

# The Benefits of Fever

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## STORY AT-A-GLANCE

- › In most cases, there's no reason to fear a fever; using fever-reducing medications may prolong the illness
- › Increasing research supports the "let it ride" philosophy, which states that fever is protective and should be allowed to run its course
- › When critically ill patients were aggressively treated to reduce fever, the study had to be stopped early because so many people in the aggressive treatment group died compared to the group whose fevers weren't treated
- › Several hours of mild fever is beneficial for COVID-19 patients, as it raises cellular levels of beneficial heat shock protein 70 (HSP70), which is protective in cases of sepsis-induced ARDS
- › In people with influenza, using fever-reducing drugs is linked to a 5% increase in mortality; in most cases, rest and plenty of fluids are all that's needed when a fever strikes

I originally wrote this article 12 years ago. But the topic is so important that I wanted to publish an update spreading the word that, in most cases, there's no reason to fear a fever. Reaching for fever-reducing medications right away is also typically counterproductive and may make it take longer for you to get better.<sup>1,2</sup>

Fever is a sign that your, or your child's, immune system is working at its best. Virtually all animals — and even fish<sup>3</sup> — naturally develop a fever when they're fighting a bacterial

or viral illness. This response occurs because it improves your body's ability to get rid of infection.

## **Fever Benefits Your Body**

When an organism invades your body, it triggers the release of pyrogen, a substance that signals your brain's hypothalamus to raise your body's temperature. This is done through a number of different mechanisms, including:

- Shivering
- Release of the hormone TRH
- Increasing your metabolic rate
- Restricting blood flow to the skin to minimize heat loss
- Piloerection (raising the small hairs), which suppresses sweating, a cooling mechanism

The fever, in turn, launches a number of beneficial body processes, including immune-protective mechanisms, that either directly or indirectly help ward off the invading bacteria or virus. For instance, temperatures from 104 to 105.8 degrees F (40 to 41 degrees C) reduce the replication rate of poliovirus in cells by 200-fold, while increasing the susceptibility of Gram-negative bacteria to antibody destruction.<sup>4</sup>

"Given the complexity of these immune mechanisms, it is remarkable that fever-range temperatures stimulate almost every step involved in this process, promoting both innate and adaptive immunity," researchers wrote in *Nature Reviews Immunology*.<sup>5</sup>

"Febrile temperatures serve as a systemic alert system that broadly promotes immune surveillance during challenge by invading pathogens."<sup>6</sup> Some of these wide-reaching benefits include:

Increase in antibodies — cells trained to attack the exact type of invader that your

More white blood cells are produced to help fight off the invading bugs

body is suffering from

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More interferon, a natural antiviral and anticancer substance, is produced, which helps block the spread of viruses to healthy cells

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Walling off of iron, which bacteria feed on

Increased temperature, which directly kills microbes (most bacteria and viruses grow better at temperatures lower than the human body)

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Improved ability of certain white blood cells to destroy bacteria and infected cells

Fever also impairs the replication of many bacteria and viruses

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## **Fever? Let It Ride**

"The fever response is a hallmark of infection and inflammatory disease and has been shaped through hundreds of millions of years of natural selection,"<sup>7</sup> yet many health care providers still consider it dangerous and worthy of treating because it causes discomfort.

Scientists also continue to debate fevers' merits. One side favors the idea that fever should be suppressed because of its high metabolic costs. Every 1.8 degree F rise in body temperature requires a 10% to 12.5% increase in metabolic rate,<sup>8</sup> which is significant.

This is one of the reasons why you frequently lose weight when you have a fever. However, increasing research supports the "let it ride" philosophy, which contends that fever is protective.<sup>9</sup> Writing in the Journal of Thoracic Disease, researchers with the University of Miami Miller School of Medicine described a classic 1975 study<sup>10</sup> on fever and survival in iguanas infected with bacteria:<sup>11</sup>

*"He gave them the opportunity to seek heat via sunlamps and all but one sought the warmth to raise their temperature. The one who did not was the only one who died. Next, he injected the iguanas with bacteria and gave them antipyretics [fever-reducing drugs]. The iguanas that were able to mount a fever despite the antipyretic were the only ones that survived."*

A 1987 study on rabbits also found that administering fever-reducing drugs caused more harm than good. The team found fever suppression in the animals "had a markedly deleterious effect on the course of infection, resulting in an increased content of infectious virus in the mesenteric lymph nodes, increased mortality, and retarded recovery in animals that survived the infection."<sup>12</sup>

Similarly striking findings have been found in people, specifically critically ill patients in the intensive care unit. One group of patients was treated aggressively for fever, receiving acetaminophen every six hours if their temperature rose above 101.3 degrees F (38.5 degrees C).

The other group only received treatment if their fever reached 104 degrees F (40 degrees C), which consisted of acetaminophen and cooling blankets until their temperature went below 104 degrees F.

The study had to be stopped early because so many people in the aggressive treatment group died compared to the other group – seven deaths versus one, respectively. "Aggressively treating fever in critically ill patients may lead to a higher mortality rate," the team concluded.<sup>13</sup>

Another study, this time on fish, showed allowing fever to run its course cleared infection in about half the time it took for animals without a fever to heal.<sup>14,15</sup> In addition to rapidly clearing infection, fever helped control inflammation and repair tissue damage.

"We let nature do what nature does, and in this case, it was very much a positive thing," study author and immunologist Daniel Barreda, with the University of Alberta, said in a news release.<sup>16</sup> "Every animal examined has this biological response to infection," she says, suggesting that fever provides a strong evolutionary survival advantage.

## Moderate Fever Is Protective Against COVID-19

Acute respiratory distress syndrome (ARDS), which involves programmed cell death in the lungs' alveolar cells, is a primary cause of death in COVID-19 patients. The natural rise in body temperature that occurs during mild or moderate fever, however, may raise cellular levels of beneficial heat shock protein 70 (HSP70), which is protective in cases of sepsis-induced ARDS.

Writing in *Frontiers in Medicine*, researchers suggested that several hours of mild fever, defined as less than 101.8 degrees F (38.8 degrees C), is advantageous for COVID-19 patients, "allowing lung cells to accumulate protective HSP70 against damages from the inflammatory response to the virus SARS-CoV-2."<sup>17</sup> Again, simply allowing a mild or moderate fever to take its course helps increase HSP70, offering you a survival advantage.<sup>18</sup>

*"HSP70s can use the energy from ATP hydrolysis to forcefully unfold and dismantle different types of aggregated and functional protein oligomers in the cell. Hence, it can drive conformational changes in various large cytotoxic protein aggregates and convert them into soluble, harmless, functional proteins.*

*... Conversely, degenerative neuronal and muscular tissues in aging nematodes and humans that systematically express lower cellular levels of HSP70s than young individuals are particularly fragile and stress-sensitive. Cells with low HSP70 levels tend to spontaneously undergo apoptosis, and consequent tissue losses in aging humans lead to progressive degenerative diseases."*

Because the ability to develop fever and accumulate HSP70 decreases with age, the team even suggested using thermotherapies or physical training to raise body temperature in these cases. Scientists writing in *Evolution, Medicine, and Public Health* also suggested letting fever do its job, particularly in the pandemic era:<sup>19</sup>

*"For COVID-19, many public health organizations have advised treating fever with medicines such as acetaminophen or ibuprofen. Even though this is a*

*common practice, lowering body temperature has not improved survival in laboratory animals or in patients with infections.*

*Blocking fever can be harmful because fever, along with other sickness symptoms, evolved as a defense against infection. Fever works by causing more damage to pathogens and infected cells than it does to healthy cells in the body. During pandemic COVID-19, the benefits of allowing fever to occur probably outweigh its harms, for individuals and for the public at large."*

## **Fever-Reducing Drugs May Backfire**

In most cases, fever-reducing medications should be avoided, as they typically only suppress the natural healing mechanisms of the fever and prolong the illness. For example, in people with influenza, using fever-reducing drugs is linked to a 5% increase in mortality.<sup>20</sup> Even the American Academy of Pediatrics (AAP) warned against "fever phobia" and overuse of fever-reducing drugs:<sup>21</sup>

*"Appropriate counseling on the management of fever begins by helping parents understand that fever, in and of itself, is not known to endanger a generally healthy child. In contrast, fever may actually be of benefit ...*

*When counseling a family on the management of fever in a child, pediatricians and other health care providers should minimize fever phobia and emphasize that antipyretic use does not prevent febrile seizures."*

Further, in their advice for parents wondering if they should treat their child's fever, AAP states, "The key is to watch your child's behavior. If they are drinking, eating, sleeping normally, and are able to play, you do not need to treat the fever. Instead, you should wait to see if the fever improves by itself."<sup>22</sup>

Remember, the point of the fever is to stimulate the immune system and create an inhospitable environment for invading organisms, essentially turning up the heat high enough that the invading microbes cannot live. So, anytime you lower a fever artificially you're making your body more hospitable to the invading pathogens.

Lowering a fever with medications also masks your symptoms, which may lead you to return to your normal activities too soon, when your body could still benefit from extra rest. The drugs may also prolong illness. In a study of acetaminophen for children with chickenpox, the drug led to prolonged itching and time to scabbing compared to placebo treatment.<sup>23</sup>

Further, a study of adults with colds found that aspirin and acetaminophen suppressed production of antibodies and increased cold symptoms, with a trend toward longer infectiousness.<sup>24</sup>

These medications also carry risks of side effects, including liver damage with acetaminophen, stomach upset with Ibuprofen and Reye's syndrome with aspirin. It's recommended that children under 19 not be given aspirin when they have a fever, due to the link to Reye's syndrome.

## **When Is a Fever Dangerous?**

It's rare for a fever to rise higher than 104 or 105 degrees F, and as long as your child isn't distressed, there is no harm in letting a fever run its course. Keep in mind also that fevers tend to spike in the late afternoon and evening, so a slight increase in fever during this time is not necessarily cause for alarm.

In most cases, rest and plenty of fluids is all that's needed when a fever strikes. Fever does increase fluid loss, so it's important to give your child plenty of fluids, even if they don't feel thirsty, to prevent dehydration. There are some instances, however, when a fever does require medical attention. This includes:

- Fever in an infant younger than 3 months (at any temperature)
- Fever above 102.2 degrees F (39 degrees C) in children between 3 months and 36 months, if they appear ill
- Anytime a fever rises over 104.5 degrees F (40 degrees C)

- In some cases of sepsis or neurological injuries, uncontrolled fever may lead to worse outcomes<sup>25</sup>

In children 5 years and under, fever can also lead to a seizure, known as a febrile seizure. Though this can be frightening, it typically will cause no lasting effects. During a febrile seizure, lay your child on his side or stomach on the ground, loosen any tight clothing and support the child to prevent injury.

When the seizure stops, you should seek medical attention right away to be sure the seizure was not caused by something other than the fever, such as meningitis or bacteria in the blood.

However, remember that letting a fever run its course is typically the best choice to fight off a viral or bacterial infection. You can further bolster your immune system's ability to ward off pathogens, and reduce the likelihood of developing a fever in the first place, by **eating right**, getting plenty of daily movement, using sound methods for stress relief and sleeping well.

## Sources and References

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