

March 12, 2025  
By [Akshay Syal, M.D.](#)

Measles isn't just a [rash and a fever](#).

The disease [outbreak in West Texas](#) that continues to grow has sent 29 people, most of them small children, to the hospital. Two people have died, including a 6-year-old child.

It's not yet known how many people have gotten sick in the outbreak — there are at least 223 confirmed cases, but experts believe hundreds more people may have been infected since late January. As public health officials try to slow the spread of the highly contagious virus, some experts are worried about longer-term complications.

Measles is unlike other childhood viruses that come and go. In severe cases it can cause pneumonia. About 1 in 1,000 patients develops encephalitis, or swelling of the brain, and there are 1 or 2 deaths per 1,000, according to the Centers for Disease Control and Prevention.

The virus can wipe out the immune system, a complication called “immune amnesia.”

When we get sick with viruses or bacteria, our immune systems have the ability to form memories that quickly allow them to recognize and respond to the pathogens if they're encountered again.

Measles targets cells in the body, such as plasma cells and memory cells, that contain those immunologic memories, destroying some of them in the process.

“Nobody escapes this,” said Dr. Michael Mina, a vaccine expert and former professor of epidemiology at Harvard T.H. Chan School of Public Health, who has led some of the research in the field.

In a 2019 study, Mina and his team found that a measles infection can wreck anywhere from [11% to 73% of a person's antibody stockpile](#), depending on how severe the infection. That means that if people had 100 antibodies to chickenpox before they had measles, they may be left with just 50 after measles infections, potentially making them more vulnerable to catching it and getting sicker.

Akiko Iwasaki, a professor of immunology at the Yale School of Medicine, said: “That's why it's called amnesia. We forget who the enemies are.”

While virtually everybody who gets infected with measles will have their immune systems weakened, some will be hit harder than others.

“There's no world in which you get measles and it doesn't destroy some [immunity],” he said. “The question is does it destroy enough to really make a clinical impact.”

In an earlier study from 2015, Mina estimated that before vaccinations, when measles was common, the virus [could have been implicated in as many as half of all childhood deaths from infectious disease](#), mostly from other diseases such as pneumonia, sepsis, diarrheal diseases and meningitis.

The researchers found that after a measles infection, the immune system can be suppressed almost immediately and remain that way for two to three years.

“Immune amnesia really begins as soon as the virus replicates in those [memory] cells,” Mina said.

The best defense against serious complications is the [measles vaccine](#). Two doses of the vaccine are 97% effective in preventing infection.

## **What is ‘immune amnesia’?**

Our bodies are constantly exposed to a variety of bacteria and viruses in the environment. Over time, our immune systems can learn to remember the specific intruders and spring into action quickly if they find something that doesn’t belong in the body.

“Kids are in contact with all sorts of microbes, and most of those encounters don’t lead to illness,” said Dr. Adam Ratner, a pediatrician and the director of the division of pediatric infectious disease at NYU Langone Health. “The child will often recover and have memory, so if they see the same strain of a virus that causes diarrhea they will get less sick the second time that they’re exposed to it.”

With immune amnesia, he said, if people are exposed to the same strain of virus again, their bodies behave as if it was the first time and they don’t have that robust protection.

That means the measles virus can destroy the immunity people have built up over time to things like the common cold, the flu, bacteria that can cause pneumonia or any other pathogen.

Mina draws a comparison to HIV, saying the level of immunosuppression in a severe measles infection can be compared to untreated HIV for years. He cautioned, however, that HIV affects different parts of the immune system and that people’s immune systems can eventually recover from measles.

## **How does measles wreck the immune system?**

The highly contagious virus can destroy long-lived plasma cells that reside in our bone marrow and are essential to our immune systems. The cells are like factories that pump out antibodies to protect us from intruders that enter our bodies.

“It’s almost like bombing a sacred city,” Mina said, referring to the potential devastation of plasma cells after a measles infection.

Measles also targets cells in our bodies called memory cells, cells that remember what intruders look like so our immune systems can quickly identify and fight them in the future.

Once we breathe in the virus, it gets engulfed by cells called macrophages, which act as a “trojan horse” to take the virus to our lymph nodes, Iwasaki said.

Once there, the virus is able to bind to and destroy those memory cells, wiping out some of our built-up immunity in the process.

“Once [memory cells] are eliminated, we basically don’t have memory for those particular pathogens anymore, so you become more susceptible to pretty much any infection that’s unrelated to measles,” Iwasaki said.

## **Does the immune system recover?**

The way the body starts to regain its immune memory after being walloped by measles is by getting exposed to other viruses and bacteria and becoming sick again, building up immunity.

While such immunity can be relearned, it can lead people to be especially prone to other infections right after measles, said John Wherry, an immunologist at the University of Pennsylvania.

“As every parent of a daycare-old child knows, if you’re building a lot of immunity in that time you’re suffering through it,” Wherry said.

Mina compared relearning our immunity to why it seems babies are frequently sick.

“That sickness that babies get is not because babies are more fragile. It’s just because they don’t have the same immunological memory set yet,” he said. “They have to spend a few years to get it built up through exposure, and that’s kind of what people go through after measles.”

## **How measles can cause brain inflammation**

More frightening is an untreatable measles complication called subacute sclerosing panencephalitis (SSPE), a brain disease that can occur 10 years or more after someone recovers from the infection and is almost always fatal.

For reasons not well understood, the measles virus can cause a persistent infection that can lead to damage in the brain, resulting in cognitive decline, coma and death.

Researchers believe SSPE, once considered rare, may be more common than realized. A [review of measles cases in California](#) from 1998 to 2015 found that SSPE cases occurred at a higher-than-expected rate among unvaccinated children.

The disease is progressive, and symptoms typically occur in phases, said Dr. Bessey Geevarghese, a pediatric infectious disease specialist at Northwestern Medicine.

“It can start with just personality changes and behavioral changes,” she said. In children, it can be something as subtle as worse performance in school.

The disease then progresses and can eventually cause seizures and abnormal movements, Geevarghese said. Finally, parts of the brain that regulate our vital signs, like breathing, heart rate and blood pressure, are damaged, which can lead to death.

There is no cure for the disease, and it is almost always fatal. Patients usually survive one to three years after diagnosis. In the United States, there are typically four to five cases every year, but that may be an underestimate, said Ratner, of NYU Langone Health.

“It’s probably more common than we think it is, because it’s not necessarily always diagnosed,” he said. “But as these outbreaks become more common, I think we will obviously see more cases of SSPE.”



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