

Heat waves and hot temperatures are hard on the body—but a series of built-in adaptations make it easier to cope

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Credit: AI-generated image ([disclaimer](#))

[Record-breaking temperatures](#) have [been recorded](#) in many countries [in 2023](#). In some parts of Europe, summer temperatures even [exceeded 45°C](#).

While this kind of heat can be uncomfortable, our body is built with many adaptations that help it continue to function when it's hot.

The body runs most efficiently with an [internal temperature](#) of [around 37°C](#), which enables all the body's functions to work optimally. This internal temperature is controlled by a small area of the brain called the [hypothalamus](#), which functions as the body's thermostat. When it's hot outside, the hypothalamus triggers a series of processes that dissipate heat to ensure the body sustains its functions.

One of the first processes the body triggers is vasodilation. This widens the blood vessels to allow more blood to flow through them. When it's hot, the [blood vessels](#) closest to the surface of the skin are among the first to undergo vasodilation. This is to allow [heat to escape](#).

Sweating is another mechanism the hypothalamus controls. Sweat is secreted from special glands in the surface of the skin. This helps [heat evaporate](#).

Sweat is composed of 99% water, but also [contains a blend](#) of electrolytes, fatty acids, urea and lactic acid. The body itself is [75% water](#). Losing [even 1%](#) of this can result in dehydration and difficulty thinking. A [10% loss](#) in fluid is life threatening. Since sweating uses water, it must be replaced.

An inactive adult sweats about [450ml of water a day](#). When combined with the amount of water removed by urination and other body processes, most people need to consume about [1.5 liters of water a day](#). A person exercising or working in hot temperatures can lose up to [1,200ml an hour](#)—or [ten liters](#) per day. In [hot weather](#) it's [recommended you consume](#) about one liter an hour at regular intervals, rather than all at once.

Health risks

The processes that help keep us cool also put additional strain on certain parts of the body.

For instance, the pumping of blood to the skin means the heart has to work harder. Even when at rest, heart rate increases nearly two-thirds when the [temperature rises from 28 to 50°C](#). There's an [increased risk of dying](#) from heart problems in [extreme temperatures](#) because of this increased strain on the heart. In polluted areas, just two days of heat above 28°C increases risk of dying from a heart attack by [nearly 20%](#). This rises to nearly 75% if the heat persists for four days.

While the body compensates for this additional strain by making [blood less viscous at higher temperatures](#) so it can flow more easily, dehydration can rapidly [counteract this](#).

Hot outdoor temperatures also make it harder for the brain to dissipate the heat it generates from its own processes. This can have an affect on brain function.

Outdoor temperatures between [24 and 28°C](#) are associated with a decline in cognitive function. This decline is seen even in [young people](#), though heat's [affect on the brain](#) is far worse for [older people](#). Older people are more affected because of their sensitivity to temperature changes, and because their bodies [adapt much more slowly](#) to changes due to aging.

Temperatures in the high 30°Cs and low 40°Cs can cause the blood brain barrier (which protects the brain from toxic and harmful substances circulating in the blood) to [break down](#). This causes it to become leaky and allow substances that wouldn't normally be there (such as pathogens) into the protective fluid.

Hot temperatures also affect our respiratory system. This can lead to [poorer lung function](#).

For people with chronic respiratory conditions (such as [chronic obstructive pulmonary disease](#)) hot weather may make symptoms worse—and may even [increase the risk of death](#). [Older adults](#) and [children with asthma](#) may also find hot weather makes it harder to expel air. This is important because the body is generating more [waste products](#), such as [carbon dioxide](#), in an effort to stay cool that need to be removed. While hot air doesn't affect lung function in healthy people as much, the hotter and more humid it gets the more [lung capacity decreases](#).

Extreme heat also has a significant affect on [kidney function](#). This is mainly because of sweating, which reduces fluid availability in the body and changes the electrolyte balance, causing the kidneys to work harder. [This may explain](#) why more people are diagnosed with [kidney stones](#) and other [kidney conditions](#) (such as acute kidney injury) in warmer months.

But while hot weather can have a big impact on the body, there are many simple things you can do to avoid the harms of extreme heat.

One of the most important things is to drink enough fluid—ideally water. In warm climates or during heat waves, [drinking alcohol or caffeinated drinks](#) can cause further dehydration—so it's best to limit intake of these. You can also replenish electrolytes using certain drinks (such as coconut water or milk) or foods (such as bananas and watermelon).

When outside, avoid sitting in the sun. Instead, cool off in a [shady park](#) or in an air conditioned building if any are nearby. Cool showers and baths are also useful and may lower risk of death from the heat in [older adults](#). Avoid strenuous activities as this generates additional heat that

the body may struggle to dissipate. Wear loose clothing as this allows the warm layer of air next to the body to escape.

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