Animal study shows human brain cells repair damage in multiple sclerosis

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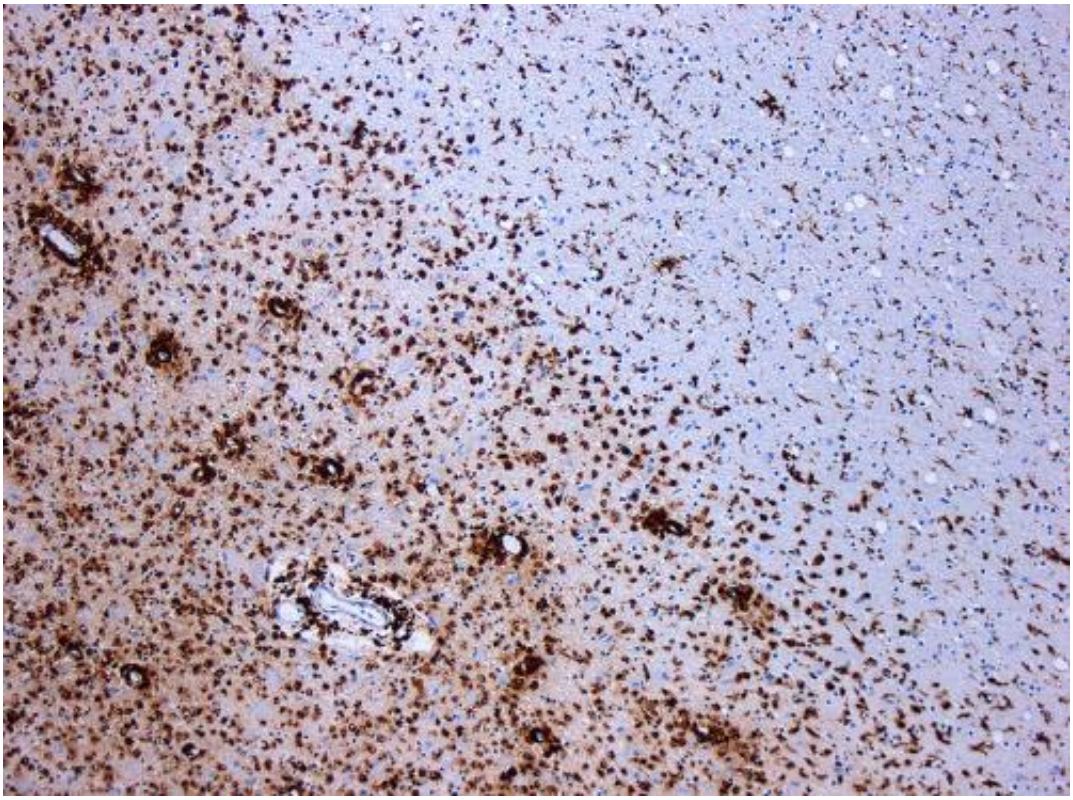

Demyelination by MS. The CD68 colored tissue shows several macrophages in the area of the lesion. Original scale 1:100. Credit: CC BY-SA 3.0 Marvin 101/Wikipedia

A new study shows that when specific human brain cells are transplanted into animal models of multiple sclerosis and other white matter diseases, the cells repair damage and restore function. The study provides one of

the final pieces of scientific evidence necessary to advance this treatment strategy to clinical trials.

"These findings demonstrate that through the transplantation of human glial cells, we can effectively achieve remyelination in the adult brain, " Steve Goldman, M.D., Ph.D., professor of Neurology and Neuroscience at the University of Rochester Medical Center (URMC), co-director of the Center for Translational Neuromedicine, and lead author of the study. "These findings have significant therapeutics implications and represent a proof-of-concept for future clinical trials for multiple sclerosis and potential other neurodegenerative diseases."

The findings, which appear in the journal *Cell Reports*, are the culmination of more than 15 years of research at URMC understanding support cells found in the brain called glia, how the cells develop and function, and their role in neurological disorders.

Goldman's lab has developed techniques to manipulate the chemical signaling of embryonic and induced pluripotent stem cells to create glia. A subtype of these, called glial progenitor cells, gives rise to the brain's main support cells, astrocytes and oligodendrocytes, which play important roles in the health and signaling function of nerve cells.

In multiple sclerosis, an autoimmune disorder, glial cells are lost during the course of the disease. Specifically, the immune system attacks oligodendrocytes. These cells make a substance called myelin, which, in turn, produce the "insulation" that allow neighboring nerve cells to communicate with one another.

As myelin is lost during disease, signals between nerve cells becomes disrupted, which results in the loss of function reflected in the sensory, motor, and cognitive deficits. In the early stages of the disease, referred to as relapsing multiple sclerosis, the lost myelin is replenished by

oligodendrocytes. However, over time these cells become exhausted, can no longer serve this function, and the disease becomes progressive and irreversible.

In the new study, Goldman's lab showed that when human glia progenitor cells are transplanted into adult mouse models of progressive multiple sclerosis, the cells migrated to where needed in the brain, created new oligodendrocytes, and replaced the lost myelin. The study also showed that this process of remyelination restored motor function in the mice. The researchers believe this approach could also be applied to other neurological disorders, such as pediatric leukodystrophies—childhood hereditary diseases in which myelin fails to develop—and certain types of stroke affecting the white matter in adults.

This research is in the process of being developed by a University of Rochester start-up company Oscine Therapeutics. The company's experimental transplant therapy for multiple sclerosis and other glial diseases, such as Huntington's disease, is currently under early FDA review for clinical trials. Goldman is the scientific founder, an officer, and holds equity in the company.

Provided by University of Rochester Medical Center