

## Study suggests why heart attack victims do better with social support

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Researchers have identified specific damages to the brain that may occur when heart attack victims are socially isolated from others. The study in mice found that those animals that lived alone before undergoing a heart attack showed five to eight times more damage to neurons in one part of the brain than did similar animals that lived with others.

While studies in humans have shown that socially isolated heart attack victims have a lower survival rate than others, this study may help reveal the mechanisms behind that result, said Zachary Weil, co-author of the study and former doctoral student in neuroscience at Ohio State University.

"This study shows that there are basic changes that occur in the brain when a heart attack victim is socially isolated," Weil said.

"In these mice, living with others seemed to provide strong protection from some of the damaging results of a heart attack."

The study appears in the October 2008 issue of the journal *Molecular Psychiatry*.

In the study, mice were put into two groups – members of one group lived alone, while the others lived communally in a cage with four other mice.

After two weeks with these living arrangements, some of the mice



underwent a surgically induced heart attack. Those in a control group underwent the same surgical procedure, but the researchers prevented any loss of oxygen to the brain that would occur in a typical heart attack.

Brain tissue and blood samples were later collected from the mice. Researchers compared damage in the hippocampus, the area of the brain that plays a key role in memory. A lack of oxygen during a severe heart attack – one where the victim stops breathing – can either kill or seriously damage neurons, the primary cells of the nervous system.

Results showed that the mice that were socially isolated prior to the heart attack showed five to eight times more damage to their neurons compared to mice that were housed together, said Weil, who is now a post-doctoral researcher at Rockefeller University in New York.

Socially isolated mice also showed evidence of greater inflammation in the hippocampus, when compared to socially housed and control mice.

"There was a runaway inflammatory response in the tissue of socially isolated mice, which is damaging to the brain," said Randy Nelson, a coauthor of the study and professor of psychology and neuroscience at Ohio State.

Socially isolated mice showed increased activation of microglia, a type of immune cell in the central nervous system that responds to damaged neurons, the study found.

One of the ways microglia respond is by releasing tumor necrosis factor alpha (TNF-a), one of a large family of proteins called cytokines -chemical messengers that are mobilized when the body is injured or has an infection. These cytokines cause inflammation in their effort to repair an injured or infected area of the body.



Levels of TNF-a were elevated in isolated mice, but not in socially housed mice, compared to the control mice.

The higher levels of TNF-a in the socially isolated mice, and the inflammation it caused, was the main reason for the increased neuronal damage in these animals, Nelson said.

"Inflammation is normally good, but in this case it is too much of a good thing," he said.

In addition, results showed that the isolated mice had higher levels of the stress hormone corticosterone following the heart attack. Other studies have linked elevated levels of this hormone to increased neuronal damage.

"We found that the hormonal stress response network is more activated after cardiac arrest in socially isolated animals," said Courtney DeVries, in whose lab the work was conducted and another co-author and associate professor of psychology and neuroscience at Ohio State.

"This is contributing to damage in the neurons."

DeVries said this study, and others in her lab and in labs across the country, have highlighted the importance of social isolation and relationships in health, and specifically in recovery from heart attacks and strokes.

In fact, studies have shown that social isolation is as strong a predictor of one-year survival rates among heart attack victims as more classic risk factors such as high cholesterol and hypertension.

"One of the stumbling blocks has been that we haven't found the mechanism that explains why socially isolated individuals don't fare was



well when it comes to heart attacks.

"But this study shows there is a physical reason why isolated people don't do as well, and it has to do with the inflammatory response to a heart attack."

If these findings continue to be replicated, it may suggest new ways to help treat heart attack victims.

"It is very difficult to alter people's social networks, but if we can understand the exact mechanism behind why socially isolated people don't fare as well after a heart attack, we may be able to develop therapies that can improve their outcomes," DeVries said.

Source: Ohio State University

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