

Gut microbes protect against neurologic damage from viral infections

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Gut microbes produce compounds that prime immune cells to destroy harmful viruses in the brain and nervous system, according to a mouse study published today in *eLife*.

The findings suggest that having healthy and diverse microbiota is essential for quickly clearing viruses in the nervous system to prevent paralysis and other risks associated with diseases such as multiple sclerosis.

A condition that causes progressive damage to nerve cells, multiple sclerosis has become more common over the past several decades. Viral infections in the brain or spinal cord are thought to trigger this disease. Some scientists believe that changes in the way we eat, increased sanitation or growing antibiotic use may be causing detrimental changes in the [helpful bacteria](#) that live within the human body, potentially increasing the risk of multiple sclerosis and other related diseases.

"We wanted to investigate whether gut microbes could alter the immune response to a virus in the central nervous system and whether this affects the amount of damage the virus causes," says one of the lead authors David Garrett Brown, a graduate research assistant in the Department of Pathology at University of Utah Health, Salt Lake City, US.

To do this, Garrett Brown and co-lead author Ray Soto looked at the effect of Mouse Hepatitis Virus, a virus that infects cells in the mouse nervous system and causes multiple-sclerosis type symptoms, on two groups of mice: some with normal gut microbes and some that were bacteria-free. They found that bacteria-free mice had a weak [immune response](#), were unable to eliminate the virus and developed worsening paralysis, while those with normal gut bacteria were better able to fight off the virus.

Mice treated with antibiotics before the onset of disease were unable to defend themselves. They also had fewer [immune cells](#) called microglia, which help flag viruses for destruction by other immune cells.

Next, the team identified compounds produced by gut bacteria that

might help the microglia. When they administered these helpful compounds to the bacteria-free mice, they saw that the animals were protected from neurologic damage caused by the [virus](#).

"We've shown that [gut microbes](#) protect infected mice from paralysis by turning on a specific pathway in central nervous system [cells](#)," explains June Round, Associate Professor in the Department of Pathology at University of Utah Health, and a co-senior author alongside Professor Thomas Lane, from the same department. "This suggests that signals from microbes are essential to quickly clear viruses in the [nervous system](#) and prevent damage from multiple sclerosis-like diseases. Our results emphasise the importance of maintaining a diverse community of bacteria in the gut, and that interventions to restore this community after taking antibiotics may be necessary."

More information: D Garrett Brown et al, The microbiota protects from viral-induced neurologic damage through microglia-intrinsic TLR signaling, *eLife* (2019). [DOI: 10.7554/eLife.47117](https://doi.org/10.7554/eLife.47117)

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