

# Temperature Rising

On Heat-Related Illness

**Janelle Bludorn PA-C**

Duke University



# Objectives



Describe trends in heat-related illness, including effects on vulnerable populations.



Compare features of systemic heat-related conditions and select a treatment plan for each.



Differentiate the clinical presentations and management of heat-related dermatologic conditions.

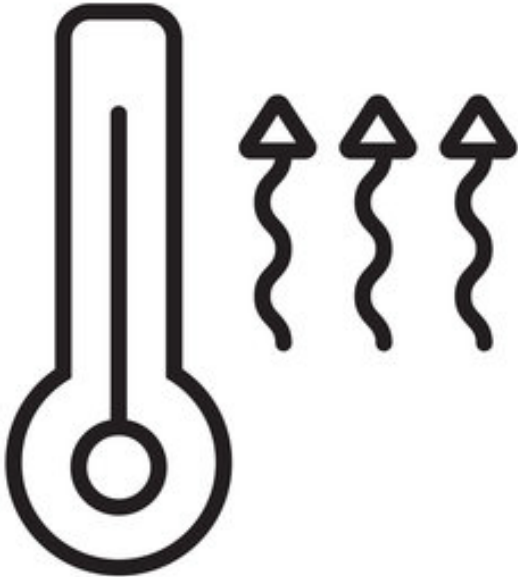


Provide effective patient education on heat-related illness, including prevention and when to seek medical care.

# The Problem

Pathophysiology | Epidemiology

# Thermoregulation



Temperature maintenance



Hypothalamus



Evaporative cooling

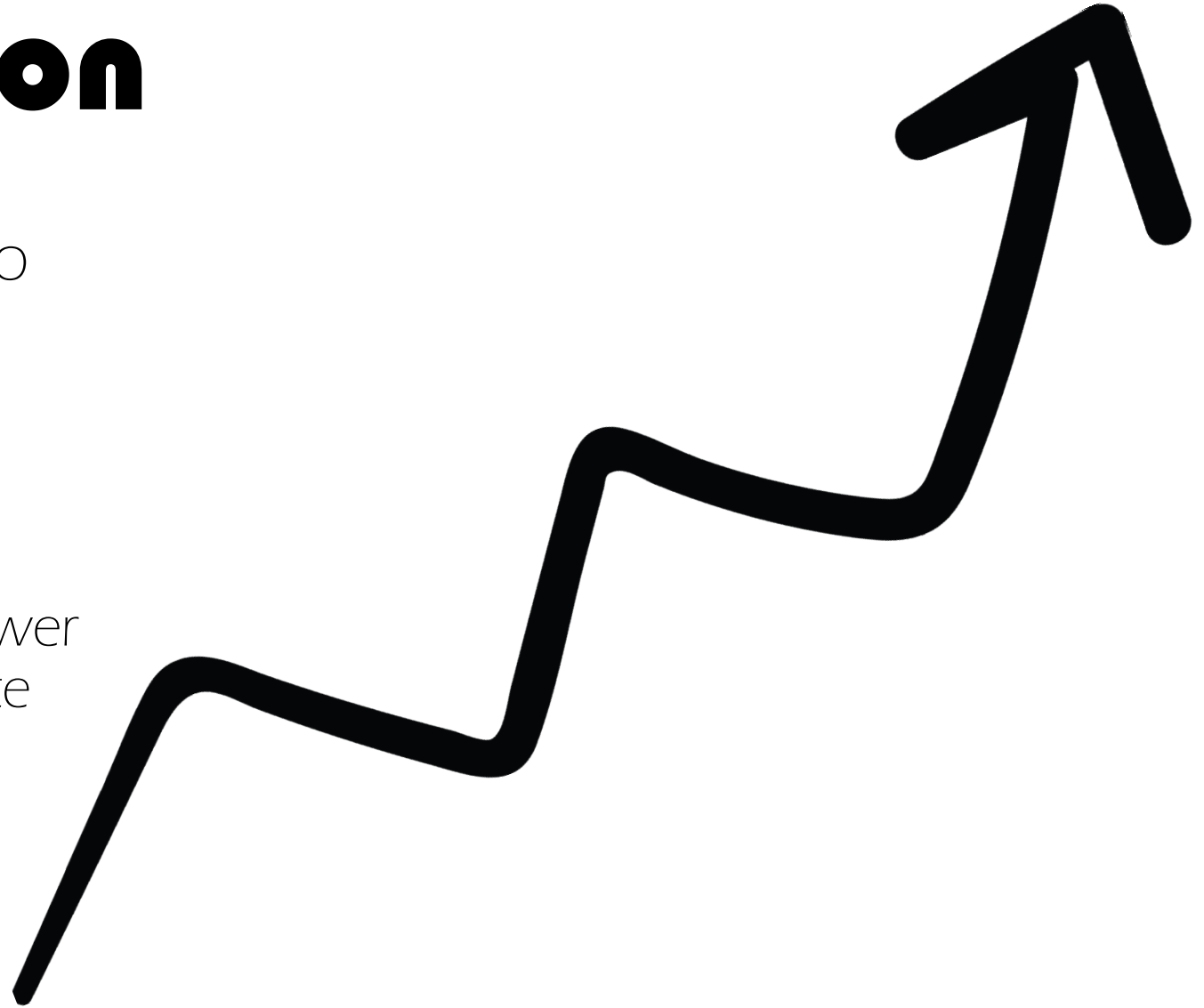


Physiologic changes

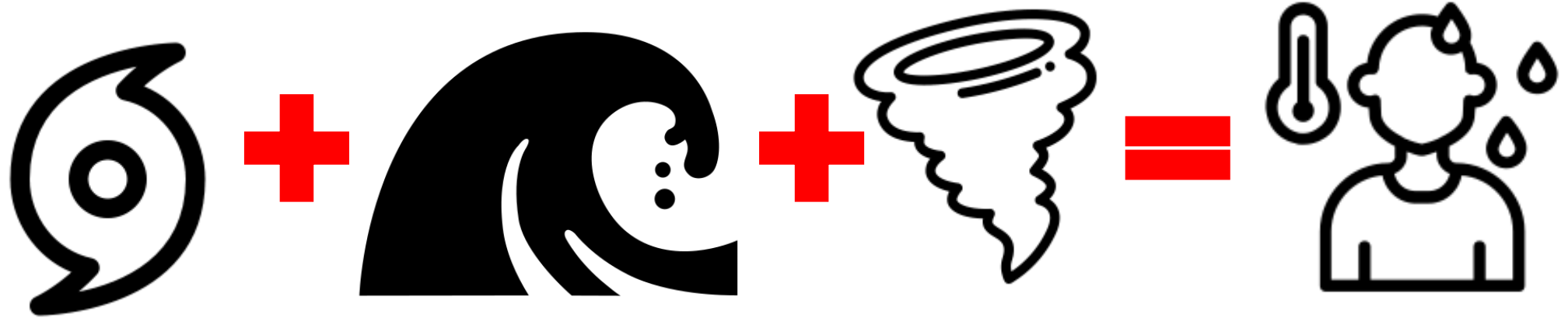
# Acclimatization

Physiological adaptations due to repeated exposure to a hot environment, including:

- Increased sweating efficiency
- Circulatory stabilization
- Ability to perform work with lower core temperature and heart rate
- Increased skin blood flow at a given core temperature

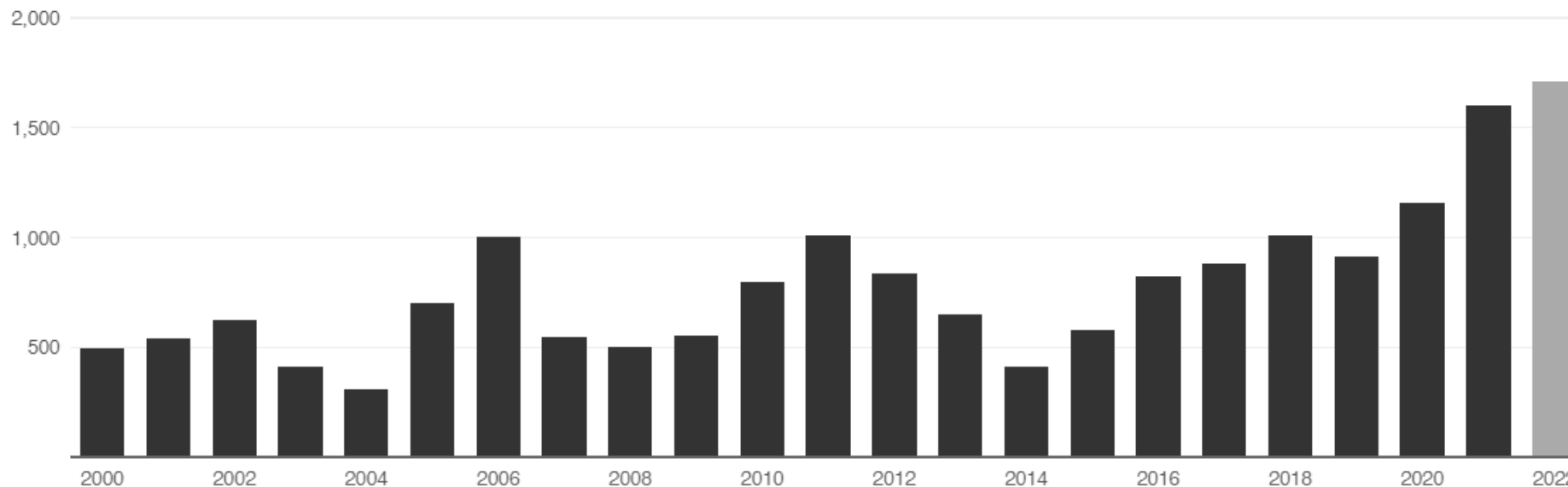


**Extreme heat bears the highest mortality of any natural disaster**



# Extreme heat bears the highest mortality of any natural disaster

Heat-related deaths in the U.S. have increased in recent years



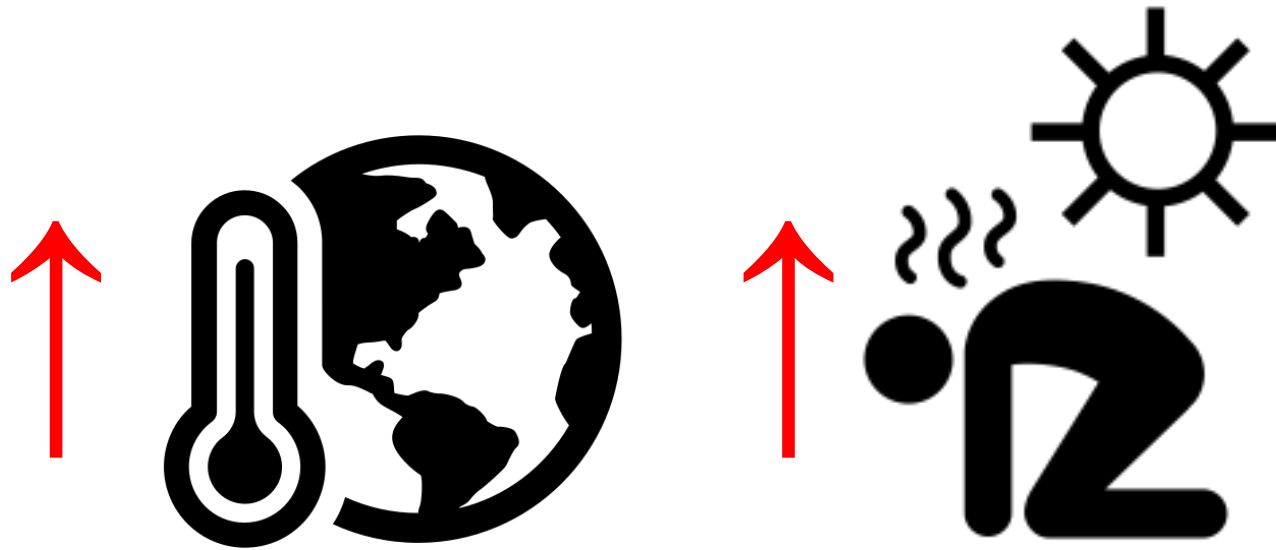
## Notes

2022 data is provisional.

Source: National Center for Health Statistics

Credit: Alyson Hurt/NPR

**Severity of environmental conditions correlate with incidence of heat illness**





# Populations disproportionately affected include:



Elderly



Infants & children



Lower SES



Pregnant



Outdoor workers

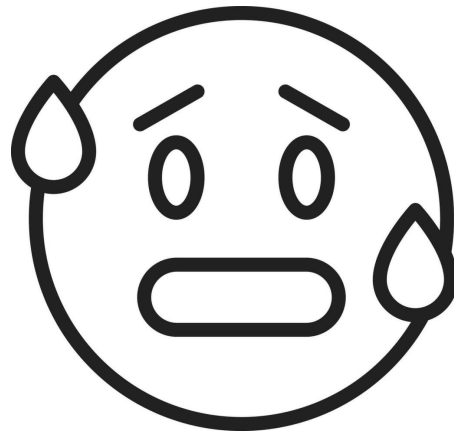
# **Systemic Heat- Related Conditions**

# Heat Stroke

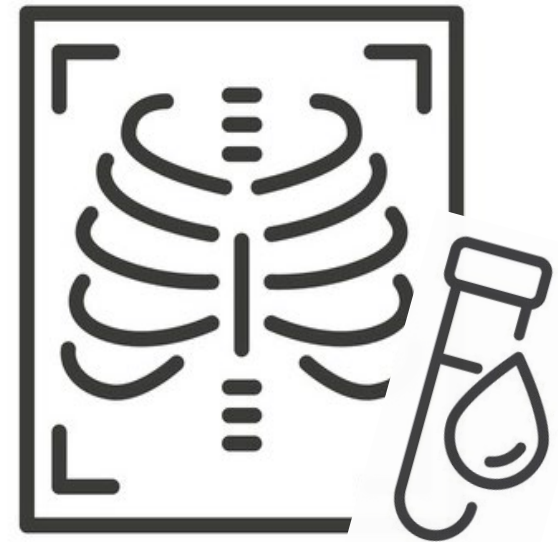
↑ core body temperature + central nervous system dysfunction in the setting of environmental heat



weak,  
dizzy,  
nausea  
lethargy

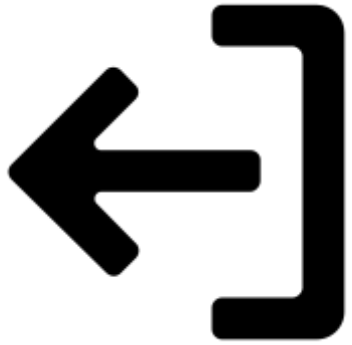


abnormal  
vitals,  
neurological  
findings

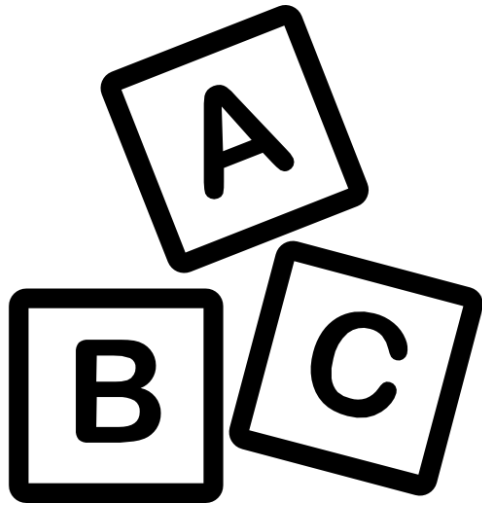


assess for  
concurrent &  
complicating  
conditions

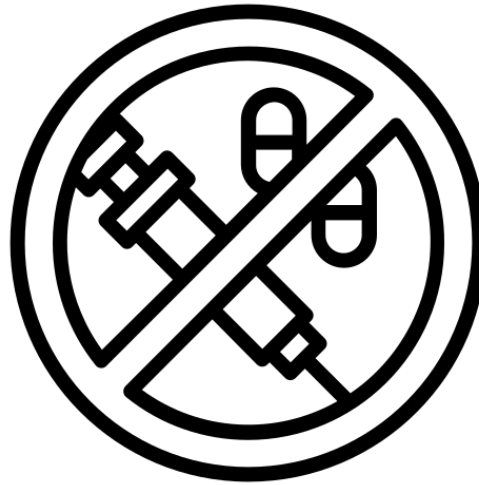
# Heat Stroke: Management



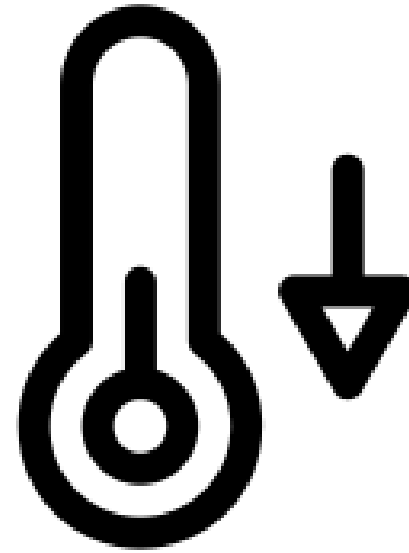
remove  
from heat



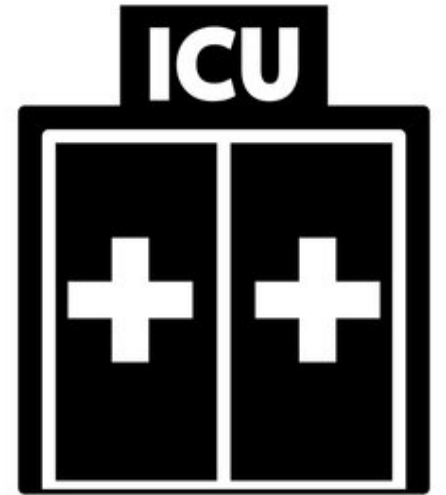
resuscitation



no antipyretics or alpha-  
adrenergic agonists



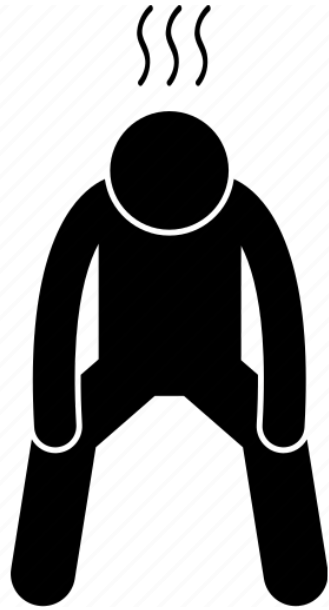
rapid cooling



admission

# Heat Exhaustion

On the spectrum of heat stroke, less severe. No altered mental status.



fatigue, weak, nausea,  
headache, dizzy

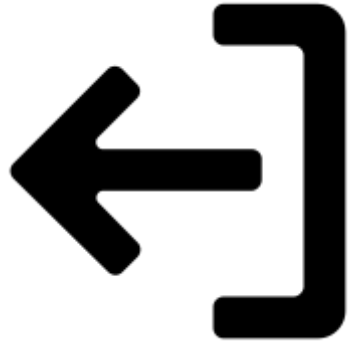


temp  
elevation

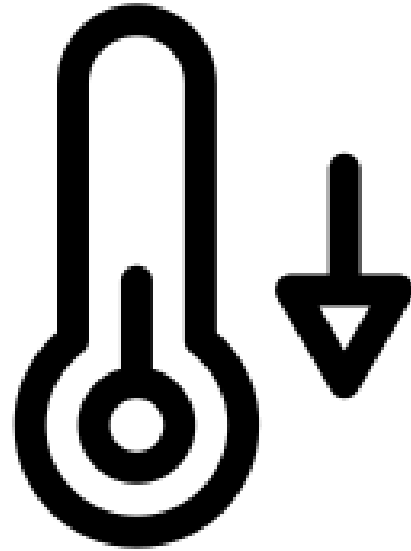


clinical  
diagnosis

# Heat Exhaustion: Management



remove  
from heat



evaporative cooling



rehydration



monitor for change  
in clinical status



# Heat Cramps

Painful muscle spasms usually affecting the abdomen, arms, or legs during or after activity in the heat

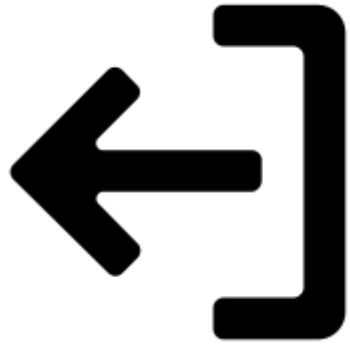


salt loss from  
sweating



clinical  
diagnosis

# Heat Cramps: Management



remove  
from heat



rest



replete fluids and  
electrolytes

# Hot Takes



Pharmacologic therapy is not required in **heat stroke**; some medications including antipyretics and alpha adrenergic agonists can worsen clinical status.



**Heat exhaustion** does **not** present with altered mental status.



Factors that may contribute to **heat cramps** include dehydration, loss of sodium and/or potassium, and extreme environmental conditions.

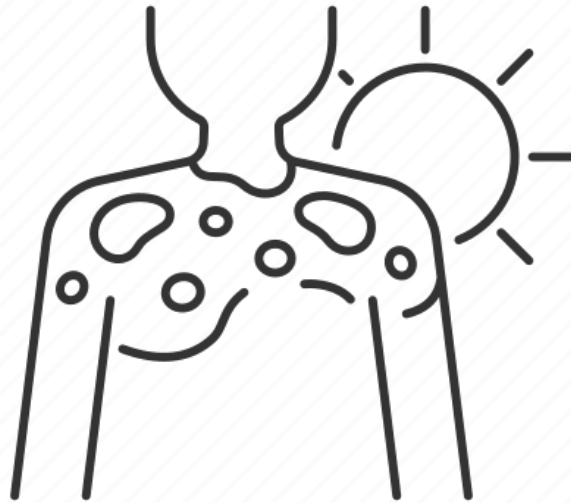
# **Dermatologic Heat- Related Conditions**

# Sunburn

Dermatologic inflammatory response to UV radiation from sun or artificial sources



onset 3-5 hours,  
peak 12-24 hours,  
subsides 72 hours



erythema, pain,  
vesicles, blisters



clinical  
diagnosis

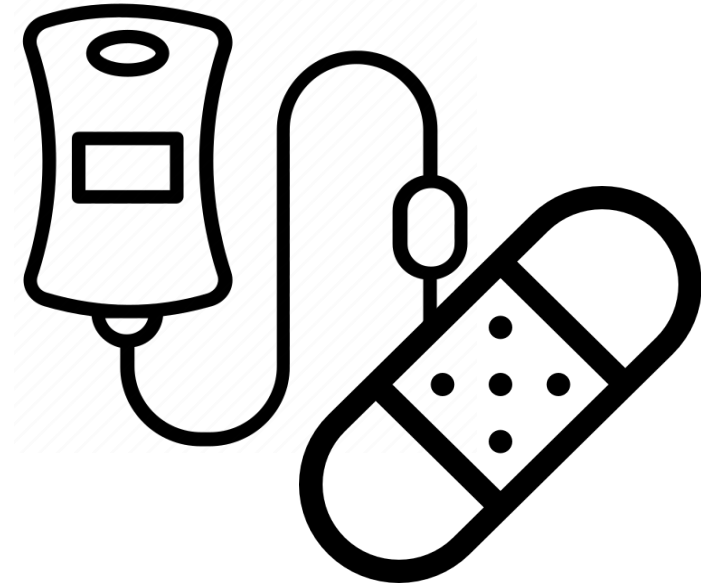
# Sunburn: Management



self-limiting



mild: cool compress/soaks,  
+/- topicals to soothe, nsaid



severe: +/- IV fluids/analgesia  
and wound care

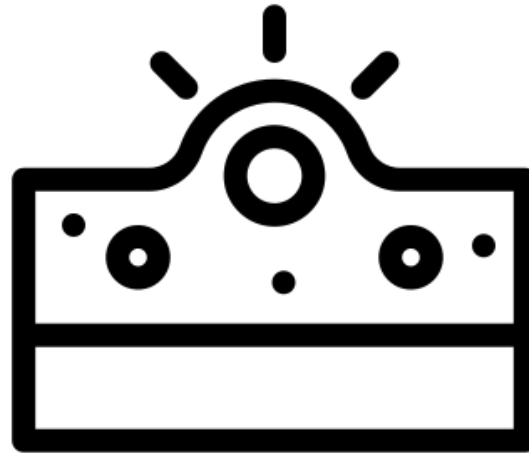


# Heat Rash

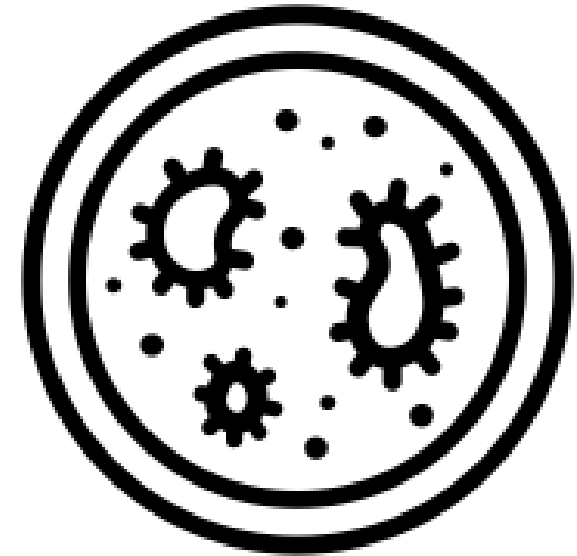
Inflammatory disorder of the epidermis from blockage of sweat eccrine sweat ducts, also called miliaria, sweat rash, or “prickly heat”



hot, humid, or tropical environments



papules not associated with hair follicle

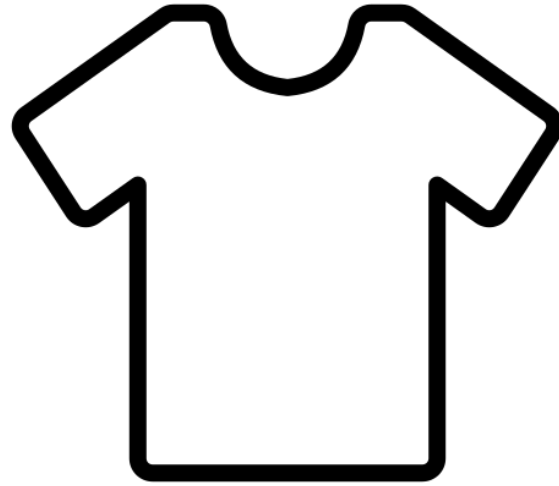


secondary bacterial infection possible

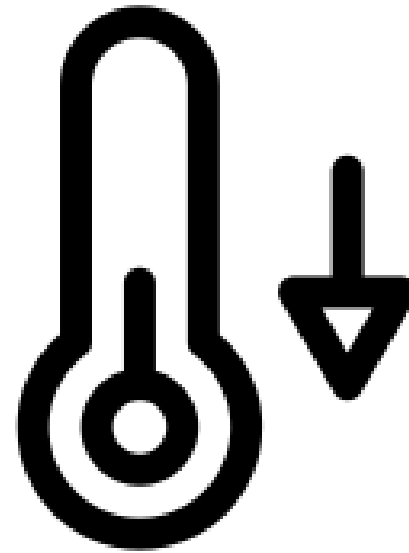
# Heat Rash: Management



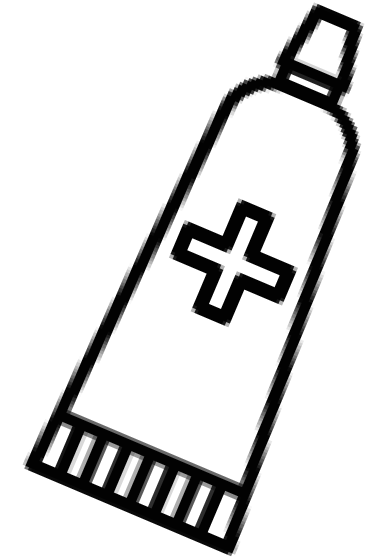
remove  
from heat



clothing: remove or wear  
breathable materials



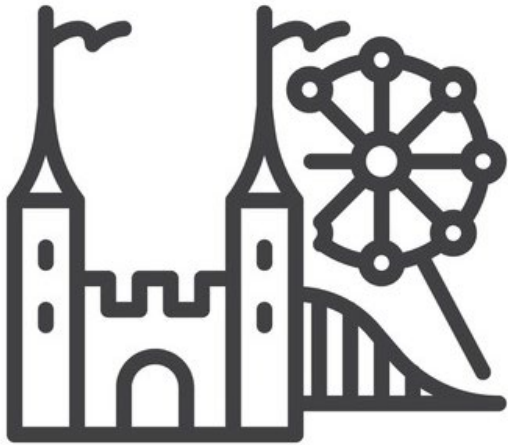
evaporative cooling



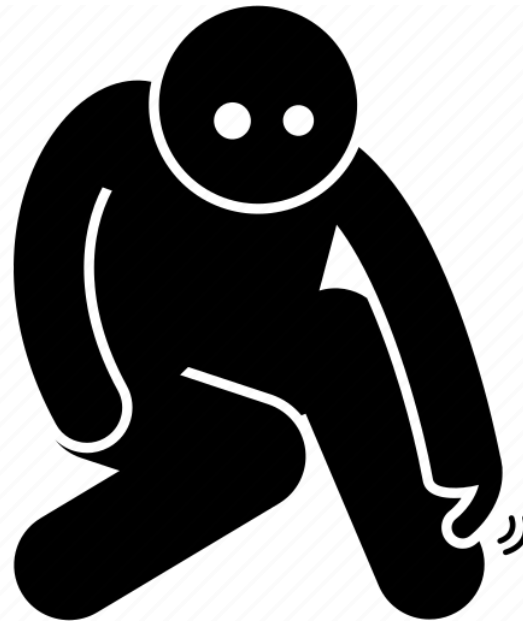
+/- topical steroids &  
antibacterials; no emollients

# Exercise Induced Vasculitis

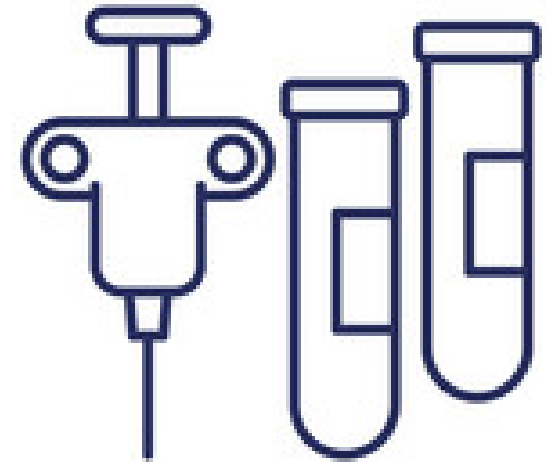
Small-vessel vasculitis on the lower legs from physical activity during hot and humid weather



hot environment  
theme parks



Itch, pain, urticaria or  
petechiae



clinical diagnosis, rule out  
coagulopathy &  
autoimmune, +/-biopsy

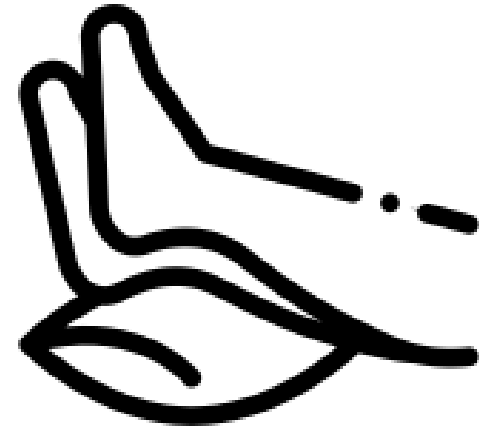
# Exercise Induced Vasculitis: Management



self-limiting



nsaid, topical steroids



leg elevation

# Hot Takes



Cool compresses are the best initial management for **sunburn**.



**Heat rash**, sometimes called “prickly heat” is a pruritic, non-follicular rash caused by blocked eccrine sweat ducts.



Physical activity in hot, humid weather can cause **exercise-induced vasculitis**.

# Talking to Patients

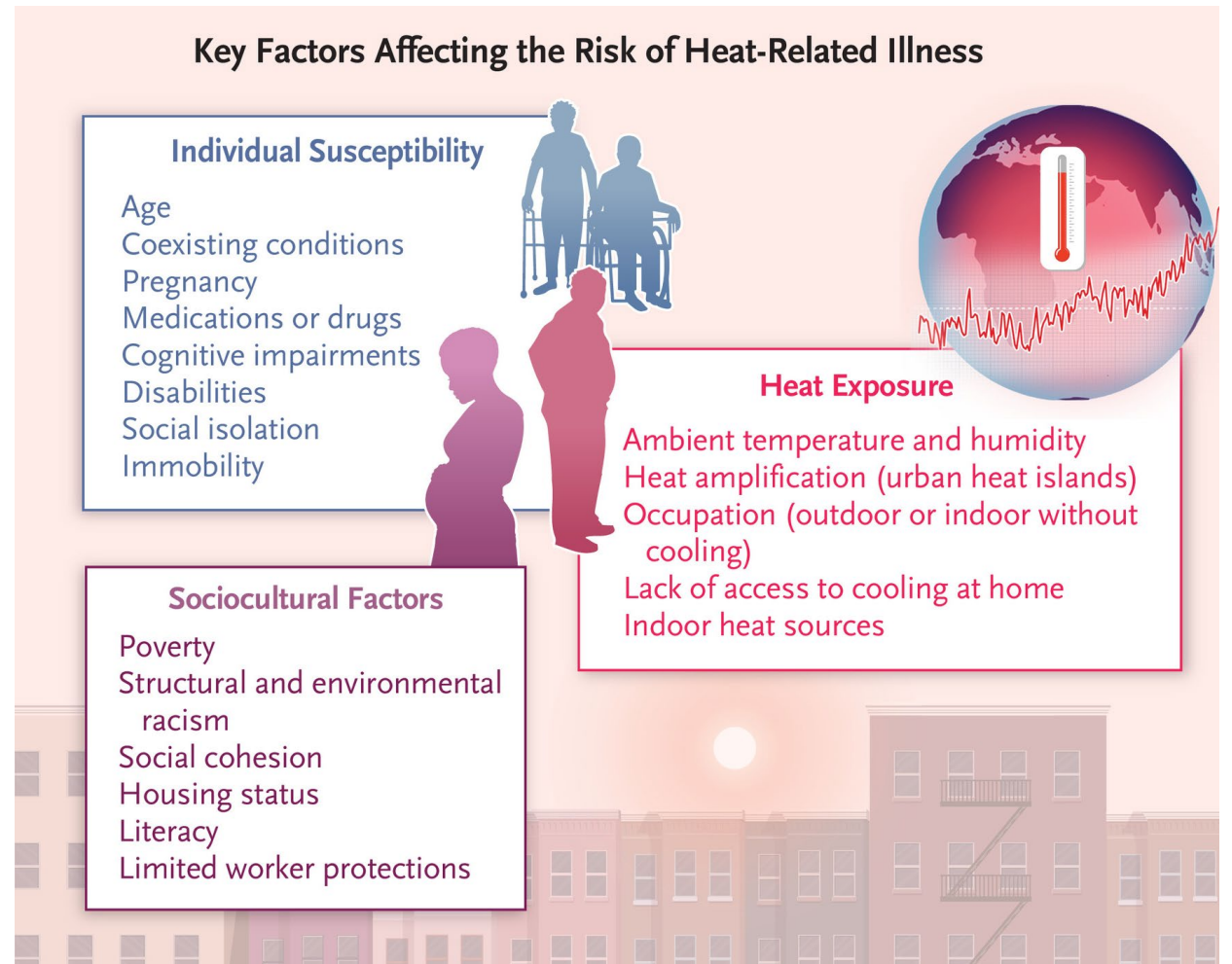
Risk | Prevention | When to Seek Care



# Extreme Heat (& Your Patients' Risk)

Screen all patients for risk of heat-related illness & identify heat-vulnerable patients

Let them and/or caregivers know of their at-risk status before the warm season begins



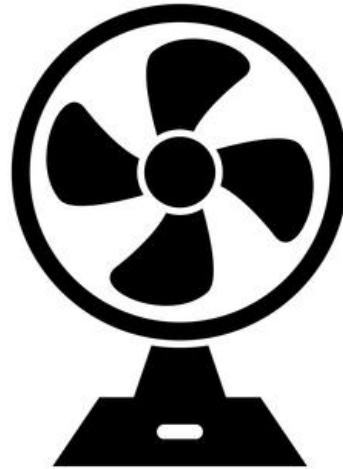
# Prevention Measures



Know signs  
& symptoms



When to  
seek care



Access to  
cooling



Power  
outage plans




Social work  
consultation

# When to Seek Care

**HEAT-RELATED ILLNESSES**

WHAT TO LOOK FOR	WHAT TO DO
<b>HEAT STROKE</b>	
<ul style="list-style-type: none"> <li>High body temperature (103°F or higher)</li> <li>Hot, red, dry, or clammy skin</li> <li>Fast, strong pulse</li> <li>Headache</li> <li>Dizziness</li> <li>Nausea</li> <li>Confusion</li> <li>Losing consciousness (passing out)</li> </ul>	<ul style="list-style-type: none"> <li>Call 911 right away—heat stroke is a medical emergency</li> <li>Move the person to a cooler place</li> <li>Help lower the person's temperature with cool cloths or a cool bath</li> <li>Do not give the person anything to drink</li> </ul>
<b>HEAT EXHAUSTION</b>	
<ul style="list-style-type: none"> <li>Heavy sweating</li> <li>Cold, pale, and clammy skin</li> <li>Fast, weak pulse</li> <li>Nausea or vomiting</li> <li>Muscle cramps</li> <li>Tiredness or weakness</li> <li>Dizziness</li> <li>Headache</li> <li>Fainting (passing out)</li> </ul>	<ul style="list-style-type: none"> <li>Move to a cool place</li> <li>Loosen your clothes</li> <li>Put cool, wet cloths on your body or take a cool bath</li> <li>Sip water</li> </ul> <p><b>Get medical help right away if:</b></p> <ul style="list-style-type: none"> <li>You are throwing up</li> <li>Your symptoms get worse</li> <li>Your symptoms last longer than 1 hour</li> </ul>
<b>HEAT CRAMPS</b>	
<ul style="list-style-type: none"> <li>Heavy sweating during intense exercise</li> <li>Muscle pain or spasms</li> </ul>	<ul style="list-style-type: none"> <li>Stop physical activity and move to a cool place</li> <li>Drink water or a sports drink</li> <li>Wait for cramps to go away before you do any more physical activity</li> </ul> <p><b>Get medical help right away if:</b></p> <ul style="list-style-type: none"> <li>Cramps last longer than 1 hour</li> <li>You're on a low-sodium diet</li> <li>You have heart problems</li> </ul>
<b>SUNBURN</b>	
<ul style="list-style-type: none"> <li>Painful, red, and warm skin</li> <li>Blisters on the skin</li> </ul>	<ul style="list-style-type: none"> <li>Stay out of the sun until your sunburn heals</li> <li>Put cool cloths on sunburned areas or take a cool bath</li> <li>Put moisturizing lotion on sunburned areas</li> <li>Do not break blisters</li> </ul>
<b>HEAT RASH</b>	
<ul style="list-style-type: none"> <li>Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)</li> </ul>	<ul style="list-style-type: none"> <li>Stay in a cool, dry place</li> <li>Keep the rash dry</li> <li>Use powder (like baby powder) to soothe the rash</li> </ul>



**ENFERMEDADES RELACIONADAS CON EL CALOR**

EN QUÉ SE DEBE FIJAR	QUÉ HACER
<b>GOLPE DE CALOR</b>	
<ul style="list-style-type: none"> <li>Alta temperatura corporal (103 °F o más)</li> <li>Piel caliente, enrojecida, seca o húmeda</li> <li>Pulso acelerado y fuerte</li> <li>Dolor de cabeza</li> <li>Mareos</li> <li>Náuseas</li> <li>Confusión</li> <li>Pérdida del conocimiento (desmayos)</li> </ul>	<ul style="list-style-type: none"> <li>Llame al 911 de inmediato, el golpe de calor es una emergencia médica</li> <li>Lleve a la persona a un sitio más fresco.</li> <li>Ayude a bajar la temperatura de la persona con paños fríos o dándole un baño con agua fría.</li> <li>No le dé a la persona nada para beber</li> </ul>
<b>AGOTAMIENTO POR CALOR</b>	
<ul style="list-style-type: none"> <li>Sudor abundante</li> <li>Piel fría, pálida, húmeda y pegajosa</li> <li>Pulso rápido y débil</li> <li>Náuseas o vómitos</li> <li>Calambres musculares</li> <li>Cansancio o debilidad</li> <li>Mareos</li> <li>Dolor de cabeza</li> <li>Desmayos</li> </ul>	<ul style="list-style-type: none"> <li>Vaya a un sitio fresco</li> <li>Affójese la ropa</li> <li>Apíquese paños húmedos en el cuerpo o dese un baño con agua fría</li> <li>Tome sorbos de agua</li> </ul> <p><b>Busque atención médica de inmediato si:</b></p> <ul style="list-style-type: none"> <li>Tiene vómitos</li> <li>Sus síntomas empeoran</li> <li>Sus síntomas duran más de 1 hora</li> </ul>
<b>CALAMBRES POR CALOR</b>	
<ul style="list-style-type: none"> <li>Sudor abundante durante ejercicios físicos intensos</li> <li>Dolor o espasmos musculares</li> </ul>	<ul style="list-style-type: none"> <li>Suspenda todo tipo de actividad física y vaya a un lugar fresco.</li> <li>Beba agua o una bebida deportiva</li> <li>Espere que los calambres desaparezcan antes de realizar más actividades físicas</li> </ul> <p><b>Busque atención médica de inmediato si:</b></p> <ul style="list-style-type: none"> <li>Los calambres duran más de 1 hora</li> <li>Usted sigue una dieta baja en sodio</li> <li>Usted tiene problemas cardíacos</li> </ul>
<b>QUEMADURAS SOLARES</b>	
<ul style="list-style-type: none"> <li>Piel dolorida, enrojecida y tibia</li> <li>Ampollas en la piel</li> </ul>	<ul style="list-style-type: none"> <li>Evite el sol hasta que se le cure la quemadura</li> <li>Apíquese paños fríos en las áreas quemadas por el sol o dese un baño con agua fría</li> <li>Aplique loción humectante a las áreas quemadas</li> <li>No rompa las ampollas</li> </ul>
<b>SARPULLIDO POR CALOR</b>	
<ul style="list-style-type: none"> <li>Grupos de pequeñas ampollas rojas que parecen granitos en la piel (generalmente en el cuello, el pecho, la ingle o en los pliegues de los codos)</li> </ul>	<ul style="list-style-type: none"> <li>Quédese en un lugar fresco y seco</li> <li>Mantenga el sarpullido seco</li> <li>Use talco (como talco para bebés) para calmar el sarpullido</li> </ul>



Scan, save, & print in English & Spanish to save a life (or an ER visit)



# Final Hot Takes



Extreme heat causes more mortality than all other natural disasters



Not all AMS + hot + hypotensive = sepsis...consider heat stroke



When it's hot, broaden your "rash" differential to include skin, ducts, and even vessels!



Screen all patients for risk of heat-related illness & help at-risk patients make a hot weather action plan

# References

1. Jud P, Hafner F. Exercise-induced vasculitis. *CMAJ*. 2018;190(7):E195. doi:10.1503/cmaj.171377
2. Mangus CW, Canares TL. Heat-Related Illness in Children in an Era of Extreme Temperatures. *Pediatr Rev*. 2019 Mar;40(3):97-107. doi: 10.1542/pir.2017-0322. Epub 2019 Mar 1. PMID: 30824495.
3. Moreau TP, Deeter M. Heatstroke—predictable, preventable, treatable. *JAAPA*. 2005 Aug;18(8):30-5. doi: 10.1097/01720610-200508000-00006. PMID: 16119013.
4. Sorensen C, Hess J. Treatment and Prevention of Heat-Related Illness. *N Engl J Med*. 2022 Oct 13;387(15):1404-1413. doi: 10.1056/NEJMcp2210623. Epub 2022 Sep 28. PMID: 36170473.
5. Thomas K, Hardy RD, Lazrus H, Mendez M, Orlove B, Rivera-Collazo I, Roberts JT, Rockman M, Warner BP, Winthrop R. Explaining differential vulnerability to climate change: A social science review. *Wiley Interdiscip Rev Clim Change*. 2019 Mar-Apr;10(2):e565. doi: 10.1002/wcc.565. Epub 2018 Dec 7. PMID: 31007726; PMCID: PMC6472565.
6. Warning Signs and Symptoms of Heat-Related Illness | Natural Disasters and Severe Weather | CDC. Accessed July 26, 2023. <https://www.cdc.gov/disasters/extremeheat/warning.html>



# Temperature Rising

On Heat-Related Illness

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Duke University