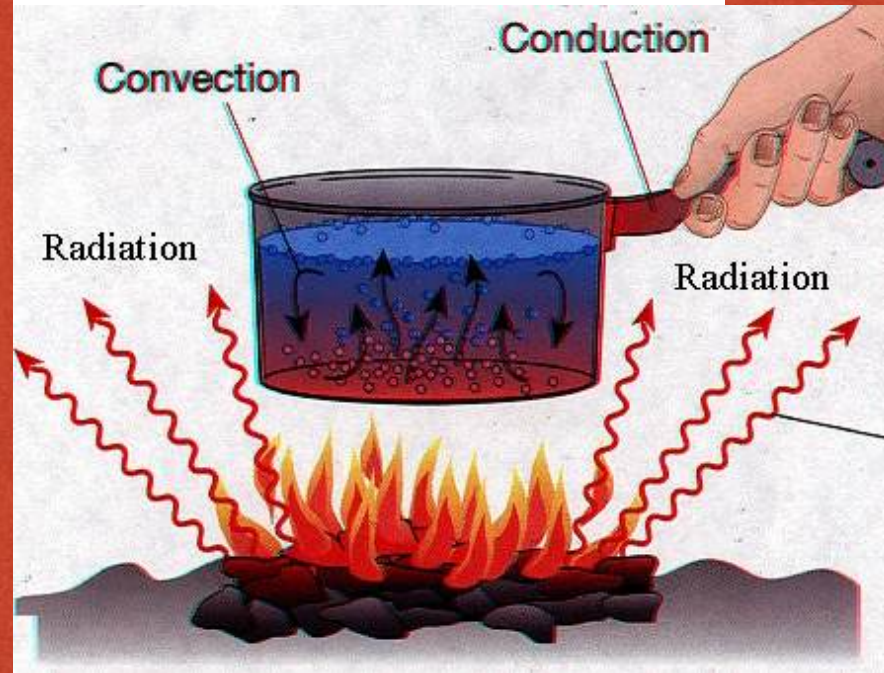
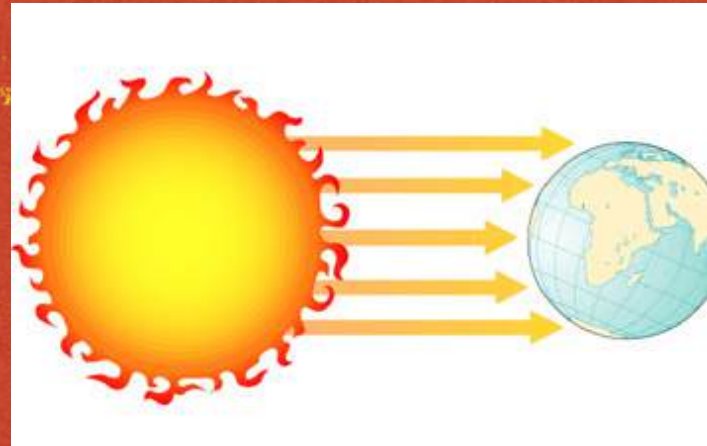
Preseason Football in hot and humid weather



Risk for Heat Illness(Especially first 2 Weeks)

How the Body Handles Heat

- Radiation
- Conduction
- Convection
- Evaporation



Heat From Radiation

The energy transferred to or from an object via electromagnetic radiation from higher to lower energy surfaces.

- Heat from the sun!
- 150 kcal/hr
- Heat gain if *> 96 degrees outside*



Heat Conduction

The transfer of heat from a warmer to a cooler object through direct contact. Heat produced in muscle is transferred to circulating blood as long as core temperature is lower.

- Ice Packs
- Water baths- water conducts heat 25X faster than air
- Cold towels

Heat Convection

The transfer of heat from an object to the surrounding air.

- Moving air from fans, wind, cycling
- Rate of heat loss can vary 5 fold between
- Resting in still air and running on a breezy day

Evaporation

- The transfer of heat by the vaporization of sweat and from respiration.

- The most efficient means of heat loss!

- Is dependant upon:

- Humidity

- Velocity of moving air

- Surface area exposed

- Sweat rate

- Effectiveness is diminished when humidity is $> 60\%$



Evaporation

- Evaporation decreases as total body water decreases with dehydration and decreased blood flow to periphery and thus decreased sweat produced.
- Clothing and equipment reduce surface area and thus reduce evaporation: increases core temp, weight loss, heart rate.
- Football uniform reduces body surface area for evaporation by 60%

Evaporation sweat rate

- Unacclimated athlete = 1 L/hr = 500 kcal/hr
- Acclimated athlete = 3 L/hr = 1500 kcal/hr
- An acclimated is better at making sweat and helps cool more efficiently.
- Can be affected by:
 - Medications: diuretics, amphetamines, cocaine, PCP, LSD
 - Medical conditions: scleroderma, burns, cystic fibrosis
 - Ointments, lotions

Acclimatization

- Physiologic process by which an individual becomes able to tolerate work in a hot environment.
- Becoming “Thermal efficient”
- Usually takes 7-14 days
 - Maximum acclimatization takes 3 months.
- Fluid and salt increase heat acclimatization.

		Relative Humidity (%)													
°F		40	45	50	55	60	65	70	75	80	85	90	95	100	
Air Temperature	110	136													
	108	130	137												
	106	124	130	137											
	104	119	124	131	137										
	102	114	119	124	130	137									
	100	109	114	118	124	129	136								
	98	105	109	113	117	123	128	134							
	96	101	104	108	112	116	121	126	132						
	94	97	100	102	106	110	114	119	124	129	135				
	92	94	96	99	101	105	108	112	116	121	126	131			
	90	91	93	95	97	100	103	106	109	113	117	122	127	132	
	88	88	89	91	93	95	98	100	103	106	110	113	117	121	
	86	85	87	88	89	91	93	95	97	100	102	105	108	112	
	84	83	84	85	86	88	89	90	92	94	96	98	100	103	
	82	81	82	83	84	84	85	86	88	89	90	91	93	95	
	80	80	80	81	81	82	82	83	84	84	85	86	86	87	

Heat Index
(Apparent
Temperature)

With Prolonged Exposure
and/or Physical Activity

Extreme Danger

Heat stroke or sunstroke
highly likely

Danger

Sunstroke, muscle cramps,
and/or heat exhaustion likely

Extreme Caution

Sunstroke, muscle cramps,
and/or heat exhaustion possible

Caution

Fatigue possible

Know The Risk!

Take Home:

When it's hot and humid and the air is still, you are in danger of heat illness.



How do We Prevent Heat Illness

- Don't Practice/Modify Practice when Hot Humid
 - First Few weeks of preseason summer ball greatest risk
- Drink Fluids before, during and after
- Have shade and ice available on practice field
- Light clothing: Shells, shorts and limit full pads to no greater than 30 minutes first 2 weeks

What do ya drink?

- Cold water is fine for activities under an hour

Flavored water will be consumed more readily

- Carbohydrate type drink good after an hour of activity



Why Drink?

- **Dehydration impairs athletic performance**
- Coaches who want their athletes performing at their peak should be making their athletes drink, not withholding fluid as a punishment.
- 20 to 48 ounces of fluid per hour of strenuous exercise(American College of Sports Medicine Position 1996)

What not to drink

- Carbonated beverages

- Make athlete feel bloated, therefore perceived sensation of full. May not drink enough

- Caffeine

- Diuretic effect
- lose electrolytes (cramping)

How to drink?

- 500cc(1/2liter) 2 hours before exercise
- 16oz 30 minutes before exercise
- 4 to 8 oz every 15 to 20 minutes(Sports Drinks for activities longer than one hour)
- After Exercise
 - 24 oz of fluid for every pound lost durring exercise

How many carbs do ya need?

- 1 hours of training: 3 grams/ pound of body weight
- 2 hours of training: 3.6 grams
- 3 hours of training: 4.5 grams
- 4+ hours of training: 6 grams

Carbohydrate Sources

- Gatorade 14 to 79 grams per 12 ounces
- Orange Juice 27 grams/ 8 ounces
- Coke 27 grams/8 ounces
- Sports Gels 28 grams
- Swedish Fish Candy 39 grams/handful

Am I really drinking enough?

- If you are training daily monitor your weight
- If you are within 1-2 lbs of previous days weight you can participate but drink more
- If you are 5 to 6% off of previous days starting weight, restrict to light workouts and drink
- If you lose 7% or more of body weight from previous day. Do not participate, seen by a doc

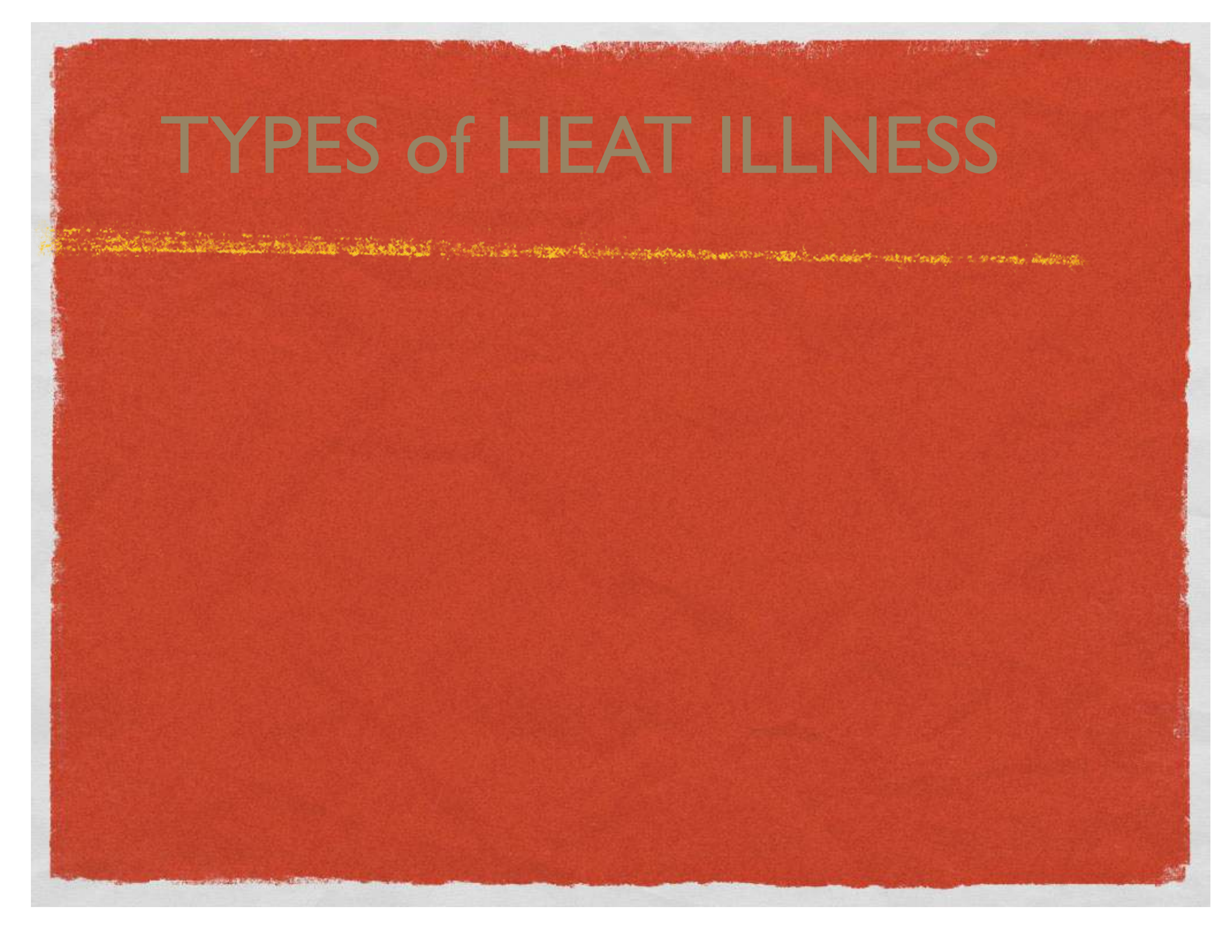
HEAT ILLNESS

(Progressive Illness)

- Exercise associated muscle cramps (heatcramps)
- Heat syncope
- Exercise exhaustion (heat exhaustion)
- Exertional heat stroke
- Exertional hyponatremia
- Exertional rhabdomyolysis



TYPES of HEAT ILLNESS

The image features a solid red rectangular background. A horizontal yellow brushstroke, resembling a paint stroke, runs across the middle of the red area. The text 'TYPES of HEAT ILLNESS' is written in a light gray, sans-serif font at the top of the red area.

HEAT CRAMPS

(The Beginning of Heat Illness)

- An acute, painful, involuntary muscle contraction that presents during, or after intense exercise.
- Causes:
 - Dehydration
 - Electrolyte imbalances (sodium chloride)-acclimatized athletes lose 14 grams NaCl
 - Neuromuscular fatigue
 - Anxiety
 - Acid/base disturbances (hyperventilation)

Heat Cramps Treatment

- Remove from activity
- Replace fluids
- Replace salt (too little, too late)
- Stretch
- Massage (ice)
- I.V. fluids
- Others: Calcium gluconate, Quinine, I.V. Valium,
- Pinch thumb web space, lip(Skin Turgor Test)



Heat Syncope

- A feeling of lightheadedness or dizziness that occurs when a person is exposed to high environmental temperatures.
- Usually occurs during the first 5 days of acclimatization before blood volume expands.

Heat Syncope Signs and Symptoms

- Syncope
- Dizziness
- Tunnel vision
- Pale or sweaty skin
- Decreased pulse
- Normal rectal temperature

Heat Rash

Prickly Heat (aka lichen tropicus, miliaria rubra, heat rash)

- Erythematous rash caused by acute inflammation of sweat ducts
- Presentation includes itching, pruritic rash in warm environment (itching usually responds to antihistamines)
- If prolonged can develop into chronic dermatitis



Heat exhaustion

• Pallor

• Persistent muscular cramps

• Urge to defecate

• Weakness

• Fainting

• Dizziness

• Headache

• Hyperventilation

• TBW loss of $> 5\%$

• Nausea

• Anorexia

• Diarrhea

• Decreased urine

• output

• Rectal temperature:

• 97-104 degrees

Heat Exhaustion Treatment

- Move to shaded area
- Measure rectal temperature
- Remove excess clothes
- Fans, ice, ice towels
- Rehydrate
- I.V. fluids if situation worsens or rapid recovery is necessary.
- RTP 24-48 hours if no LOC and at baseline weight

Heatstroke



Triad:

- Temp $> 40.50^{\circ}\text{C}$ (104.90°F)
- CNS dysfunction
- Anhidrosis

Anyone with hyperpyrexia and AMS is considered heatstroke until proven otherwise.

- Any neurological disturbance can occur with heatstroke

Heat Stroke Signs/Symptoms

- Temperature > 104 rectal
- Fast heart rate
- Low blood pressure
- Sweating
- Rapid breathing
- Altered mental status
- Vomiting
- Diarrhea
- Seizures
- Seizure
- Coma ~ 70%
- Acute renal failure
- Rhabdomyolysis
- Bleeding (DIC)
- Pancreatitis/ GI bleed

Heat stroke

Cooling Techniques

- Evaporative
- Immersion
- Ice packing
- Strategic ice packs
- Gastric lavage
- Peritoneal lavage
- Cardiac bypass



Call 911 and do not delay transport to hospital
80% will die!

SUMMARY

- In beginning do it slow, let it show and when the temp is low
 - Drink before, during and after (You perform better hydrated)
 - Know the signs/symptoms of heat illness and tell a coach or ATC
- Heatstroke is 100% Preventable and no athlete should ever die!

Thank You

