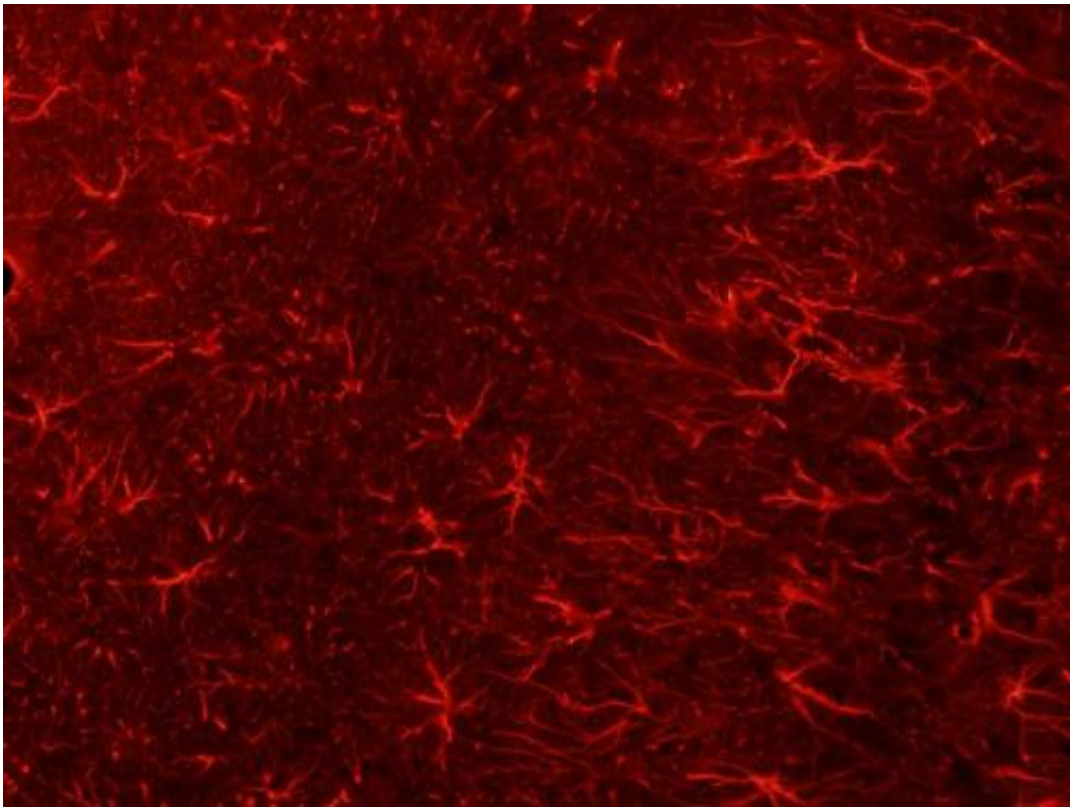
Adding human glial cells to mice brains found to improve memory and cognition

December 3 2014, by Bob Yirka



Glial cells in a rat brain stained with an antibody against GFAP. Credit: Orchinik Lab, Arizona State University, via Wikipedia

(Medical Xpress)—A team of researchers working at the University of Rochester in New York, has found that injecting glial cells into a mouse brain caused an improvement in both memory and cognition in the mouse. In their paper published in *The Journal of Neuroscience*, the team

explains how they injected the test mice and then tested them afterwards to see what impact it had on their abilities.

Injecting human brain cells into mice brains appears to be the stuff of horror films, but in this case, it wasn't really what it might have seemed. Glial cells are precursors to other cells—in this case, they develop into astrocytes, which are technically, brain cells. But, the important distinction here is that they are not neurons, which means they are not involved in thinking—instead they are involved in memory retention and help with housekeeping tasks.

Last year, the team injected mature glial cells into mice brains and reported improvements in ability by the mice—this time they went further, injecting progenitor precursor glial cells, which allows for development of more astrocytes. The team injected just 300,000 of the cells (from donated human embryos) and found just 12 months later that they had multiplied to grow to 12 million, completely displacing the original mouse astrocytes. It appeared, the team reported, that the cell growth only stopped when it reached the physical confines of the skull. They also note that it was interesting that the glial could thrive in such an environment considering that astrocytess in people are 10 to 20 times as big as those in mice and they carry 100 times as many tendrils. Testing the mice showed that their memory was far superior to normal mice and they had improved cognition as well.

In another experiment, the researchers injected mice that had a form of mouse multiple sclerosis with the same types of glial cells—the mice had trouble with generating myelin, the protein nerve insulator, which is problematic for those with MS. They found that a lot of the glial cells they injected into the mice matured into oligodendrocytes which are responsible for myelin generation—somehow the brain had recognized what was lacking and made corrections based on the new cell presence.

The team is considering testing the same procedure with other animals, but says it will not do it with monkeys—the ethical issues might become too great.

More information: A Competitive Advantage by Neonatally Engrafted Human Glial Progenitors Yields Mice Whose Brains Are Chimeric for Human Glia The *Journal of Neuroscience*, 26 November 2014, 34(48): 16153-16161; DOI: 10.1523/JNEUROSCI.1510-14.2014

Abstract

Neonatally transplanted human glial progenitor cells (hGPCs) densely engraft and myelinate the hypomyelinated shiverer mouse. We found that, in hGPC-xenografted mice, the human donor cells continue to expand throughout the forebrain, systematically replacing the host murine glia. The differentiation of the donor cells is influenced by the host environment, such that more donor cells differentiated as oligodendrocytes in the hypomyelinated shiverer brain than in myelin wild-types, in which hGPCs were more likely to remain as progenitors. Yet in each recipient, both the number and relative proportion of mouse GPCs fell as a function of time, concomitant with the mitotic expansion and spread of donor hGPCs. By a year after neonatal xenograft, the forebrain GPC populations of implanted mice were largely, and often entirely, of human origin. Thus, neonatally implanted hGPCs outcompeted and ultimately replaced the host population of mouse GPCs, ultimately generating mice with a humanized glial progenitor population. These human glial chimeric mice should permit us to define the specific contributions of glia to a broad variety of neurological disorders, using human cells in vivo.