

Saudi hajj pilgrims' deaths highlight how extreme heat kills

June 20 2024, by Isabelle TOURNÉ



Pilgrims at the hajj were laid low by the scorching heat.

More than 1,000 people have died at this year's hajj pilgrimage in extreme heat in Saudi Arabia, an AFP tally showed on Thursday.

The pilgrimage involved hours of walking and praying in a country where temperatures reached 51.8 degrees Celsius (125 Fahrenheit) this week.

The World Health Organisation (WHO) has calculated that heat kills at least half a million people every year but warns that the real figure could be up to 30 times higher.

Here a scientist explains how [extreme heat](#) damages the body and how physical activity outdoors raises the risk.

Heat effect on body

In normal conditions, the body regulates its own [temperature](#) like a thermostat, holding it steady at about 36.8C (98.2F).

When outside heat rises, the body cools itself by raising blood-flow to vessels near the skin.

This emits heat at the surface, while perspiration also cools the outside of the body.

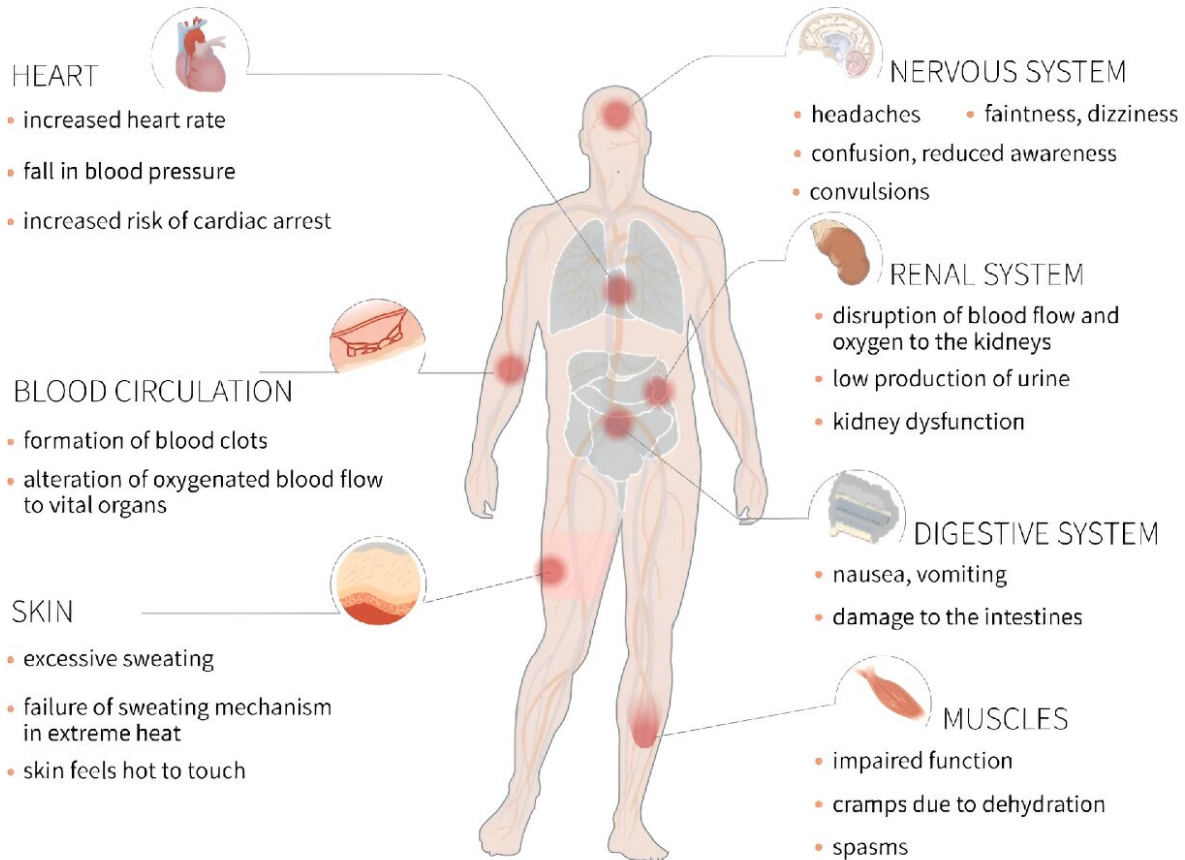
"To ensure the correct functioning of the cells, enzymes and [vital organs](#), the body's temperature must stay constant, whatever the external conditions," said Pieter Vancamp, a neurobiologist at the French research institute INRAE.

Dying of heat

During an activity such as the hajj, where pilgrims spend hours outdoors in the sun, "the body can quickly become exhausted and can no longer find the reserves of water needed to perspire", Vancamp said.

Effects of heat stress on the human body

When the body is exposed to unusually high temperatures, it can have the following effects:



Sources: Quebec government, British health ministry, University of Princeton



Effects of heat stress on the body.

Then the kidneys, heart and brain risk overheating and "stop working", he added.

When the body's natural thermostat is overwhelmed in this way, symptoms strike: fatigue, headaches, fever and broken sleep.

These can herald more serious effects, such as dehydration, which

chokes off water to the vital organs.

The biggest risk is heatstroke, when the body's temperature exceeds 40C (104F).

"The body has its limits," said Vancamp. "When the weather is too hot or when extreme heat is combined with physical activity, for example, the body can find itself unable to self-regulate."

Aggravating factors

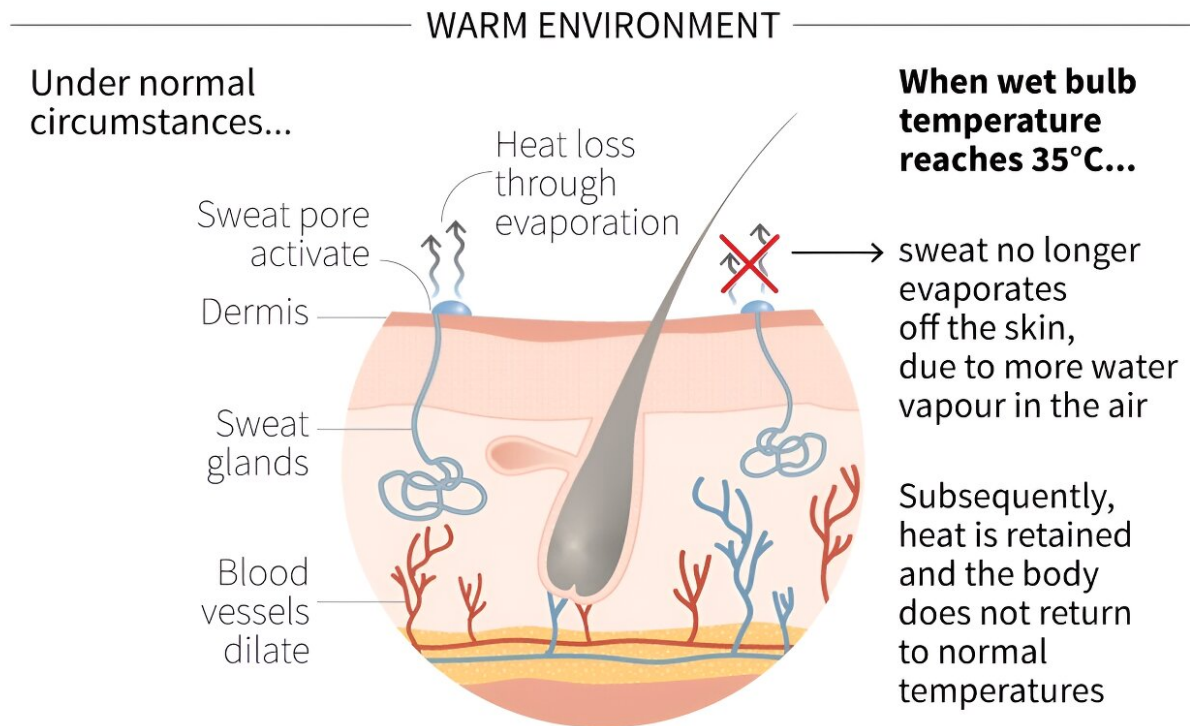
Babies, the elderly, people with [health problems](#) and outdoor workers are most at risk.

The number of sweat glands in the body decreases with age, leaving the body less able to cool itself.

"Several factors determine our reaction to heat: age, [body mass](#), [physical activity](#), genes," said Vancamp.

Wet-bulb temperature

A measure combining temperature and humidity, if exceeding 35°C*, equivalent to 35°C dry heat at 100% humidity, can kill a young healthy person after 6 hours



Source: NASA, Raymond et al. (2020) *or 46°C dry heat at 50% humidity, etc.



Graphic explaining wet-bulb temperature.

"But when the heat is too strong, even young, healthy bodies can lack the energy to keep the temperature close to 37C."

The WHO warns that hot nights pose a particular health risk.

Nighttime heat gives the body no chance to cool down, leading to a rise in heart attacks.

Heat-related illnesses

Most common health effects caused by extreme heat

<p>HEAT CRAMPS</p> <p>MAIN SYMPTOMS Painful muscle cramps or spasms (often in abdomen, arms, calves), heavy sweating</p>  <p>CAUSE Prolonged exposure to extreme heat, combined with dehydration</p>	<p>HEAT EXHAUSTION</p> <p>Heavy sweating, fatigue, dizziness, nausea or vomiting, thirst, fainting, headache, irritability</p>  <p>Exposure to extreme heat over extended period (usually several days), combined with dehydration</p> <p>Severe illness, requires emergency medical treatment</p>	<p>HEATSTROKE</p> <p>High temperatures, profuse sweating, fast heart rate, severe vomiting or diarrhea, hot/flushed skin, unconsciousness, difficulty breathing, altered mental state</p>  <p>Prolonged exposure to, or physical exertion in, high temperatures. Body fails to regulate its temperature, 40 °C (104 °F) or higher</p> <p>Most serious medical condition, requires emergency treatment. Can result in death</p>
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Sources: US CDC, Red Cross, StJohnAmbulance, Canadian health authorities



Graphic explaining the most common health effects or symptoms caused by extreme heat.

More heat deaths in future?

Worldwide, people were exposed to an average of 86 days of life-threatening temperatures in 2022, according to The Lancet Countdown report last year.

The number of people over 65 who died from heat rose by 85 percent between the periods 1991-2000 and 2013-2022, the leading medical journal added.

Climate change caused by humans burning [fossil fuels](#) is increasing [heat waves](#) and other [extreme weather events](#).

On the current trajectory, the world is on track to warm about 2.7C above the pre-industrial average by the end of this century, according to

Climate Action Tracker.

The Lancet Countdown projected that under a 2C warming scenario, about five times as many people will die from the heat each year by 2050.

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