MOUNTAIN COMMUNITIES CERT COMMUNITY EMERGENCY RESPONSE TEAM

Hyperthermia

August 23, 2022

Presented to: AV CERT

Charlotte Richmond, PhD

Hyperthermia

- Physiology & Physics
- Pathophysiology
- Types of Hyperthermia
- Risks & Causes
- Symptoms & Treatment
- Prevention

Which person would have more issues regulating body temperature when it is hot weather?

A. Person from Lancaster
B. Person from Greater Frazier Mountain
C. Equally the same

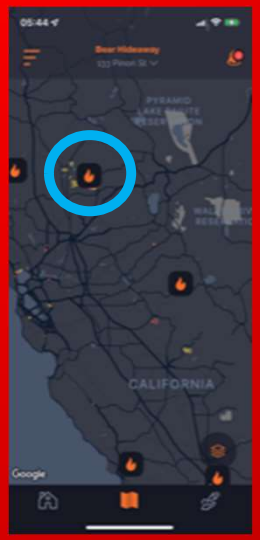
Why is it important to understand HYPERTHERMIA?

California Family Likely Died of Hyperthermia and Dehydration on Hike, Officials Say—Here's What That Means

What killed the family of three and their dog had puzzled investigators since August.

By **Korin Miller** | Published on October 22, 2021

Rices Fire – 30Jun2022



CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

INCIDENT UPDATE

FIRE.CA.GOV

CAL FIRE

7:34 PM · Jun 30, 2022

The fire began about 2 p.m. Tuesday near the Yuba River. As of late Thursday, firefighters had about 20% of the blaze contained, the California Department of Forestry and Fire Protection reported.

So far, 13 firefighters and one civilian have been injured, CalFire reported. The injuries were heat-related, such as dehydration.

Recent News:

UPS Driver, 24, Dead from Suspected Heat Stroke After Passing out in His Truck During Delivery

"I'm still shocked. I can't believe it. My son just turned 24," the driver's father, Esteban Chaver Sr., said of the tragedy

By **Shafiq Najib**

July 02, 2022 01:20 PM

Fiesta Days – Frazier Park 05-07Aug2022

- Mountain Communities CERT provided First Aid
- Provided hyperthermia information to food vendors
- 19 people were treated at the First aid Booth
  - 7 were for heat-related issues
  - Temperature was 80-85^{o} F

What is Hyperthermia?

Hyperthermia is an abnormally high body temperature — or overheating

- The body absorbs or generates more heat than it release
- Normal body temperature is about 98.6º F
- Any body temperature above 99 or 100º F is too warm
- Caused by overexertion in hot, humid conditions
- Most forms of hyperthermia are preventable

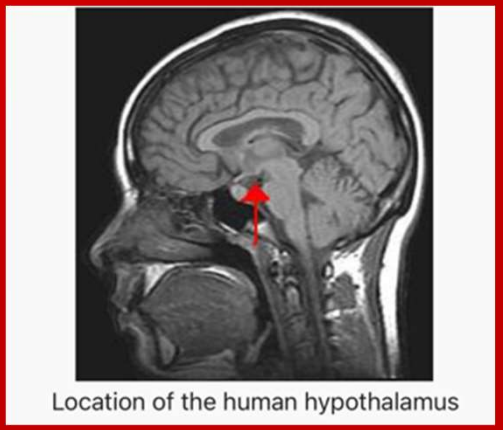
Measuring Site	Normal Temperature Range
Forehead	97.0 – 99.5°F (36.1 – 37.5°C)
Ear	96.4 – 100.4°F (35.8 – 38.0°C)
Mouth	95.9 – 99.5°F (35.5 – 37.5°C)
Anus	97.9 – 100.4°F (36.6 – 38.0°C)
Armpit	94.5 – 99.1°F (34.7 – 37.3°C)

Physiology

Our bodies produce/transfer heat – we do not produce/transfer cold

Body temperature is well regulated

- **Hypothalamus – body's thermostat**
  - **Sets desired body temperature (set point)**
  - **Stimulates either heat production, retention, or loss**
- **Cardiovascular system**
  - **Blood transports heat along with oxygen**
  - **Oxygen used for metabolic heat production**
  - **Circulation – vasoconstriction (decreases heat loss) & vasodilation (increases heat loss)**
- **Regulation of water – kidneys, sweating, and lungs**

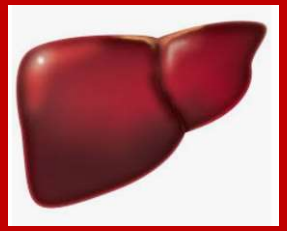


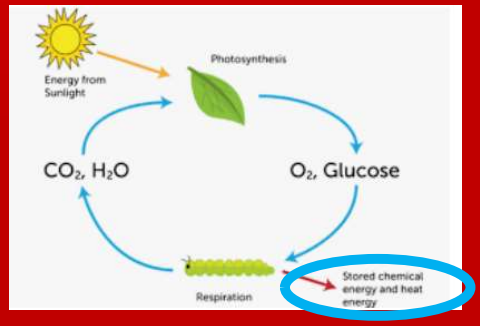
Location of the human hypothalamus

Heat balance: Heat production = Heat loss

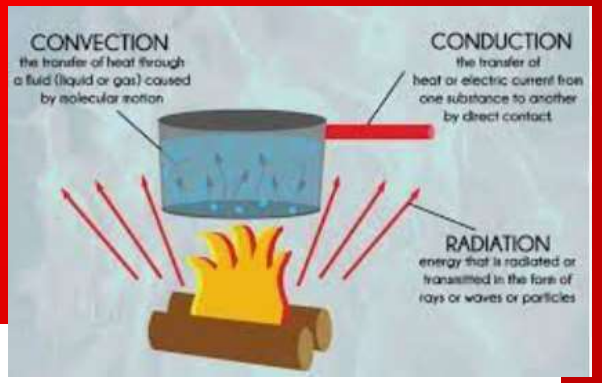
Physiology

- Heat is primarily generated in:
  - Muscle tissue, including the heart
  - In the liver
  - Biochemical reactions at the cellular level
  - Heat production increases through muscle contractions
    - Exercise & shivering
- Heat is lost through the skin (90%) and lungs (10%)





Physics



The rate of heat loss is determined by:

- **Convection (movement of fluids and gasses surrounding the skin)**
- **Conduction (heat transferred between objects)**
- **Radiation (heat transfer between body surface & surrounding area)**
- **The rates of these can be affected by body mass, clothing & other environmental conditions**
- **“Heat of vaporization” cools body by sweating**
  - **Excess body heat is used to convert sweat into vapor**

Heat Loss through Sweating

- Sweat - vitally important for body temperature regulation
- When body temperature rises, hypothalamus activates sweat glands
- Sweat needs to evaporate off skin to be effective
- Humidity hampers the evaporative process
- Negative aspect of sweating: water loss
- Dehydration decreases the ability to sweat
- People acclimated to the heat conserve water by sweating at higher body temperatures

Types of Hyperthermia

- Heat Cramps
- Heat Rash
- Heat Stress
- Heat Exhaustion
- Heat Stroke

Types of Hyperthermia

- **Heat Cramps:**
  - Loss of electrolytes through sweating (mainly sodium)
  - Often occur in arms, hands, lower legs & feet
  - Cramps are caused from sodium/fluid depletion and not the heat
- **Heat Rash:**
  - Skin irritation caused from sweating /heat
  - Cluster of small, red pimples or blisters
  - Develops in elbow crease, under breasts, groin, chest & neck
- **Heat Stress:**
  - Can occur while working in hot conditions
  - Firefighters, miners and construction workers
  - Heat stress can lead to heat exhaustion or heat stroke

Types of Hyperthermia

- **Heat Exhaustion:**
  - Body temperature may be as high as 104° F
  - Can lead to heatstroke
- **Heat Stroke:**
  - The most severe form of hyperthermia
  - Life-threatening condition that causes your body temperature to rise above 104° F
  - Affects the brain and other organs
  - Heatstroke is especially dangerous if your body temperature rises above 106° F

Risks of Hyperthermia

- Dehydration
- Over 65 or under 4 years old
- Strenuous physical activity in hot weather
- Excessive consumption of alcohol
- Caffeine intake
- Electrolyte imbalance
- Have certain medical conditions:
  - Heart, Lung, Liver, & Blood vessels
  - Overweight or Underweight
- Take certain medications:
  - Diuretics, stimulants, sedatives, tranquilizers or heart & BP
- Wear heavy, tight or dark clothing in hot weather

Causes of Hyperthermia

- Body takes in more heat than it releases
- Failure to maintain proper hydration to counter sweating
- Sweating isn't efficient enough to cool body down
  - Dehydration
  - Humidity
- Not acclimated to a hot environment
- Physical exertion in very hot, humid weather (most common)
  - Sweat evaporation is decreased with humidity

Heat Cramps

Symptoms

- Sudden muscle spasms in feet, calves, thighs, hands or arms
- Cramps might feel painful or tense
- Muscles might be sore after the cramp passes

Treatment

- Identify that you have heat cramps
- Stop the exercise routine or activity that led to the cramp
- Rest in a cool environment (get out of the sun!)
- Drink plenty of fluids
  - Water
  - Electrolyte drinks
- Gentle stretching
- Do not return to activity right away
- Drink 6-8 glasses of water every day

Heat Stress

Symptoms

- Thirsty
- Headache
- Nausea
- Dizziness
- Weakness
- Irritability
- Heavy Sweating
- Elevated body temperature

Treatment

- Lie down in a cool place
- Remove excessive clothing
- Loosen any tight clothing
- Cool by fanning and moisten skin
- Frequent small drinks of water
- Monitor for signs of heat exhaustion/stroke

Heat Exhaustion

Symptoms

- Thirsty
- Headache
- Rapid, weak pulse
- Dizziness or fainting
- Cool, moist, pale, or flushed skin
- **Heavy sweating**
- Temperature up to 104° F
- Anxious
- Poor coordination
- Fatigue, weakness & restlessness

Treatment

- Take temperature (elevated but below 104° F)
- Find a cooler environment
- Insulate from hot ground
- Drink cold water or electrolyte drinks slowly
  - ½ glass every 15 minutes
  - Can substitute ½ teaspoon salt into quart of water
  - Do not provide fluids/food if cramps, nauseated or vomiting
- If fluid & electrolytes are not replaced, can lead to heat stroke
- Remove unnecessary clothing
- Cooling measures
  - Cool slowly to not induce shivering
  - Cool bath or shower
  - Mist with cool water
  - Sit by a fan or in air-conditioned room/car
  - Soak towels in cool water
  - **Cautiously** use icepacks in armpits and behind neck
- Monitor condition & seek medical advice

Heatstroke

Symptoms

- Throbbing headache
- Nausea & vomiting
- Rapid, weak pulse and rapid shallow breathing
- Extremely thirsty
- Dry, swollen tongue
- Red, hot, dry skin or very pale skin
- **Little to no sweating**
- Balance problems
- Delirium (confusion or disorientation), slurred speech
- Temperature > 104^{o} F
- Low or high blood pressure
- Seizures
- **Can develop shock, slip into a coma, experience organ failure or die**
  - With shock, skin may feel cool to the touch

Treatment – Medical Emergency

- **Call 911**
- Insulate from hot ground
- Immerse in cool water, if possible
- Mist with water and blow air across their bodies (evaporative cooling)
- Apply ice packs to the neck, groin and armpits
- Avoid inducing shivering (produces heat)
- ***Avoid giving any medications, including aspirin and acetaminophen***

Heat Exhaustion vs. Heatstroke

Heat Exhaustion

- Thirsty
- Headache
- **Heavy sweating**
- Rapid, weak pulse
- Nausea and/or vomiting
- Cool, moist, pale, or flushed skin
- Temperature up to 104° F
- Poor coordination
- Dizziness or fainting
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Heatstroke

- Extremely thirsty
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- Red, hot, dry skin or very pale skin
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- Balance problems
- Delirium (confusion or disorientation), slurred speech
- Dry, swollen tongue
- Low or high blood pressure.
- Seizures, coma, death

Why insulate from hot ground?

- Heat transfer via conduction
  - Conduction is when heat transfers between objects
- When the air temperature is 86 degrees, asphalt can reach 135 degrees
  - More than hot enough to cook an egg in five minutes
- On an 87-degree day, asphalt temperatures can reach 140 degrees
  - Hot enough to cause burns, permanent damage & scarring after just one minute
- Rapid burns and blistering can occur at 150 degrees
- Hot sidewalks, pavement and parking lots can not only burn, but they also reflect heat onto the body
  - Increasing risk of deadly heat stroke

Seek Medical Advice:

- Symptoms do not subside after an hour
- Can’t replace fluids and electrolytes due to nausea and vomiting
- Temperature ever exceeds 104°F
- Develop confusion, delirium, or have a seizure
- Experience rapid breathing and a racing pulse well after ceasing the physical activity
- If you have any doubts . . .

CALL 911

Prevention of Hyperthermia

- Drink 6-8 glasses of water a day
- Consume sports drinks, lightly salted water or broth when in the heat
  - If your diet is high in salt, electrolyte drinks may not be needed
- Avoid strenuous physical activity in hot, humid conditions
  - Exercise early or late in the day
  - Exercise indoors where it is air conditioned
- Know when to come out of the heat
- Stay in air-conditioned or well-ventilated areas during heat waves
- Know when to stop exercising: when you first feel effects of the heat
- Never leave children (or pets) in closed, hot spaces such as cars
- Wear lightweight, loose-fitting and light-colored clothing when hot out
- Gradually acclimate to the heat
  - Light work or exercise about two weeks before you need to do the really hard work
  - Gradually increase your time in the heat

Children left in locked cars in the heat die of hyperthermia

Cars get hot!!

VEHICLE INTERIOR AIR TEMPERATURE

(Estimated Vehicle Interior Air Temperature v. Elapsed Time)

Elapsed Time	Outside Air Temp (F)					
	70	75	80	85	90	95
0 mins	70	75	80	85	90	95
10 mins	89	94	99	104	109	114
20 mins	99	104	109	114	119	124
30 mins	104	109	114	119	124	129
40 mins	108	113	118	123	128	133
50 mins	111	116	121	126	131	136
60 mins	113	118	123	128	133	138
>1 hour	115	120	125	130	135	140

Courtesy: Jan Null, CCM; Department of Geosciences
San Francisco State University

NEWS WATCH NOW

U.S. NEWS

11-month-old dies after being left in parked vehicle for 'extended period' in Florida

The baby "sadly succumbed to his injuries," Tallahassee police said.

SAVE

July 20, 2022, 2:16 AM PDT

By Chantal Da Silva

An 11-month old baby boy is dead after being left in a parked vehicle in Tallahassee for an "extended period," police said.

An infant died after being left in a car outside a Walgreens store where its mother was working, reports say

By Ryan Hogg
July 3, 2022 · 2 min read

The incident occurred in the parking lot of a Walgreens store in Georgia.
Steven Senne/AP

June 24, 2022 | 1:44am | Updated

A 5-year-old boy died of heatstroke when he was left in the back of his mother's car during the sweltering Texas heat, according to a report.

The child, identified by the Daily Mail as Trace Means, died on Monday when 36-year-old Amanda Means forgot the child in the back of a car outside of the family's home while preparing for a birthday party for the child's older sister.

3-Month-Old Died After Being Left In Parents' Car For Several Hours

By **Bill Galluccio**
Jun 17, 2022

Children's deaths due to heat June-July 2022

It is a Crime in California to Leave Children in Hot Cars!!

Penal Code Section 273(a)

- Good Samaritan Law protects anyone who recues a child from a hot car
  - Civil Code Section 43.102
  - Health & Safety Code Section 1799.101
- If child is locked and unattended and is in immediate danger
- Forcible entry is necessary
  - Break window in front of car, not next to child
- Reasonable effort to locate child's caregiver
- Contacted a local law enforcement, fire department or called 911
- Remains with the child after rescue until first responders arrive

Pets are also Affected by Hyperthermia

Cars get hot!!

How long does it take for a car to get HOT?
VEHICLE TEMPERATURE
Outside Temp (F)
Inside Temp (F)
10mins
30mins
70° 89° 104°
75° 94° 109°
80° 99° 114°
85° 104° 119°
90° 109° 124°
95° 114° 129°
DOGS DIE EVERY SUMMER
In minutes your car temps are deadly!
VeterinaryClinic.com

It is a Crime!!

A Washington state woman was arrested after she allegedly left her family's dog on a balcony without water or shade during dangerous high temperatures, resulting in the dog's death.

June 24, 2022

Dog Barks For Help Inside Hot Car While Owners Are At The Beach, And Officers Break Window To Save Him

SHARE THIS POST ON FB:

Share 264K

It is a Crime in California to Leave Animals in Hot Cars!!

Penal Code Section 597.7

A person who removes an animal from a vehicle is not criminally liable for actions taken reasonably and in good faith (Civil Code Section 43.100) if the person does all the following:

- Determines the vehicle is locked or there is no reasonable way to remove animal
- Forcible entry into the vehicle is necessary because the animal is in imminent danger
- Contacted law enforcement agency, fire department, animal control, or "911"
- Remains with the animal after rescue until first responders arrive
- Used no more force than was necessary under the circumstances
- Immediately turns the animal over to law enforcement, animal control, or another emergency responder who responds to the scene

For more information: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB797

Which person would have more issues regulating body temperature when it is hot weather?

A. Person from Lancaster
B. Person from Greater Frazier Mountain
C. Equally the same

Questions