Astrocyte signaling sheds light on stroke research

March 18 2013

New research published in *The Journal of Neuroscience* suggests that modifying signals sent by astrocytes, our star-shaped brain cells, may help to limit the spread of damage after an ischemic brain stroke. The study in mice, by neuroscientists at Tufts University School of Medicine, determined that astrocytes play a critical role in the spread of damage following stroke.

The National Heart Foundation reports that ischemic strokes account for 87% of strokes in the United States. Ischemic strokes are caused by a blood clot that forms and travels to the brain, preventing the flow of blood and oxygen.

Even when blood and oxygen flow is restored, however, neurotransmitter processes in the brain continue to overcompensate for the lack of oxygen , causing brain cells to be damaged. The damage to brain cells often leads to health complications including visual impairment, memory loss, clumsiness, moodiness, and partial or total paralysis.

Research and drug trials have focused primarily on therapies affecting neurons to limit brain cell damage. Phil Haydon's group at Tufts University School of Medicine have focused on astrocytes, a lesser known type of brain cell, as an alternative path to understanding and treating diseases affecting brain cells.

In animal models, his research team has shown that astrocytes—which outnumber neurons by ten to one—send signals to neurons that can

spread the damage caused by strokes. The current study determines that decreasing astrocyte signals limits damage caused by stroke by regulating the neurotransmitter pathways after an ischemic stroke.

The research team compared two sets of mice: a control group with normal astrocyte signaling levels and a group whose signaling was weakened enough to be made protective rather than destructive. To assess the effect of astrocyte protection after ischemic strokes, motor skills, involving tasks such as walking and picking up food, were tested. In addition, tissue samples were taken from both groups and compared.

"Mice with altered astrocyte signaling had limited damage after the stroke" said first author Dustin Hines, Ph.D., a post-doctoral fellow in the department of neuroscience at Tufts University School of Medicine. "Manipulating the astrocyte signaling demonstrates that astrocytes are critical to understanding the spread of damage following stroke."

"Looking into ways to utilize and enhance the astrocyte's protective properties in order to limit damage is a promising avenue in stroke research," said senior author Phillip Haydon, Ph.D. Haydon is the Annetta and Gustav Grisard professor and chair of the department of neuroscience at Tufts University School of Medicine and a member of the neuroscience program faculty at the Sackler School of Graduate Biomedical Sciences at Tufts.

More information: Hines, D.J., Haydon, P.G. (2013). Inhibition of a SNARE-Sensitive Pathway in Astrocytes Attenuates Damage following Stroke. The *Journal of Neuroscience*, vol 33 issue 10, pp 4234-4240; DOI: 10.1523/JNEUROSCI.5495-12.2013

Provided by Tufts University