



Prevention of Heat Related Illness

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AAP, Louisiana Chapter

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**Texas Children's
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Goals and objectives

- Brief review of NATA established guidelines (Position Statement) on heat related conditions
- Identify common S/S of athletes suffering from heat related illness
- Distinguish between cardiac related and heat related issues

What is a heat injury?

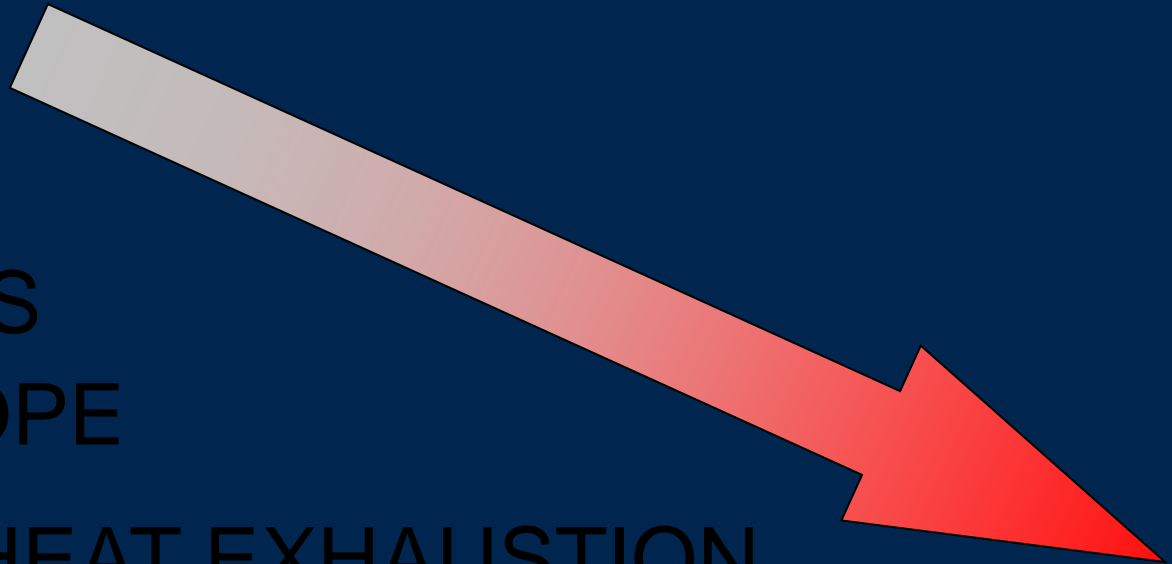
- A spectrum of injuries that are related to exposure to warm ambient conditions or the body's intrinsic production of heat.

HEAT EDEMA

HEAT CRAMPS

HEAT SYNCOPE

HEAT EXHAUSTION



HEAT  STROKE

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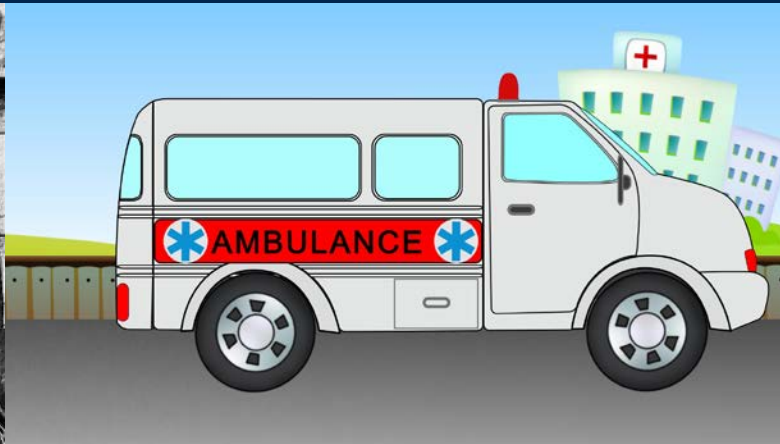
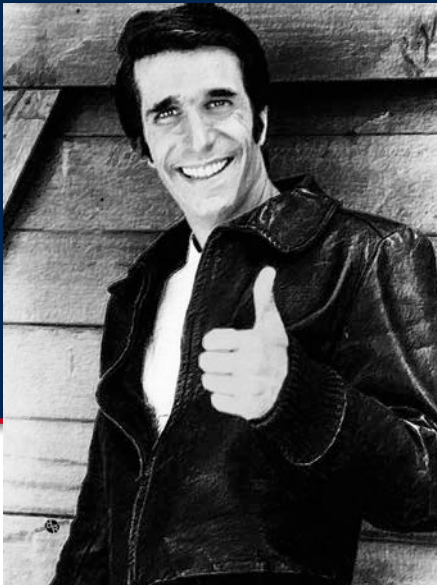
“ We now possess the knowledge to ~~nearl~~y assure survival from this potentially fatal injury if EHS is quickly and appropriately recognized and treated at the time of collapse.”

Biggest points

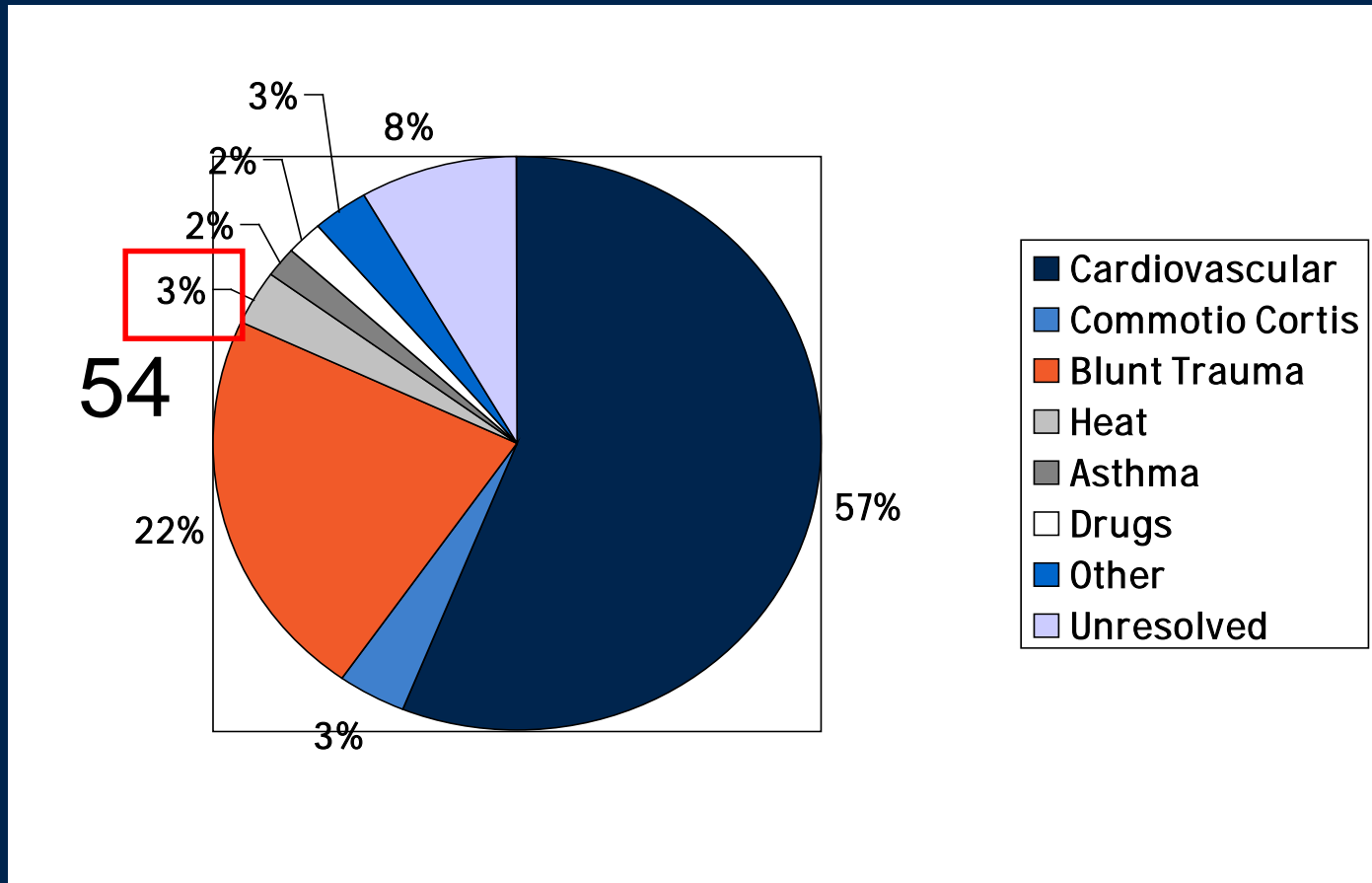
- BE PREPARED



- COOL FIRST, TRANSPORT SECOND



Sudden Death in the US, 1980-2006, 1866 young competitive athletes (18_±5, 89% male)



Maron BJ, et al. Circulation. 2009

Heat deaths rising

Heat-related fatalities that occurred during sports have more than doubled since 1975.

1975-79



1980-84



1985-89



1990-94



1995-99



2000-04



2005-09



Source: Korey Stringer Institute
By Veronica Salazar, USA TODAY

Football related deaths

- Most common during August
- >50%-during morning practices (high humidity levels)
- More than 70% of deaths came in its first two weeks.
 - 22 % occurred within the first three days of practice.
- The athletes were typically large
 - 79% with a body mass index >30
 - 86% played linemen positions.
- All deaths occurred under conditions defined as high or extreme by the American College of Sports Medicine using the wet bulb globe temperature (WBGT), but under lower threat levels using the heat index.

[Andrew J. Grundstein](#), et al. [International Journal of Biometeorology](#)
January 2012, Volume 56, [Issue 1](#), pp 11-20

Pediatrics



Basic Physiology Facts (that we may have forgotten)

- Our muscles are metabolically inefficient.
 - 70-80% of energy consumed in muscular contraction is lost in the form of heat.
- Our bodies are beautifully and wonderfully made... to get rid of heat.
 - We would die after 15 minutes of maximal exercise without thermoregulation
- Heat out has to match external and internal heat.

Optimize Thermoregulation

- Evaporation/ Radiation

- Avoid high humidity if possible (time of day)
- Avoid trapping evaporated sweat near the skin (cotton clothing)
- Maintain hydration to optimize sweat production and the body's ability to radiate heat from the skin.
- Gas permeable clothing will let sweat vapor leave your body. Sweat wicking will take the sweat off your skin.

- Convection

- Minimize barriers to wind, looser clothing or minimal clothing

Drinking water does not fix everything!

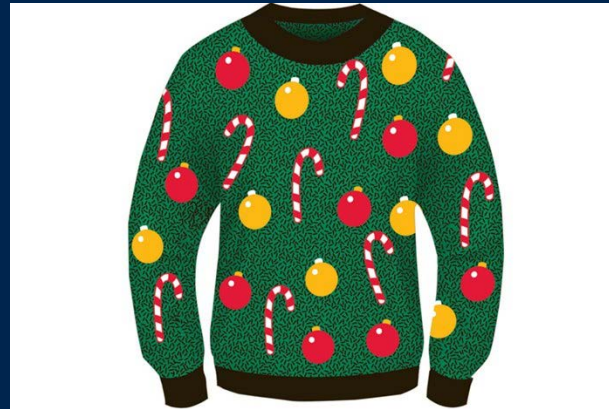
- There is only so much fluid that the body needs. Continuing to exercise and stress the system **CANNOT** be compensated for by over drinking.



Overdrinking can result in
SIADH induced hyponatremia.

Be prepared- Before the season

- Know your patients and be sure they have had a good physical.
 - Previous heat injury
 - Heavy sweaters
 - Sickle cell trait



Medications

- Decrease sweat

- Anticholinergics

- Antihistamines

- Dehydration

- Diuretics

- Ethanol

- Central dysregulation of sweat initiation and heat perception

- Antidepressants

- Lithium

- Neuroleptics ,
Phenothiazines

- Fatigue perception and heat generation

- Sympathomimetics (eg,
cocaine, amphetamines)

- Salicylates

Be prepared- Before the season

- Patient's Summer activities

- Acclimatization

- Fitness

- Those at risk

- Pre-post weight measurement

- First void specific gravity

- Education

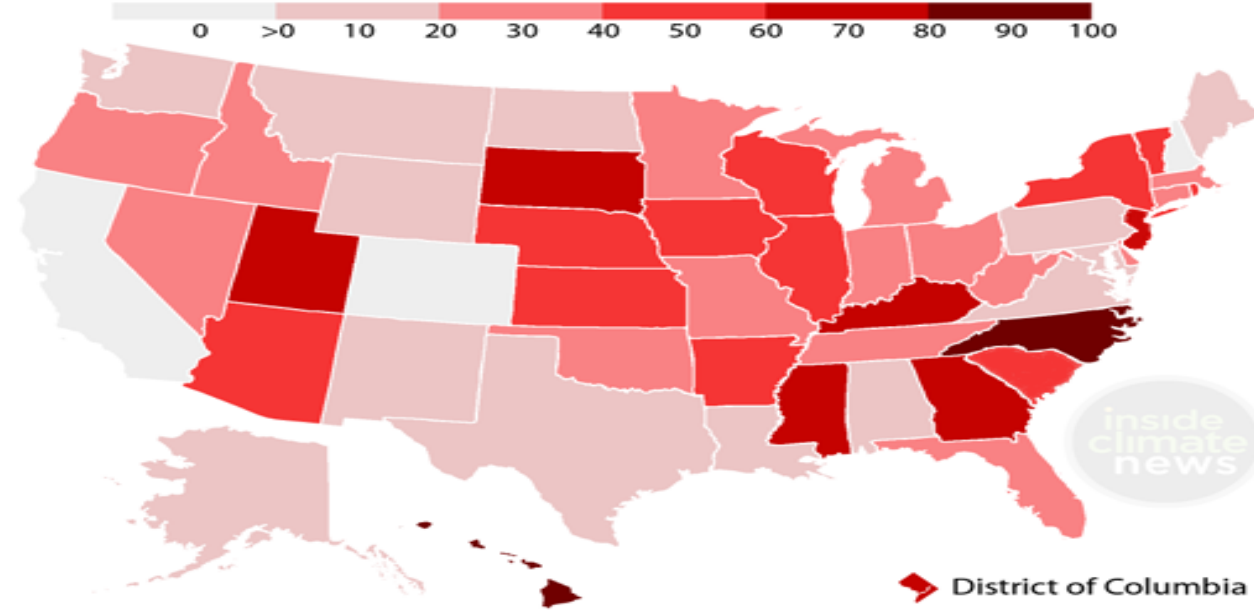
- Fever equals no play

- Hydration

Which States Take Heat Risk Seriously for High School Sports?

The Korey Stringer Institute ranks states on high school football safety, including heat risks. The following scores are based on 19 heat safety measures, including requiring cooling tubs, heat stress monitors, air-conditioned practice breaks and policies for easing players into summer workouts and for responding if they show signs of heat stress. No state received the top score of 100 percent.

HIGH SCHOOL HEAT SAFETY SCORE AS PERCENTAGE



STATE	SCORE	STATE	SCORE	STATE	SCORE
North Carolina	93.8	New York	43.8	Oklahoma	22.5
Hawaii	85.6	Illinois	41.9	Alabama	20.0
New Jersey	78.1	South Carolina	41.9	Virginia	20.0
Utah	75.0	Florida	36.3	Montana	16.3
Georgia	71.9	Oregon	35.6	Wyoming	15.0
Kentucky	70.6	Tennessee	35.6	Maryland	13.1
Mississippi	66.3	Connecticut	35.0	Maine	12.5
D.C.	63.8	Massachusetts	35.0	Alaska	10.0
South Dakota	61.9	Missouri	35.0	Louisiana	10.0
Nebraska	58.8	Minnesota	33.8	North Dakota	10.0
Arkansas	58.1	Delaware	30.6	Pennsylvania	10.0
Kansas	53.8	Michigan	30.6	Texas	10.0
Vermont	51.9	West Virginia	30.6	washington	10.0
Rhode Island	50.6	Indiana	30.0	New Mexico	9.4
Wisconsin	50.6	Nevada	30.0	California	0.0
Arizona	45.0	Ohio	25.6	Colorado	0.0
Iowa	45.0	Idaho	25.0	New Hampshire	0.0

SOURCE: Korey Stringer Institute

PAUL HORN / InsideClimate News

Be prepared-Before practice

- Schools/District

- Emergency Action Plan (EAP)
- Practice EAP

- Equipment

- Rectal thermometer
- Cooling equipment

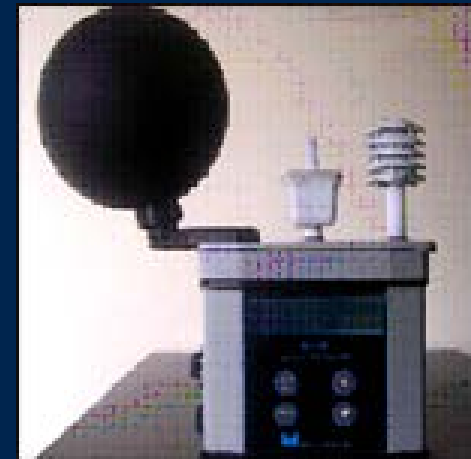
- Heat Stress Measurement



Risk Factors for Heat Injury

- Wet Bulb Globe Temperature

- 10% Dry Bulb (Ambient temp)
- 20 Black Globe (Radiant)
- 70% Wet bulb (Humidity)



- Heat Index

- Based on light breeze and partial cloud cover

		Relative Humidity (%)													
		40	45	50	55	60	65	70	75	80	85	90	95	100	
Air Temperature	110	136													<p>Heat Index (Apparent Temperature)</p> <p>With Prolonged Exposure and/or Physical Activity</p> <p>Extreme Danger Heat stroke or sunstroke highly likely</p> <p>Danger Sunstroke, muscle cramps, and/or heat exhaustion likely</p> <p>Extreme Caution Sunstroke, muscle cramps, and/or heat exhaustion possible</p> <p>Caution Fatigue possible</p>
	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	103	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		

Mild Heat Injury

- Heat edema, cramps, syncope
- Usually self limited (<1 hour)
- Get better with minimal intervention
 - Stop exercise
 - Drink cool fluid
 - Get in a cool shaded environment
 - Ice
 - Position in trendelenburg



Moderate Heat Injury- Heat exhaustion

- Must monitor closely because this may progress to heat stroke
- Symptoms include:
 - Heavy sweating
 - Feel lousy (pale, tired, weak, dizzy)
 - Nausea or vomiting
 - Muscle cramps
 - Headache
- Low BP, High HR, elevated temp
- **NO ALTERED MENTAL STATUS**

Differential Diagnosis

- Head Injury
- Street Drugs
- Cardiac Issue
- Seizure Disorder
- Hyponatremia
- Sickle crisis
- Febrile Illness
- Diabetic Ketoacidosis

NOT SO
FAST



Severe Heat Injury- Heat stroke

- MEDICAL EMERGENCY

 - 20% mortality

- May present with any of the heat exhaustion S/S and VS changes

- ALTERED MENTAL STATUS IS PRESENT



Cool first Transport second

- Cool ASAP to about 39C
 - Cool, shaded, environmentally control area
 - External Cooling Maneuvers
 - Ice Immersion (will drop about 1 degree F/3 min)
 - Ice bags in groin, axilla, head
 - Cold towels
 - Water mist and fans
- Get IV access



What don't you do?

- NSAIDs or antipyretics
- Cool them to the point of shivering
- Measure an oral temperature
- Think that they are sweating therefore they do not have heat stroke

WET BULB GLOBE TEMP		EHS RISK	ACTIVITY MODIFICATION	
°F	°C		High RF	Low RF
< 65	<18.3	SAFE	NONE	NONE
65.1-72	18.4-22.2	SAFE	Increase rest: work, ✓ fluids	NONE
72.1-78	22.3-25.6	MILD Watch RF	+ decrease total duration	✓ fluids
78.1-82	25.7-27.8	MODERATE High for RF	+ decrease intensity	✓ fluids
82.1-86	27.9-30	CANCEL	R:W= 1:1 No high intensity	Caution for high intensity or long duration
86.1-90	30.1-32.2		Cancel practice/game	Limit intensity and duration
>90.1	>32.3		Cancel exercise	Cancel

Prevention

- Activity modifications based on

- WBGT
- Fitness/Time of the season
- Acclimatization status
- Playing surface

**2019 Women's World Cup quarterfinals:
Scorching heat to maintain firm grip on
France**

Such temperatures may trigger required water breaks which are allowed by FIFA rules any time after 30 minutes into a game played in extreme heat.

- Shorten games or practice
 - Reschedule
 - Cooler part of the day (morning)/Indoors
 - Decrease intensity of practice
 - Proper Rest intervals during practice
- The threshold for extreme heat has been set at 32 C (89.6 F) on the WBGT

Prevention

- Proper fluid availability
 - Restriction of fluid should not be a punishment
 - Should try to drink equal to sweat rate
 - Need to know your sweat rate
 - Electrolyte drink for exercise > 1 hour
 - More likely to drink if cold and sweet

- Monitoring for early identification
 - Daily weights

- Progressive practice

Details emerge in heat-stroke death of Kentucky high school FB player

- Weather at 3:45PM with heat index of 97 degrees.
- Given three water breaks in a 30-minute period
- "Gassers" (12) started at 5:30 PM
- 6-foot-2, 220-pound offensive lineman
- Collapsed on the turf just 15 minutes after a teammate went down.
- His body temperature was 107 degrees when he reached the hospital
- Five months later, his first-year head coach is facing a reckless homicide charge.

Three days later, the 15-year-old was dead from heat stroke.



Associated Press, January 23, 2009



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Football Practice in 98 Degree Heat



Too much heat can lead to a dangerous situation for a football player. One of the keys is awareness and the players & coaches understood how hot it was Wednesday at North Brunswick. The heat index was 105. The temperature reached 98. The Scorpions go through an average of 65 gallons of water during each practice, on a hot day.

Head Coach chooses to practice in the late afternoon - early evening time period instead of the morning, like some teams do. "The key is to keep fluids in them. We think practicing in the evening is not a problem. We've never had a problem in 15 years and we want to keep it that way."

Take Home Message

- Heat Injury is completely preventable.
- Heat stroke is a medical emergency.
- Exercise intensity/duration and weather are modifiable.
- WBGT is the most accurate for heat stress
- Minimize risk factors and monitor for early signs.
- Proper hydration is important but not a cure.
- Cool them down fast if identified.

Resources

- NATA Position Statement: Exertional Heat Illness
- American College of Sports Medicine
 - Exertional Heat Illness during Training and Competition
 - Exercise and Fluid Replacement
- American Academy of Pediatrics
 - Climatic Heat stress and the Exercising Child and Adolescent
- Exertional Heat Illnesses, Lawrence Armstrong.