

Study shows how social support may protect brain during stroke

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New research in mice suggests that high levels of social support may provide some protection against strokes by reducing the amount of damaging inflammation in the brain.

Researchers at Ohio State University found that male mice that lived with a female partner before and after a stroke had a much higher survival rate compared to those mice that lived alone.

In addition, the paired mice suffered much less brain damage than did the surviving solitary mice.

"Under nearly every measure, it seems that there was something about living together that protected the mice by reducing the damaging inflammatory response," said Kate Karelina, lead author of the study and a doctoral student in neuroscience at Ohio State University.

In a series of experiments, Karelina and her colleagues induced experimental strokes in male mice. Some of the mice lived with a female partner for two weeks before the stroke and continuing afterwards. Other mice lived alone before and after the stroke. A control group of mice underwent similar surgery in the brain, but did not have an induced stroke.

The researchers presented their work Nov. 18 in Washington, D.C., at the annual meeting of the Society for Neuroscience.

The effects of social isolation were devastating in mice that lived alone, the findings revealed.

All of the mice that lived with another mouse survived seven days after the stroke – but only 40 percent of socially isolated animals lived that long.

The reasons for the higher survival rate for the socially housed mice were evident when the researchers compared brain tissues of mice after the stroke.

The researchers examined tissue samples in different groups of mice 12 hours, one day, three days or seven days after the stroke to determine the extent of damage.

"We confirmed that that social isolation contributes to the extent of neuronal damage in the brain as early as 24 hours after the stroke," said Courtney DeVries, associate professor of psychology and neuroscience at Ohio State, and a member of the university's Institute of Behavioral Medicine Research.

The amount of tissue damage in the brain was about four times larger in the mice housed alone compared to those housed with another mouse.

"The number of neurons dying is significantly decreased in the pair-housed mice," DeVries said.

In addition, socially housed mice had significantly less edema, or excess water in the brain, when compared to the isolated animals.

"In clinical stroke, edema is a major concern because it can lead to additional neuronal damage, so it is significant that pair housing reduced edema," Karelina said.

The study showed that two genes associated with damaging inflammation in the brain – MAC-1 and glial fibrillary acidic protein, or GFAP – showed decreased activation in the socially housed mice.

In addition, findings revealed that mice that lived with others had significantly higher levels of a cytokine in their brain called interleukin-6 (IL-6) that has an anti-inflammatory response in the brain, helping to limit damage caused by the stroke.

The finding about IL-6 is especially interesting, Karelina said, because IL-6 appears to have opposite effects in the brain than it does in the rest of the body.

"IL-6 reduces inflammation in the brain, so it is protective in a stroke, but it is a pro-inflammatory in the periphery of the body," Karelina said.

One practical result of this finding, DeVries said, is to caution researchers as they look for ways to limit damaging inflammation in the body.

For example, if drug developers wanted to develop a medicine to reduce levels of IL-6 in the body in order to minimize its pro-inflammatory response, they would have to take into account that IL-6 actually protects the brain by reducing inflammation there.

Overall, the study provides some early clues as to how social support may protect people who suffer strokes.

"We're learning more about what it is about social support that helps stroke victims have more positive outcomes," Karelina said.

Source: Ohio State University

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