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T cells may be key to stopping measles virus—and its deadly relatives

LJI researchers discover that 'cross-reactive' T cells can recognize measles and the highly lethal Nipah virus

Highlights:

- Measles cases are rising, and many are concerned about a closely related virus called Nipah virus.
 - Scientists are eager to develop vaccines or therapies to fight these viruses and their relatives across the paramyxovirus family.
 - In a new study, scientists from La Jolla Institute for Immunology (LJI) show exactly how "cross-reactive" T cells can recognize many species of paramyxovirus at once.
 - These findings may guide the development of new vaccines and therapies that stop measles, Nipah, and other paramyxovirus infections before they turn deadly.
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LA JOLLA, CA—T cells are some of the immune system's most important warriors. They can stop tumor growth and even fight off severe infections. Now scientists at La Jolla Institute for Immunology (LJI) have discovered how T cells target paramyxoviruses, a viral family that includes measles virus and Nipah virus.

Paramyxoviruses are pathogens of pandemic concern. Measles virus is highly infectious, and Nipah virus has a high mortality rate. The new study shows how we might harness T cells to save lives.

Instead of vaccinating against one virus at a time, the researchers found that activating "cross-reactive" T cells may protect against the wider paramyxovirus family. This broad protection is essential when you don't know which virus will strike next.

"No one knows which particular viral species or strain of a virus might be responsible for an outbreak, as we've seen in the recent cases of Andes hantavirus," says study leader LJI Professor [Alessandro Sette, Dr.Biol.Sci.](#)

"Activating T cells can be your first line of defense when you don't know what's going to be thrown at you," adds study co-leader LJI Research Assistant Professor [Alba Grifoni, Ph.D.](#)

The new *Cell Reports Medicine* study was supported by the National Institutes of Health's National Institute of Allergy and Infectious Diseases (NIAID) and the Coalition for Epidemic Preparedness Innovations (CEPI).

T cells are key to fighting emerging diseases

T cells are part of the adaptive immune system, which means each T cell adapts and learns to target a specific threat. A T cell might respond to influenza virus infection but not malaria parasite infection, for example. T cells are specialists.

How do our T cells do it? Each T cell looks for a specific small molecular site that marks friend from foe. Scientists call these sites "epitopes." In general, T cell epitopes on one pathogen look very different from T cell epitopes on another pathogen.

But viruses aren't as sneaky as they seem. Even as viruses evolve, some "conserved" features remain unchanged within viral families.

That's where immunologists come in. LJI scientists have shown that some T cells can "cross-react" to different viruses, as long as the viruses share similar epitopes.

In a series of [landmark studies](#) during the COVID-19 pandemic, Sette, Grifoni, LJI Assistant Professor Daniela Weiskopf, Ph.D., and Professor and Chief Scientific Officer Shane Crotty, Ph.D., showed that cross-reactive T cells can recognize the family resemblance between different coronaviruses. A person who had previously contracted a common cold coronavirus may already have T cells primed to recognize SARS-CoV-2, the coronavirus that causes COVID-19.

More recently, Sette and Grifoni demonstrated that cross-reactive T cells may offer broad protection against the deadly Lassa virus and the wider viral family of arenaviruses. [Read: [We can help the body fight entire viral families](#)] Their findings suggest that future vaccines and therapies could activate these cross-reactive T cells to protect against many dangerous viruses at once.

Each study makes it clear: cross-reactive T cells are key to stopping emerging viruses.

Why paramyxoviruses are a problem

Doctors and scientists in the United States have their eyes on one virus in particular: measles virus. Falling vaccination rates have led to a surge in measles cases in recent years. In 2026 alone, the United States has had [2,033 confirmed measles cases](#). Already, we are on track to surpass the total U.S. measles cases in 2025.

Measles is a threat worldwide. People in Southeast Asia also have to keep watch for a related threat: Nipah virus. Nipah virus is a paramyxovirus that is spread by bats. Cases are rare, but they turn deadly, fast. Nipah virus has a fatality rate of between 40 percent and 75 percent, which is much higher than measles. "Outbreaks are becoming more and more frequent, especially in the Malaysian region," says Grifoni.

The new LJI study suggests cross-reactive T cells may be just the weapons we need to combat the dangerous paramyxovirus family.

The scientists worked with LJI's [John and Susan Major Center for Clinical Investigation](#) to collect and analyze T cells from the blood of 31 study participants. These study participants had received their MMR vaccines, which protect against severe infection from the measles and mumps viruses (both are paramyxoviruses) and the rubella virus. As a result, the blood samples contained T cells that were ready to fight measles infection.

First, the researchers studied exactly *how* these T cells recognized their enemy. When the T cells spotted measles, what did they see?

LJI Postdoctoral Fellow Alison Tarke, Ph.D., and LJI Senior Staff Scientist Ricardo Da Silva Antunes, Ph.D., spearheaded experiments to map T cell epitopes on measles virus.

These findings were important on their own. "Even though measles has been studied for quite some time, and there is a vaccine for measles, there was not a lot known about the specific T-cell response elicited by the measles vaccine," says Sette.

T cells take aim at Nipah virus

Alison Tarke and the LJI team then tested how these same T cells reacted to Nipah virus. From blood tests, the scientists knew that the study participants had never been infected with Nipah virus. Their T cells hadn't had a chance to "adapt" or learn to target epitopes on Nipah virus.

And yet—the researchers found that some measles-fighting T cells could also recognize Nipah virus. These T cells had the ability to cross-react between the two related viruses. The two paramyxoviruses had "conserved" epitopes in common.

"Focusing immune responses on these conserved regions could have a broad, protective capacity for the whole viral family," says Sette.

The new study is actually the first to map T cell epitopes on Nipah virus. The researchers were also able to zero in on a specific epitope shared between measles and Nipah viruses: a region of the viral fusion or "F" protein. A large number of cross-reactive T cells targeted this relatively small, conserved viral structure.

"It appears that if someone is vaccinated against measles, their T cells will have some degree of cross-reactivity to Nipah," says Sette. "That raises the possibility that during a Nipah outbreak, one could perhaps vaccinate people with a measles vaccine, and this cross-reactivity could potentially offer some benefit."

Learn more:

[LJI Center for Vaccine Innovation](#)

CEPI article: [The Paramyxoviruses](#)

Additional authors of the study, "Comprehensive mapping of human CD4+ T cell epitopes for Nipah and measles as prototype Paramyxoviruses," include Mariah Macias, Claudia Francisco Morales, Tanner Michaelis, Leila Siddiqui, Esther Dawen Yu, Raphael Trevizani, Abril Zuniga, Christian Zmasek, Elizabeth Phillips, Simon Mallal, Brandon Lin, Jesus O. Estevez, Jonathan R. Erlich, Nicole V. Johnson, Jason S. McLellan, April Frazier, and Gene S. Tan.

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