New class of stem cell-like cells discovered offers possibility for spinal cord repair

15 September 2011

The Allen Institute for Brain Science announced today the discovery of a new class of cells in the spinal cord that act like neural stem cells, offering a fresh avenue in the search for therapies to treat spinal cord injury and disease. The published collaborative study, authored by scientists from the University of British Columbia, the Allen Institute for Brain Science and The Montreal Neurological Institute and Hospital at McGill University and titled "Adult Spinal Cord Radial Glia Display a Unique Progenitor Phenotype," appears in the open access journal *PLoS One*.

The research team utilized the Allen Spinal Cord Atlas, a finely detailed genome-wide map of gene expression throughout the mouse spinal cord, to compare the genes expressed, or turned on, in adult spinal cord radial glia with those found in other neural stem cells, revealing a signature set of 122 genes that indicate the likeness of these cells to classic neural stem cells.

The nervous system has historically been thought to be incapable of repairing itself, as the cells used to create it are exhausted during development. With the identification of these new stem cell-like radial glial cells, it may be possible to activate a certain set of genes in order to encourage those cells to reconstruct a damaged network in the adult spinal cord.

"By using the Allen Spinal Cord Atlas, we were able to discover a brand new cell type that has previously been overlooked and that could be an important player in all manner of spinal cord injury and disease, including multiple sclerosis and ALS," said Jane Roskams, Ph.D., neuroscientist at the University of British Columbia and senior author of the study.

From disabled veterans to those afflicted with Lou Gehrig's disease (ALS) or Spinal Muscular Atrophy, spinal cord related diseases and disorders affect people of all ages including nearly one-quarter of a million Americans who have suffered from a spinal cord injury; as many as 30,000 Americans who suffer from ALS at any given time; and approximately 2.5 million people worldwide who suffer from multiple sclerosis.

"This is a tremendous example of how our public atlas resources can lead to critical discoveries that offer promising avenues for developing much needed new clinical therapies," said Allan Jones, Ph.D., Chief Executive Officer of the Allen Institute.

Dr. Roskams, who led the collaborative research team, has said that it is possible this pool of cells was overlooked because of its unusual location, and because scientists have been working with limited information. With the availability of the public, online Allen Spinal Cord Atlas, the information accessible to researchers has been vastly increased.

In the search for neural stem cells, scientists have been using a few known genes as clues to find candidates deep in the middle of the spinal cord. While some neural stem cells have been discovered there, the newly identified class of spinal cord radial glia run along the edge of the spinal cord, an incredibly convenient location for activating them with minimal secondary damage to help the spinal cord repair during disease or after injury.

"When we first saw known neural stem cell genes appearing in these cells on the edge of the cord, I realized we not only had a brand new cell, but had the capacity to reveal a new gene set that may also guide us to hidden neural stem cells in atypical locations in the brain. I did not expect so many of them to link to human diseases," Dr. Roskams said.

Identifying these cells and the genes relevant to activate them opens fresh new pathways to explore effective therapies to treat spinal cord injury and several types of neurodegenerative disease.

More information: Petit, A. et al. (2011) Adult Spinal Cord Radial Glia Display a Unique Progenitor Phenotype. *PLoS ONE* 6(9): e24538. doi:10.1371/journal.pone.0024538

Provided by Allen Institute for Brain Science