New findings disprove old truth about brain cells

November 16 2006

The most common cells in the brain changes their behavior when the tissue is damaged, but their appearance does not change nearly to the extent that researchers thought. The domains of individual astrocytes are well contained in both healthy and damaged tissue. This is shown in a new study from the Sahlgrenska Academy in Gothenburg, Sweden.

The study was performed in collaboration with a US research team. The findings are being presented today in the prestigious scientific journal *Proceedings of the National Academy of Sciences*.

Astrocytes are a type of non-neuronal cells that exits in all parts of the central nervous system. They form a complex network in the brain, where their offshoots are in constant contact with other astrocytes.

"The discovery is a major step toward a better understanding of the course of events in brain damage, stroke, or dementia. Astrocytes control many neurological functions, including the brain's capacity to repair itself," says Professor Milos Pekny.

Until now scientists have assumed that astrocyte shoots grow longer and thicker in various pathological conditions and that this would mean that the cell shoots cross each other in the brain. This theory has now been disproven by the study, which provides another picture of how astrocytes are affected by a disease.

"It's true that the shoots from reactive astrocytes become thicker, but the

overall range of the cells does not increase. Altogether cells attain the same volume of brain tissue as previously and they do not penetrate into the territory of neighboring astrocytes," says researcher Ulrika Wilhelmsson.

When there is damage to the brain or if a stroke occurs, astrocytes help limit the damage, but later they also cause negative scarring, which makes it more difficult for the brain to repair itself.

Previous studies have shown that in connection with brain damage astrocytes alter their production and release of molecules.

"Astrocytes communicate with each other by exchanging ions and various molecules through contact with the shoots of neighboring astrocytes. If the network is intact, as in stroke, it can be assumed that the astrocyte communication network is rather stable," says Ulrika Wilhelmsson.

Even though astrocytes are the most common cell type in the human brain, they have previously been difficult to study.

This study used a new strategy to visualize the shoots of reactive cells. A dye was injected into contiguous astrocytes so the scientists could see how much the domains of the cells overlapped.

The findings are based on studies of brain tissue from hippocampus and the cerebral cortex in mice.

Citation: Wilhelmsson et al. PNAS.2006; 103: 17513-17518

Source: The Swedish Research Council)