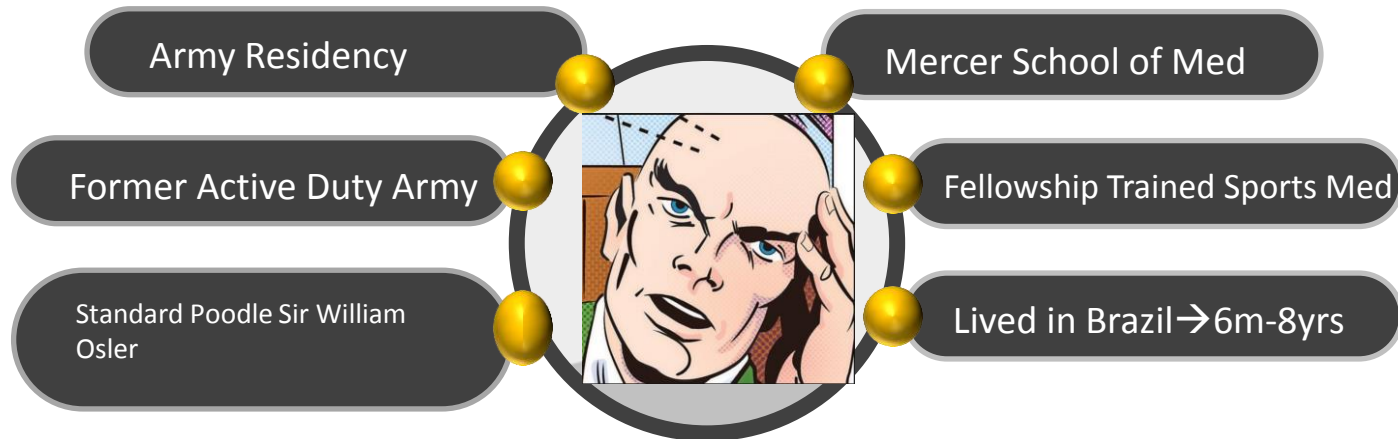


HELLO MY NAME IS



Derek Woessner /Wesner/ MD, FAAFP
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“Dear Weather: Stop Showing Off, We Know You're Hot”

Derek Woessner, MD, FAAFP
Physician of Sports Medicine



Disclosures



- None



Historical context – Heat Illness

- 1927 Vitalogy – an encyclopaedia of health and home
- *Sunstroke – “most cases are preceded by pain in the head; wandering of the thoughts, or an inability to think at all; disturbed vision; irritability of temper; sense of pain or weight at the pit of the stomach”*
- *To avoid heat stroke*
 - “1. live in the country during the summer;
 - 2. never drink any whisky, wine or beer;
 - 3. not to use severe exertion when the thermometer is over 90° in the shade”
- *Treatment: lay in the cool, give ½ tsp ammonia by mouth or whisky/brandy/wine, repeat each 30 min*



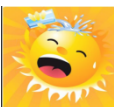
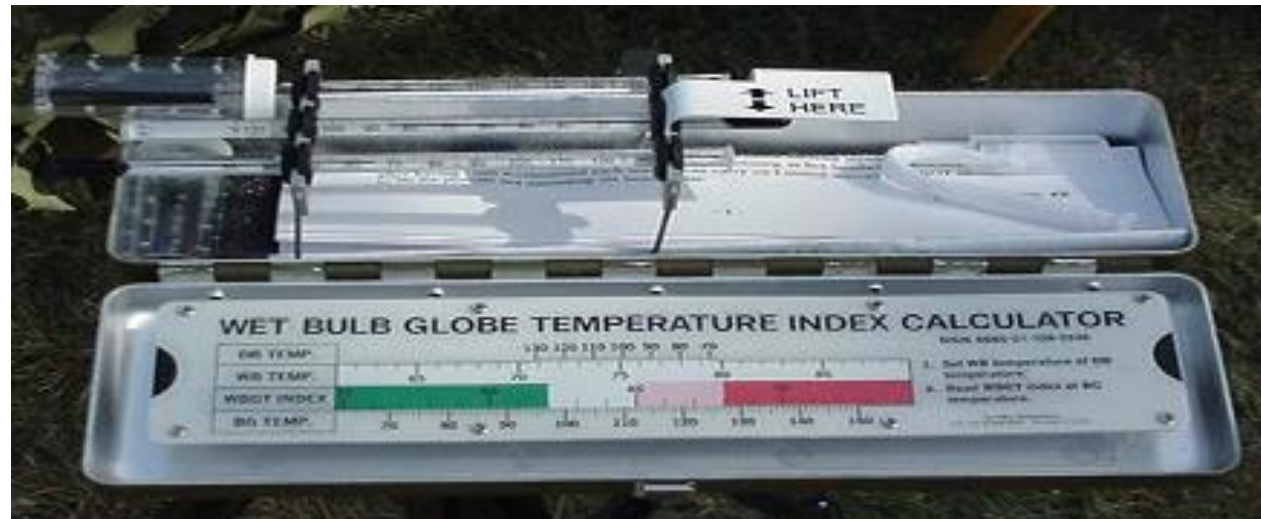


Key Terms

Wet Bulb Globe Temperature

(WBGT) is a composite temperature

used to estimate the effect of temperature, humidity, wind speed (wind chill), and visible and infrared radiation (usually sunlight) on humans



Learning Objectives



Causes of heat illness

Factors more likely to become a heat injury casualty

Signs and symptoms of heat illness

Proper treatment procedures for heat illness

Heat injury that is a medical emergency

Methods of preventing heat injuries

Return to play for heat injury





Epidemiology of Heat



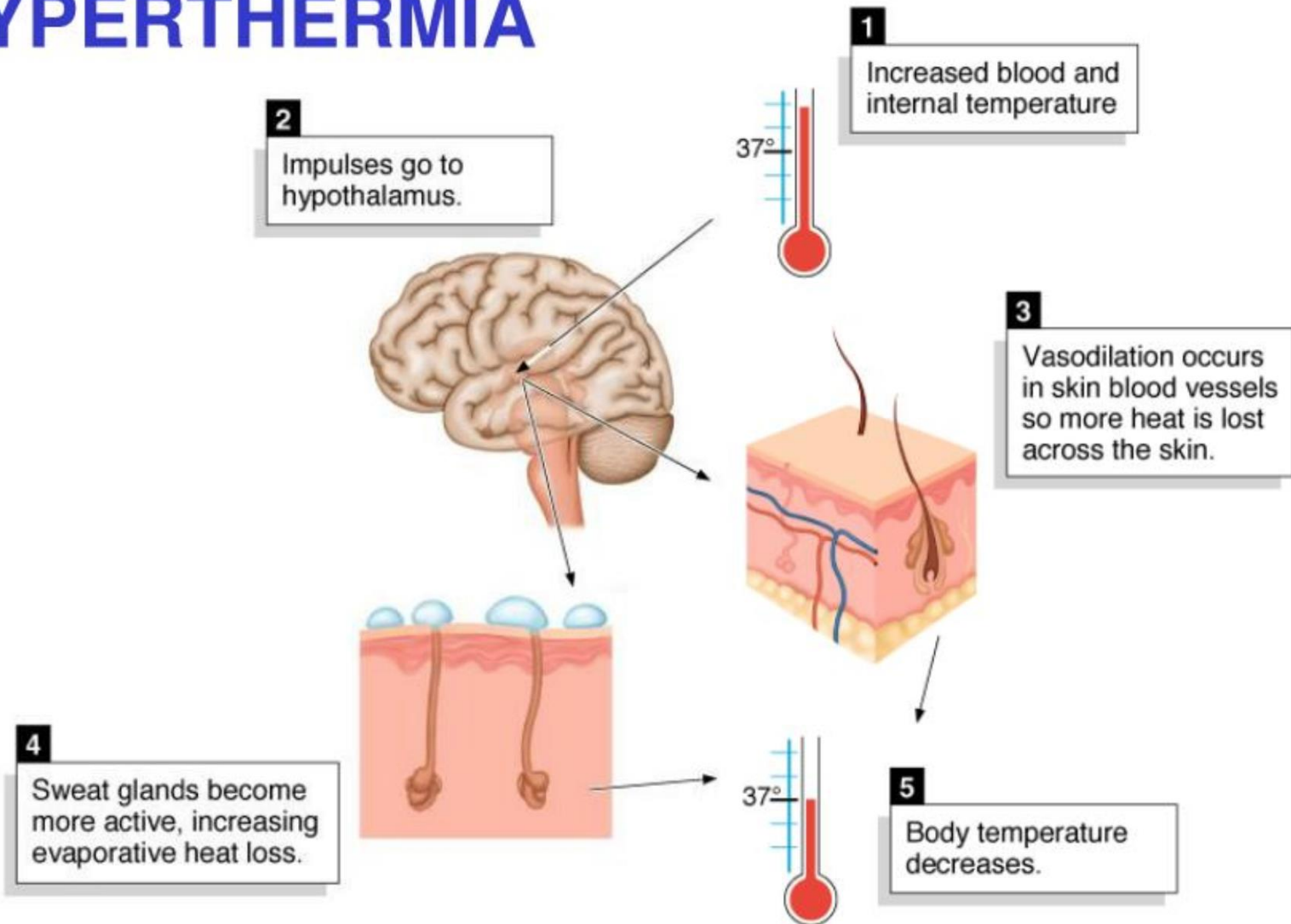
- 30 NCAA Football Players Have Died During Workouts Since 2000



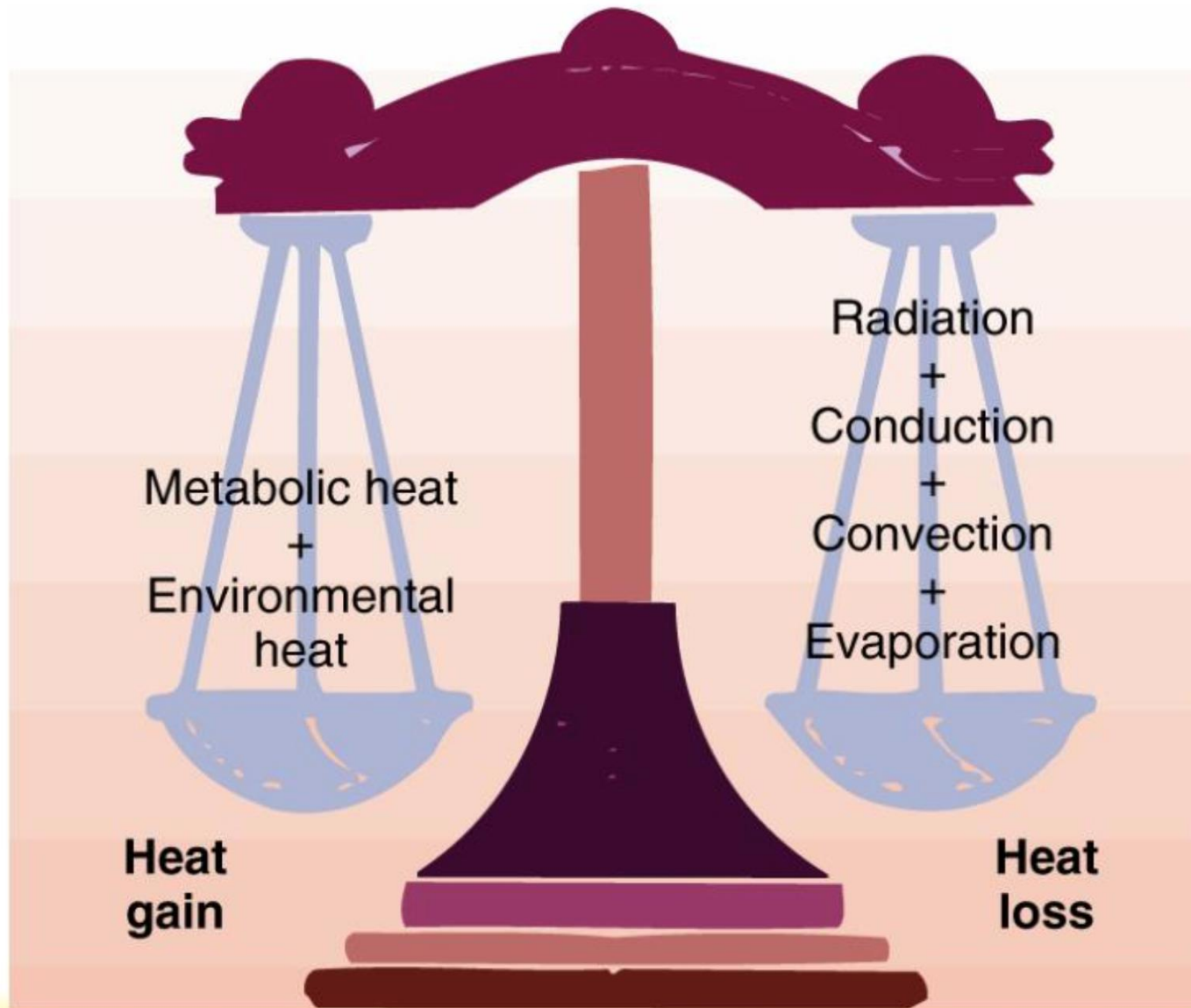
from google images© 2011



THE HYPOTHALAMUS AND HYPERTHERMIA



BODY HEAT GAINED AND LOST



PT suspected to have heat related illness



- AMS



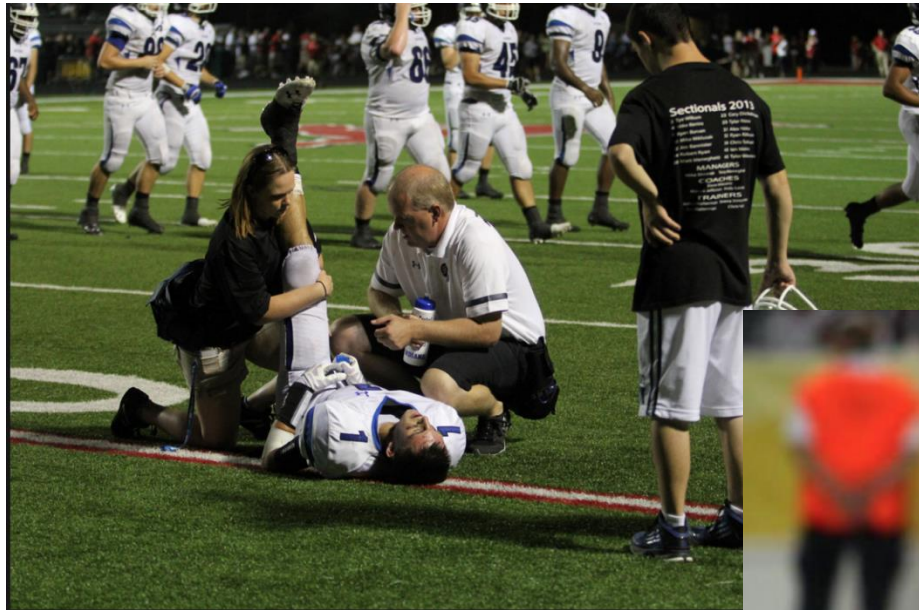
NO

Mild

Moderate



Heat cramps

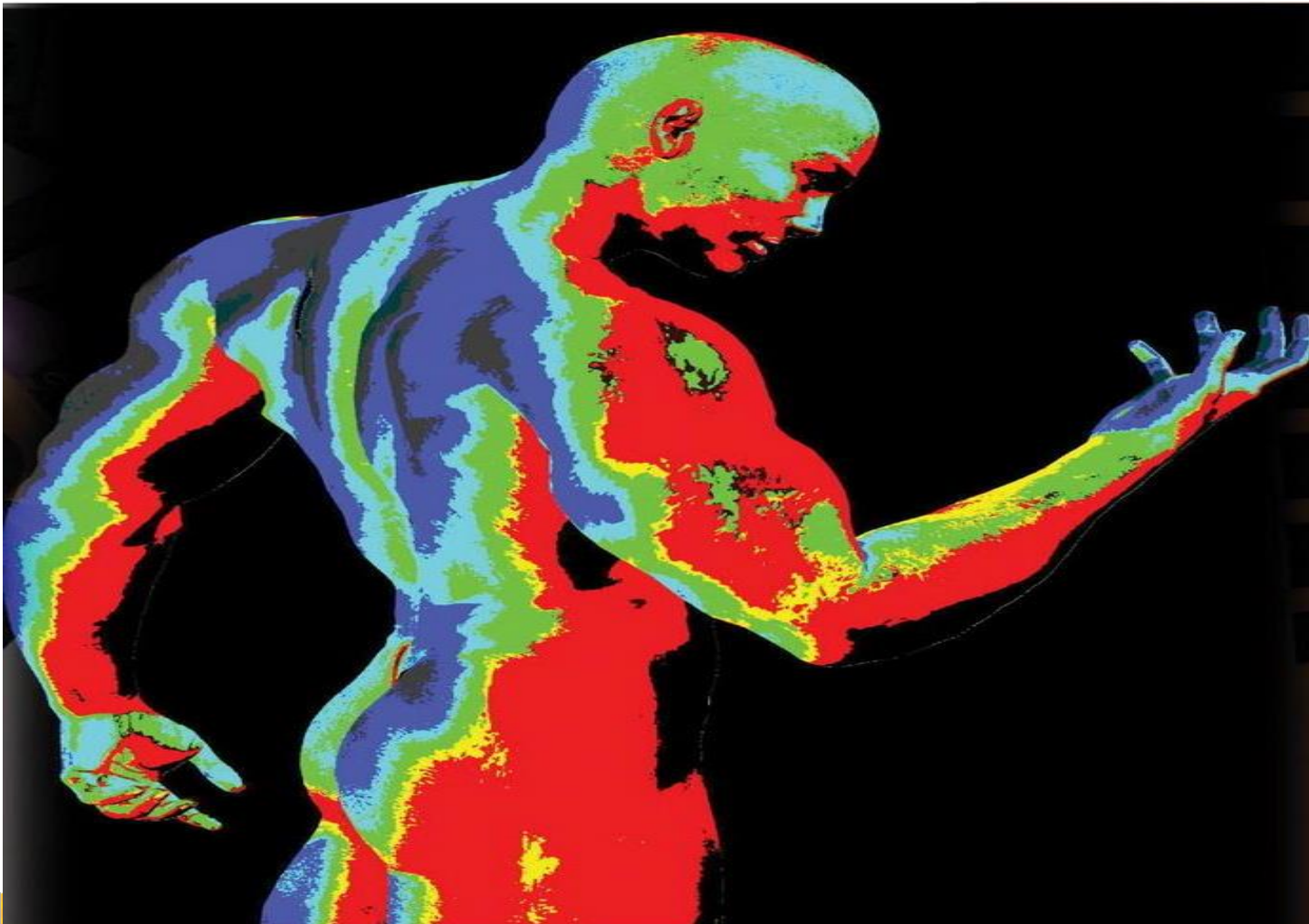


Acclimatized

- Athletes sweat more
 - Same plasma volume
 - Increased absorption of sodium
- Expanded plasma volume
 - Elevated aldosterone levels
- Time
 - 10-14 days



Adaptation to Heat



PT suspected to have heat related illness



- AMS



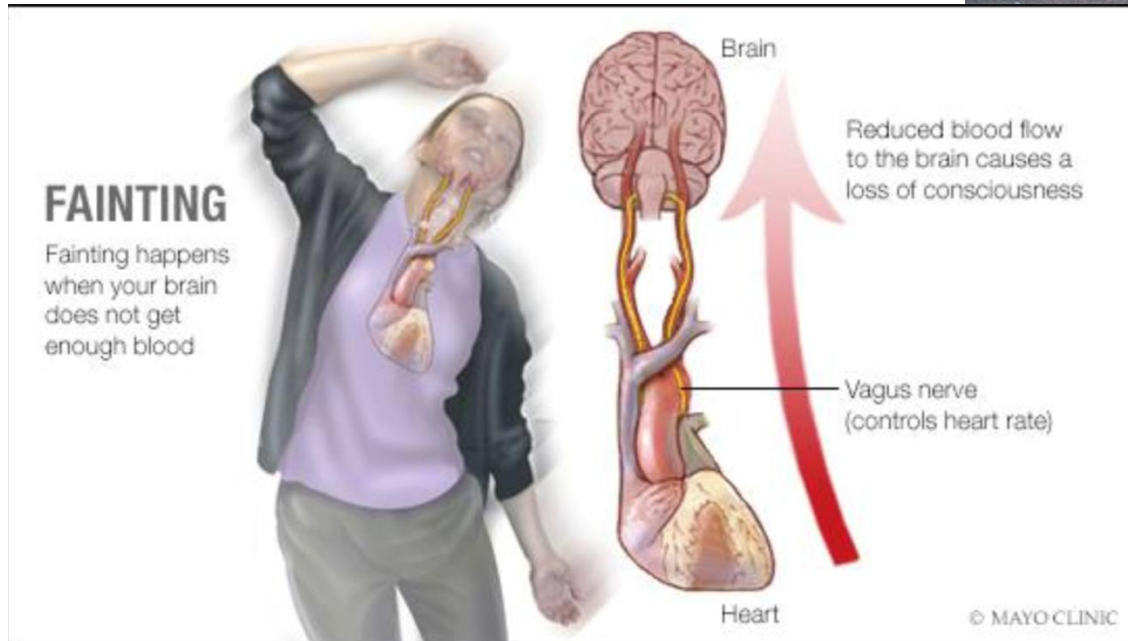
NO

Mild

Moderate



Heat Syncope



Monitoring



- Urine amount and color
- Pre & Post Weights
- Urine specific gravity

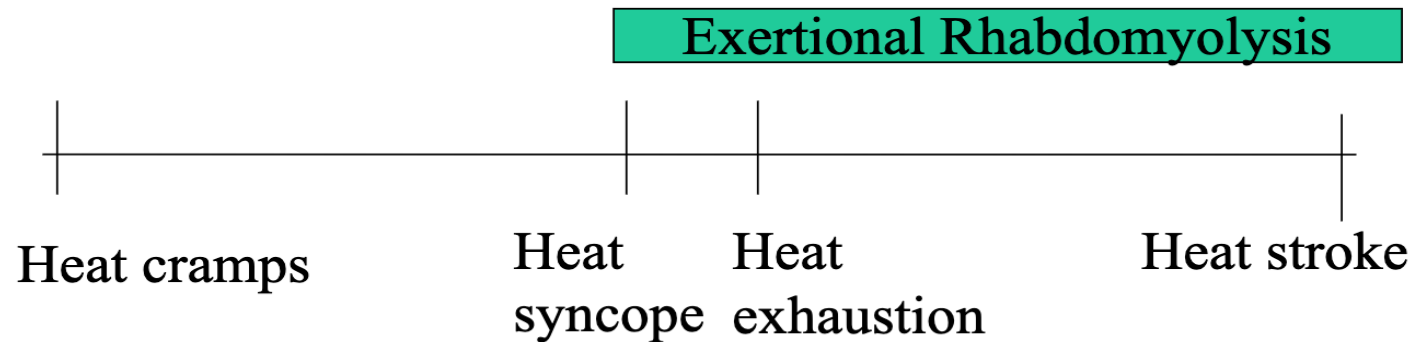
AM I HYDRATED?

Urine Color Chart

1		
2		If your urine matches the colors 1, 2, or 3, you are properly hydrated.
3		Continue to consume fluids at the recommended amounts.
4		If your urine color is below the RED line, you are
5		DEHYDRATED and at risk for cramping and/or a heat illness!!
6		YOU NEED TO DRINK MORE WATER!
7		
8		



Heat Illness Spectrum



PT suspected to have heat related illness



- AMS



NO

Mild

Moderate



Heat Exhaustion



Athlete has obvious difficulty continuing with exercise

- Core body temperature is usually 101 to 104°F (38.3 to 40.0°C) at the time of collapse

- No significant dysfunction of the central nervous system is present



Measuring temperature

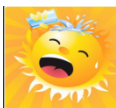


Do **NOT** use alternative methods to determine body temperature

- Cool until the patient begins to shiver.

OR

- Treat with cold water immersion for 15 to 20 minutes. This would cool most patients 3 to 4°C (5 to 7°F), which would make removal from an ice tub prudent in most cases.



PT suspected to have heat related illness



- AMS



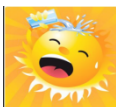
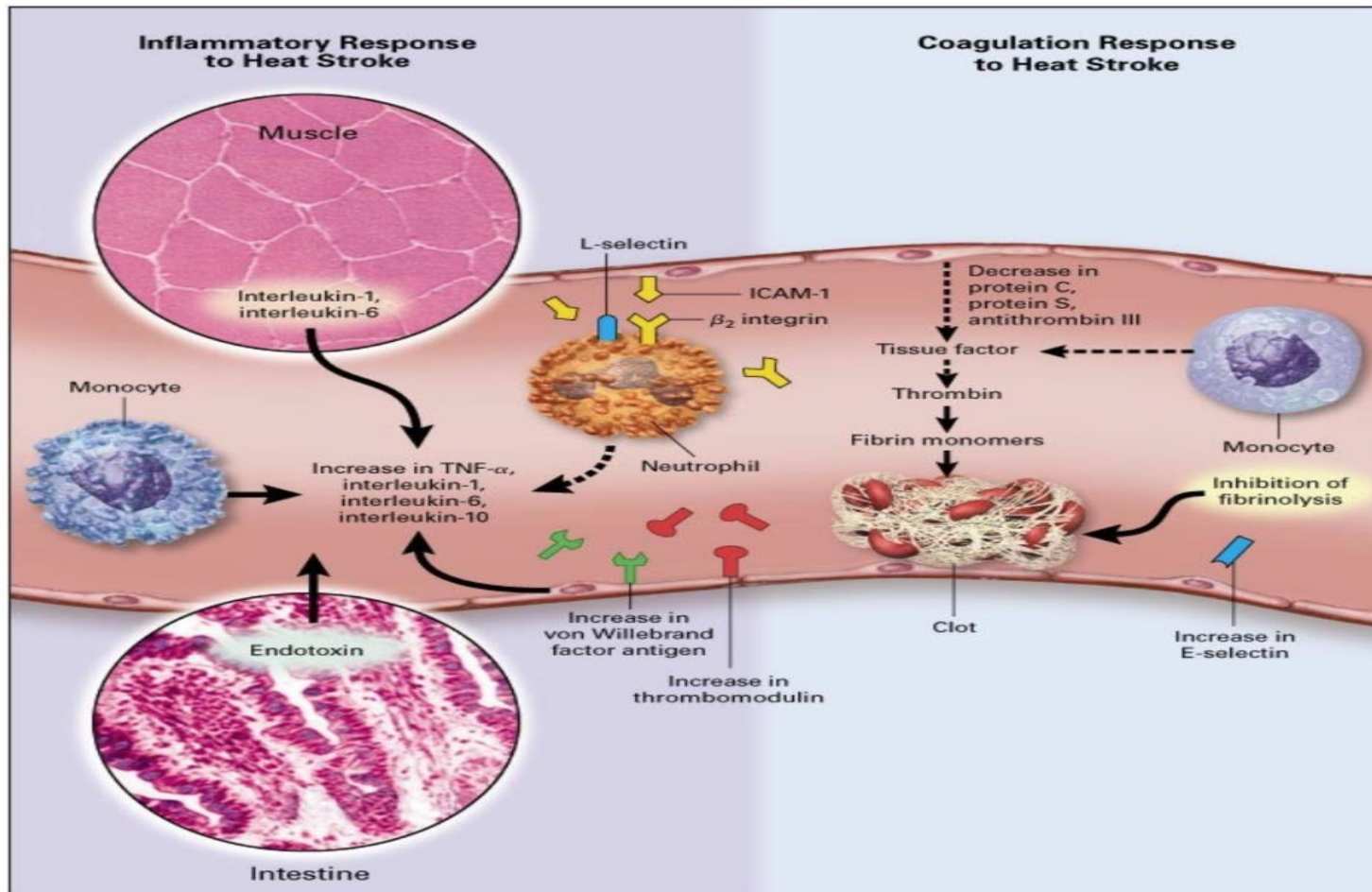
YES



Rectal Temp >104



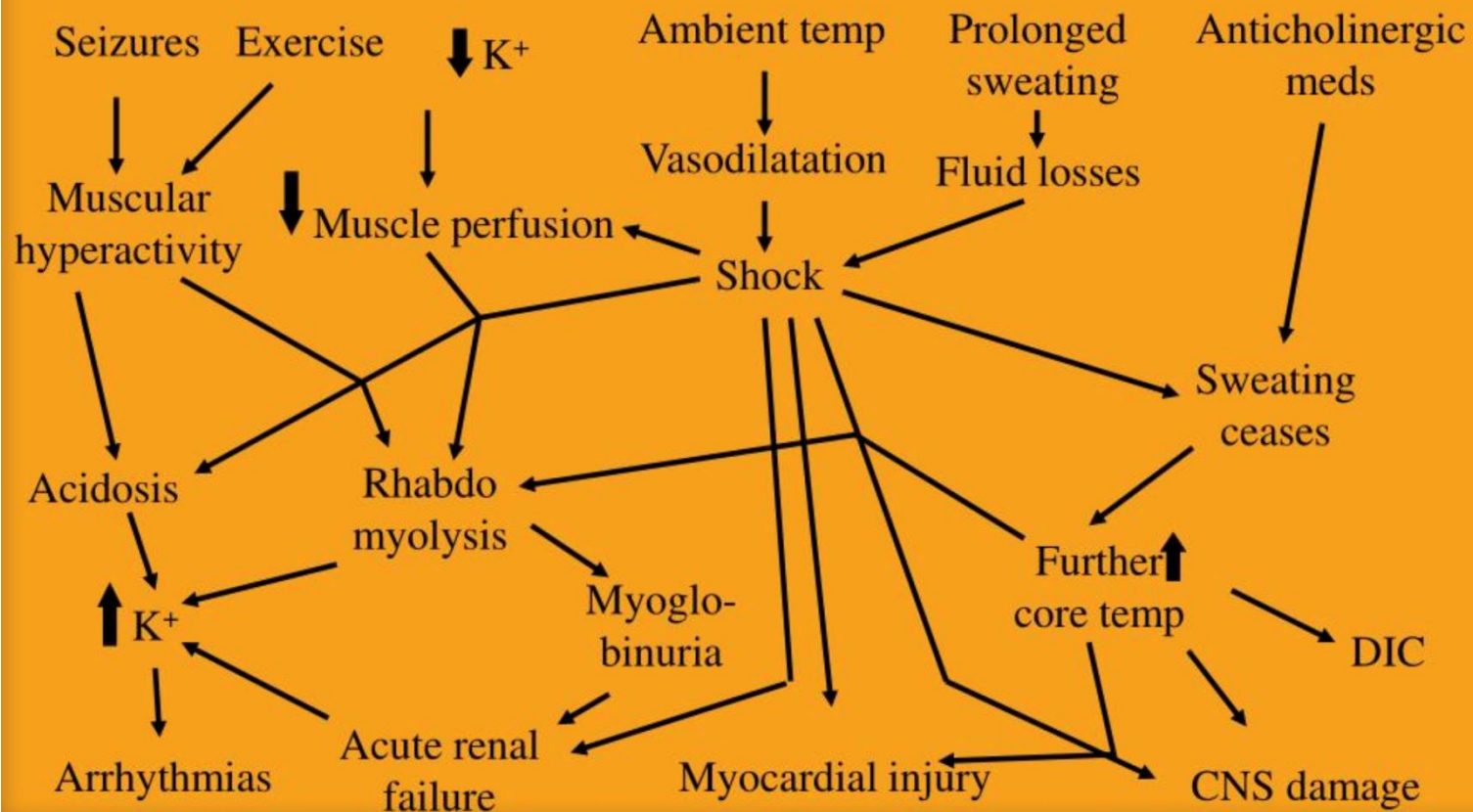
Heat Stroke



Heat Stroke



Heat Stroke - Multisystem Sequelae



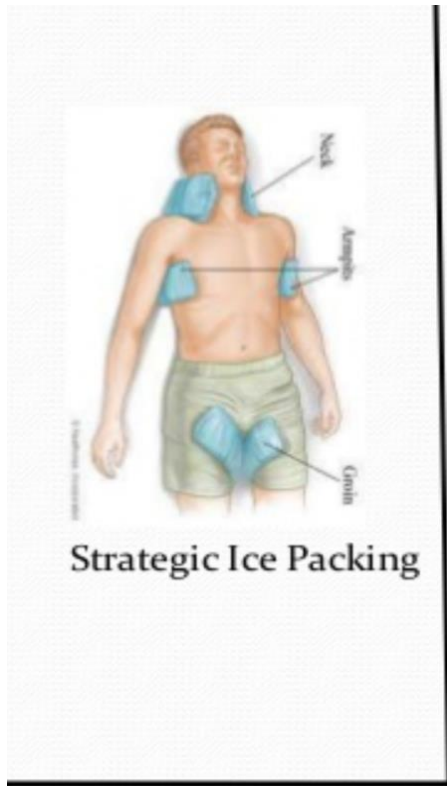
Heat Stroke



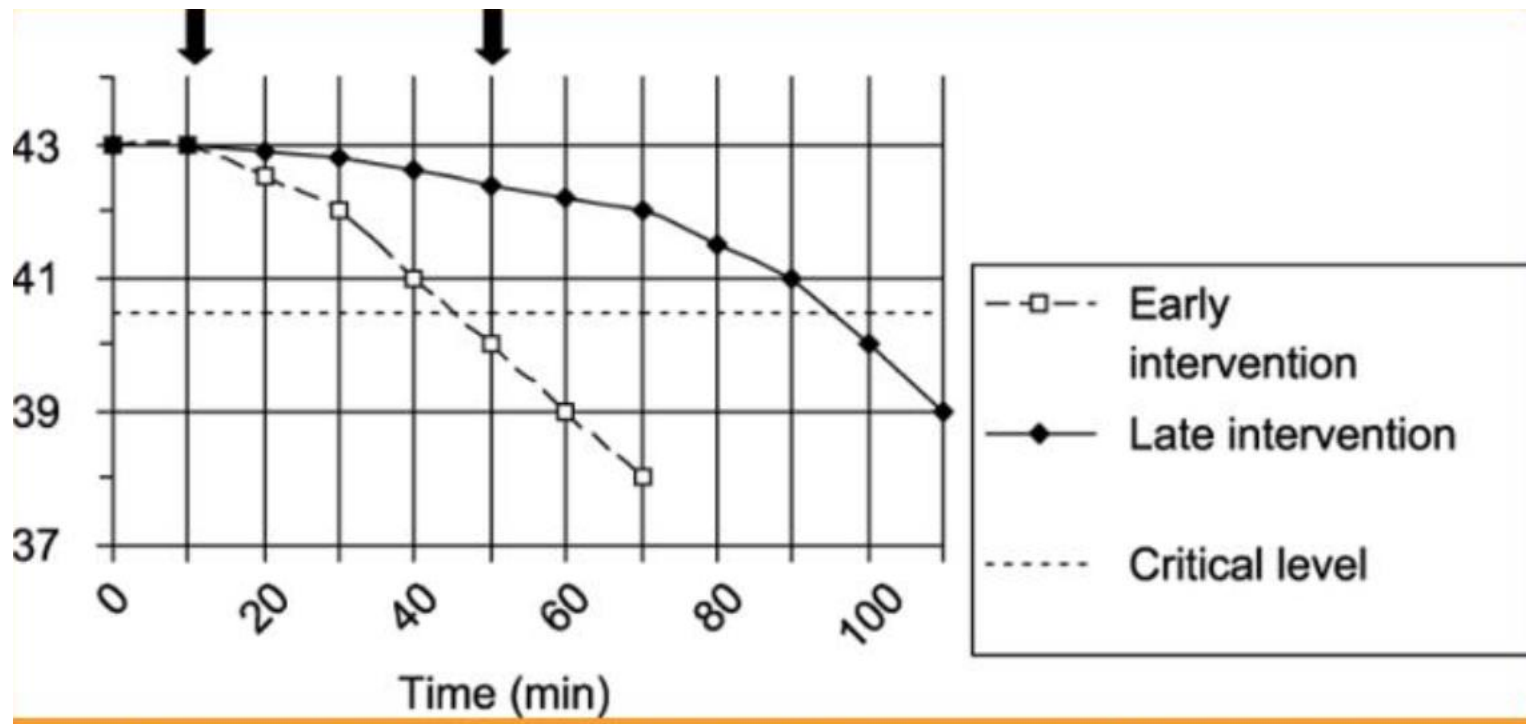
- Core above 40°C (104°F)
 - Confusion → irritability → obtundation → coma
 - Seizures, collapse, cardiac arrest
 - Need core temp
 - Tx:
 - ABCs + Ice bath



Rapid cooling



Core Temp Time



Heat injury



- Defined as an EHI
 - Exertional Heat Illness
- evidence of both hyperthermia (core temperature above 40 to 40.5°C)
- end organ damage without any significant neurologic manifestations.



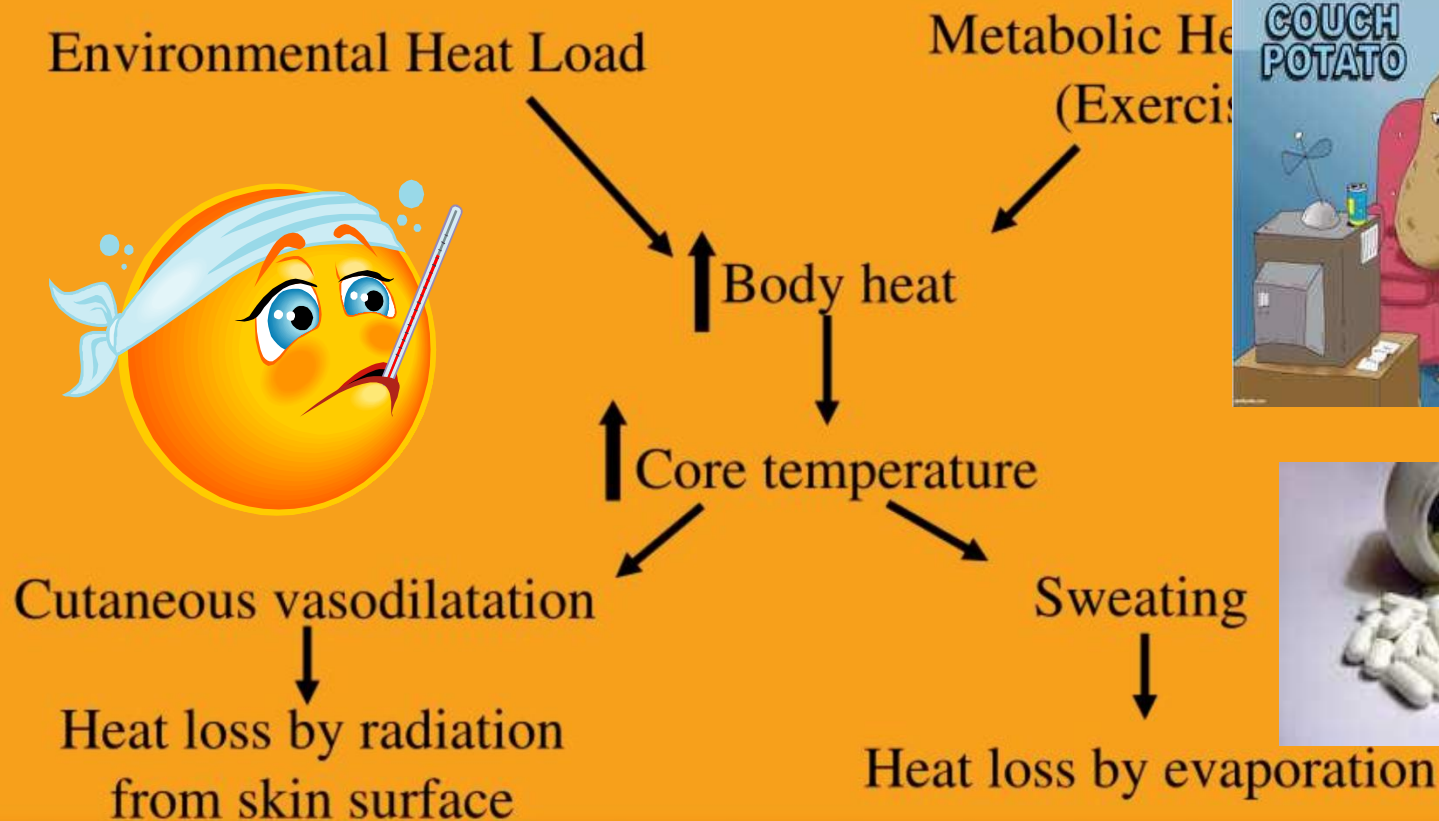
Prevention



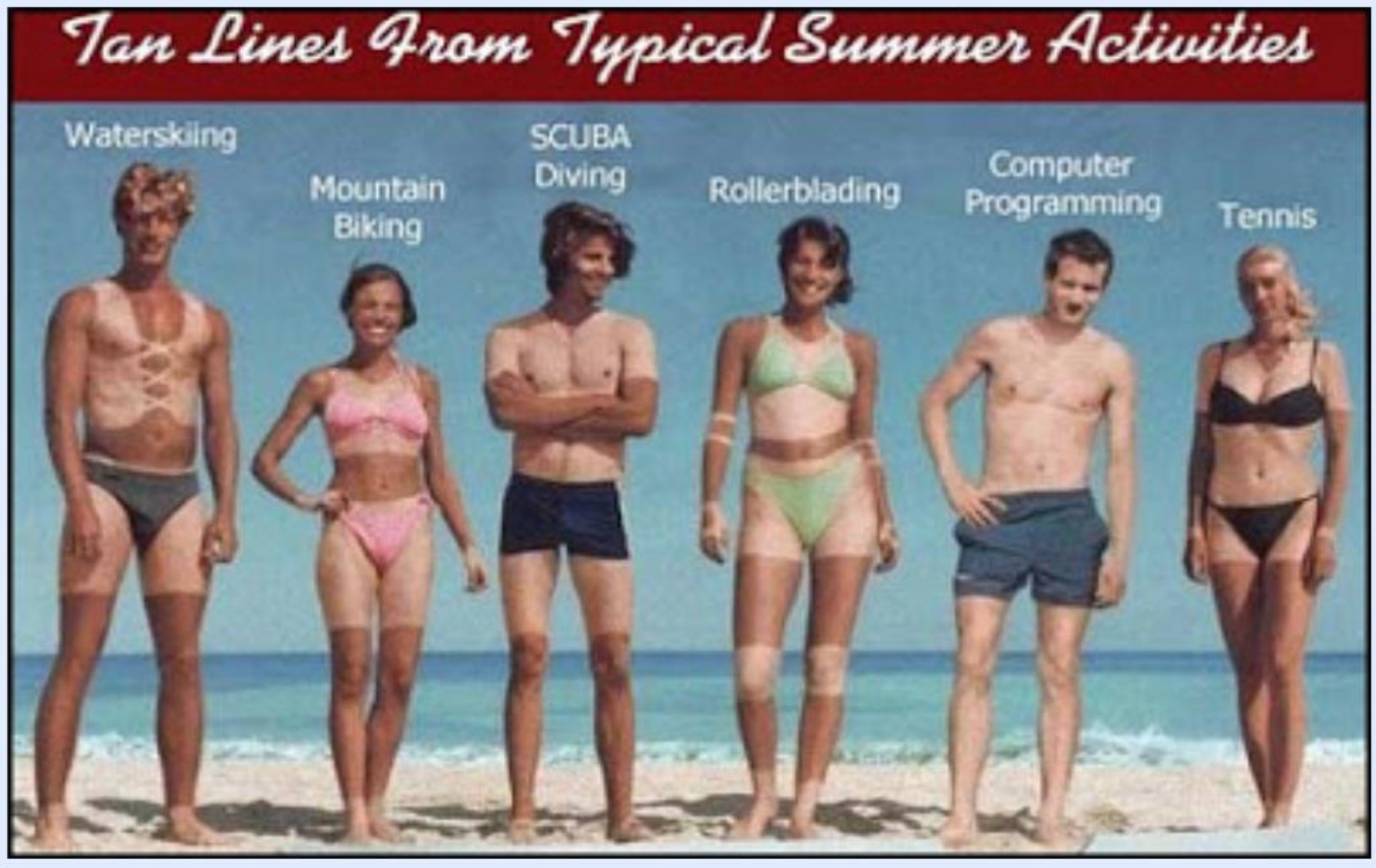
Prevention

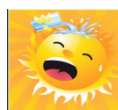


Thermoregulation with Heat Stress



Skin care





Prevention



Summary

HEAT EXHAUSTION

- Rest in shade
- Loosen uniform/ remove head gear
- Have drink 2 quarts of water over 1 hour
- Evacuate if no improvement in 30 min, or if condition worsens

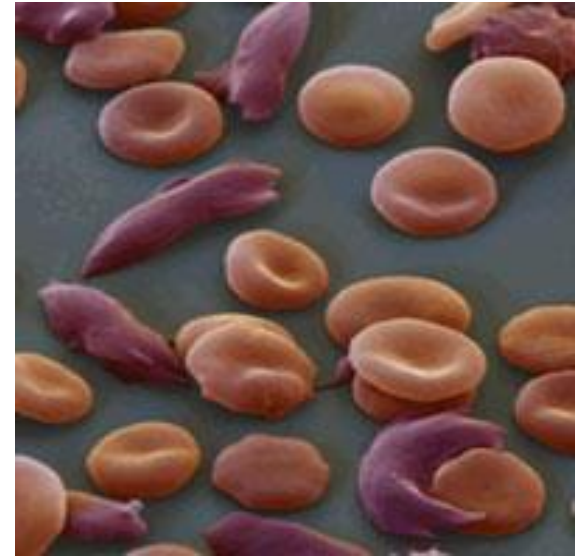
HEAT STROKE

- If PT's brain isn't working correctly then **COOL** and **CALL!!**
 - Strip
 - Rapid cool (ice sheets)
 - Call for evacuation
- Continue cooling during transport
- Maintain same person to observe for mental change

Sickle cell trait



- Exertional sickling
 - Fast Heart Rate
 - Collapse
 - High temperature
- Risks
 - Heat
 - Dehydration
 - Asthma
 - High intensity exercise
 - Altitude



Prevention



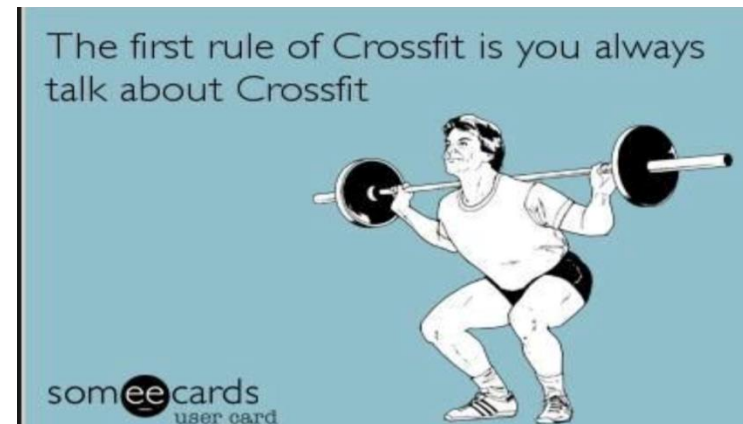
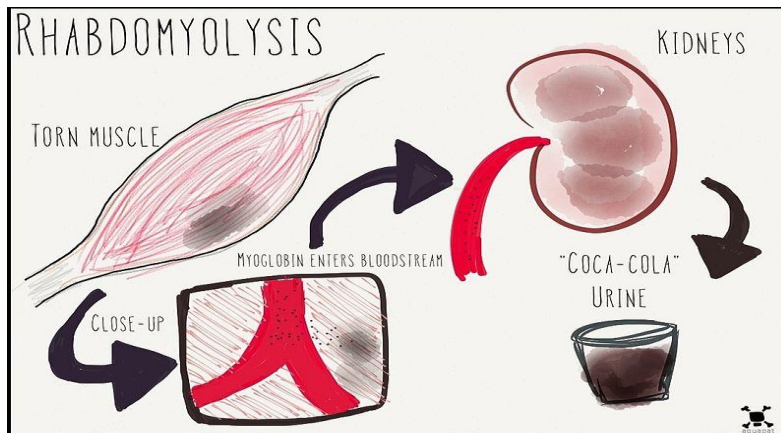
- Guidelines
 - Gradual build up
 - Intensity and duration
 - Year-round conditioning
 - Stop with symptoms
 - Monitor sickle trait athletes
 - Education of rhabdo
 - Control asthma



Exertional Rhabdomyolysis



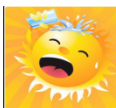
- Myoglobin → glomerular injury
- Sx: myalgias, red to brown urine due to myoglobinuria, and elevated serum muscle enzymes
- Tx: Early and aggressive fluid resuscitation



Return To Play



- No exercise permitted for at least seven days following release from medical care.
- Follow-up with the medical team approximately one week after release for physical examination and any necessary laboratory testing and diagnostic imaging based upon the organs affected during the EHS episode.
- Once cleared for a return to activity, the athlete begins exercise in a cool environment and gradually increases the duration, intensity, and heat exposure over two weeks to demonstrate heat tolerance and initiate acclimatization.
- Athletes who cannot resume vigorous activity over four weeks because of recurrent symptoms (eg, excessive fatigue) should be reevaluated. Laboratory exercise-heat tolerance testing may be useful in this setting.
- The athlete may resume full competition once he or she is able to participate in full training in the heat for two to four weeks without adverse effects.





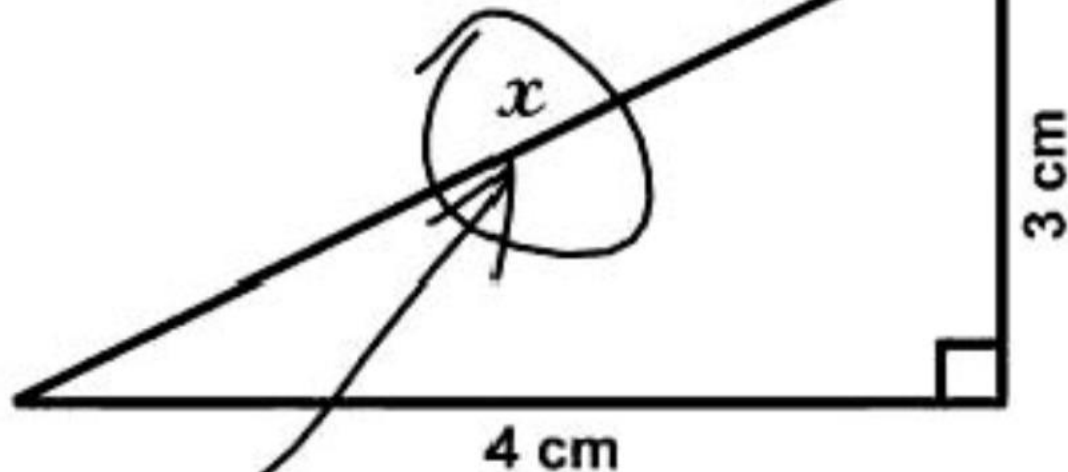
- “There should never, ever be a person die from exertional heatstroke because it’s 100 percent survivable,”
 - Dr. Doug Casa from KSI



Questions?



3. Find x .



Here it is



APPENDICES





Sample heat acclimatization program for American football^[1]

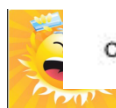
Modification	Practices 1-5		Practices 6-14
	Days 1-2	Days 3-5	
Number of practices permitted per day	1	1	2 (only every other day)
Equipment	Helmets only	Helmets & shoulder pads	Full equipment
Maximum duration of practice session	3 hours	3 hours	3 hours (maximum of 5 hours total on double session days)
Permitted walk through time (in addition to regular practice session)	1 hour (must be separated from regular practice by 3 hours)		1 hour (must be separated from regular practice by 3 hours)
Contact	No contact	Contact only with blocking sleds/dummies	Full contact drills

NOTE: Warm-up, stretching, cool-down, conditioning, and weight-room activities are all included as part of practice time.

References:

1. Preseason Heat-Acclimatization Guidelines for Secondary School Athletics. *Journal of Athletic Training* 2009; 44:332.

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Guidelines for cold water immersion treatment of exertional heat illness

Contact emergency medical services (EMS) immediately.
Assess airway, breathing, circulation, and mental status; measure vital signs before immersing the patient.
If appropriate medical staff is present on-site (eg, team physician), equipment for aggressive cooling is readily available (eg, cold water immersion, ice/wet towel rotation, high-flow cold water dousing), and no other emergency medical treatment is needed other than rapid lowering of the body temperature, follow the "cool-first, transport second" guideline.
For patients to be treated with ice water immersion, prepare as follows:
Get help.
Move patient to a shaded area.
Half fill a tub or wading pool with water and ice. Ice should cover the surface of the water at all times.
A whirlpool tub filled with ice water may be used if the athlete collapses near an athletic training room.
During ice water immersion treatment, assess the patient's core body temperature with a rectal thermistor continuously (a thermistor is a flexible thermometer that remains in place throughout the cooling and treatment process).
Obtain necessary assistance and cool the patient as follows:
Place the athlete in the ice water immersion tub.
Cover as much of the body as possible with ice water. If complete coverage is not possible, cover the torso as much as possible.
Keep the athlete's head and neck above water. An assistant or two can do so by holding the victim under the axillae with a towel or sheet wrapped across the chest and under the arms.
Place a towel soaked in ice water over the head and neck while the body is being cooled.
Keep water temperature under 15°C (60°F).
Vigorously circulate water throughout the cooling process.
Monitor vital signs approximately every 10 minutes and mental status continually during cooling.
Have several additional assistants immediately nearby in case the athlete becomes combative or must be lifted or rolled because of vomiting.
Continue cooling until the patient's rectal temperature reaches 39°C (102°F). If the rectal temperature cannot be measured and on-site ice water immersion is indicated, cool for 10 to 15 minutes and then transport to the emergency department. Cooling via ice water immersion occurs at a rate of approximately 1° C for every five minutes (or 1°F every three minutes), if the water is aggressively stirred.
Remove the patient from the immersion tub and transfer to the nearest emergency department or hospital after the rectal temperature reaches 39°C (102°F).
If ice water immersion is not feasible given the constraints of the environment, and on-site cooling is appropriate, then cool the patient using the best available means. These may include any of the following three methods:
Fill a cooler with ice, water, and 12 towels. Place six icy wet towels all over the patient's body. Leave them in place for two to three minutes, then place those back in cooler and replace them with the six others. Continue this rotation every two to three minutes.
Douse the patient continuously with cold water using a shower or hose.
If ice is available but no tub, place the patient in a tarp or sheet, cover the patient with a large amount of ice, and then wrap the tarp or sheet around them. Replenish the ice as soon as a moderate degree of melting occurs.

Adapted from: The Korey Stringer Institute (ksi.uconn.edu) and Casa DJ, McDermott BM, Lee EC, et al. Cold-water immersion: The gold standard for exertional heat stroke treatment. *Exerc Sport Sci Rev* 2007; 35:141.

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Guidelines for optimizing heat acclimatization

Acclimatization should be performed gradually over 10-14 consecutive days	
Environment	Reflects the environment that will be encountered during goal activity
	Warm or hot (WBGT >26°C)
	Relative humidity reflects the humidity that will be encountered
	If necessary environmental conditions not present, add clothing or exercise during hottest/most humid part of the day
Exercise session	Duration: >60 minutes
	Type: aerobic
	Intensity: moderate intensity (should progress from 60-80 percent age-predicted maximum heart rate)
	Frequency: one session per day (may progress to two sessions per day alternating with a single session day)
Hydration	Urine specific gravity: <1.020
	Urine osmolality: <700
	Urine color: <3 (using 8 color scale)
Safety	Monitor temperature with rectal or gastrointestinal thermistor (<40°C)
	Monitor athlete for signs and symptoms of heat illness
	Monitor heart rate for increased intensity (>80 percent age-predicted maximum)
	Avoid interval training at race speeds (may be performed separately in a cooler environment)
	Calculate sweat rate: pre-exercise nude body mass (kg) - post-exercise nude body mass (kg) + fluid ingested (L) per exercise time (hour) = sweat rate (L/hour)
	Keep athlete well hydrated before and during exercise (<2 percent dehydrated)
	Training intensity should correspond with fitness level

References:

1. Daanen HAM, Jonkman AG, Layden JD, et al. Optimising the acquisition and retention of heat acclimation. *Int J Sports Med* 2011; 32:822-828.
2. Cheung SS. Heat Stress. *Advanced Environmental Exercise Physiology*. Champaign, IL: Human Kinetics; 2010.
3. Kuennen M, Gillum T, Dokladny K, et al. Thermotolerance and heat acclimation may share a common mechanism in humans. *Am J Physiol Regul Integr Comp Physiol* 2011; 301: R524-R533.
4. Armstrong LE, Maresh CM, Castellani ML, et al. Urinary indices of hydration status. *Int J Sport Nutr* 1992; 4:265.

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