

Study in mice places blame on immune system

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Sustained stress erodes memory, and the immune system plays a key role in the cognitive impairment, according to a new study from researchers at The Ohio State University.

The work in mice could one day lead to treatment for repeated, long-term mental assault such as that sustained by bullying victims, soldiers and those who report to beastly bosses, the researchers say.

"This is chronic stress. It's not just the stress of giving a talk or meeting someone new," said lead researcher Jonathan Godbout, associate professor of neuroscience at Ohio State.

This is the first study of its kind to establish the relationship between short-term memory and prolonged stress. In the case of the mice, that meant repeat visits from a larger, nasty intruder mouse.

Mice that were repeatedly exposed to the aggressive intruder had a hard time recalling where the escape hole was in a maze they'd mastered prior to the stressful period.

"The stressed mice didn't recall it. The mice that weren't stressed, they really remembered it," Godbout said.

They also had measurable changes in their brains, including evidence of inflammation brought on by the immune system's response to the outside pressure. This was associated with the presence of immune cells, called

macrophages, in the brain of the stressed mice.

The research team was able to pin the short-term memory loss on the inflammation, and on the immune system.

Their work, which appears in *The Journal of Neuroscience*, builds on previous research substantiating the connections between [chronic stress](#) and lasting anxiety.

The impact on memory and confirmation that the brain inflammation is caused by the immune system are important new discoveries, Godbout said.

"It's possible we could identify targets that we can treat pharmacologically or behaviorally," he said.

It could be that there are ways to interrupt the inflammation, said John Sheridan, who worked on the study and is associate director of Ohio State's Institute for Behavioral Medicine Research.

The mice used in the study are exposed to repeated social defeat - basically dominance by an alpha mouse - that aims to mimic chronic psychosocial stress experienced by humans.

Researchers at Ohio State seek to uncover the secrets behind stress and cognitive and mood problems with a long-range goal of finding ways to help those who are anxious, depressed and suffer from lasting problems, including [post-traumatic stress disorder](#).

This new research focused on the hippocampus, a hub of memory and emotional response.

The researchers found that the stressed mice had trouble with spatial

memory that resolved within 28 days. They found that the mice displayed social avoidance, which measures depressive-like behavior, that continued after four weeks of monitoring.

And they were able to measure deficits in the development of new neurons 10 days and 28 days after the prolonged stress ended.

When they gave the [mice](#) a chemical that inhibited inflammation, neither the brain-cell problem nor the depressive symptoms went away. But the memory loss and inflammatory macrophages did disappear.

And that led them to conclude that the post-stress memory trouble is directly linked to inflammation - and the [immune system](#) - rather than to other damage to the brain. That type of information can pave the way for immune-based treatments, Godbout said.

"Stress releases immune cells from the bone marrow and those cells can traffic to brain areas associated with neuronal activation in response to stress," Sheridan said. "They're being called to the brain, to the center of [memory](#)."

Provided by The Ohio State University

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