# Brain's white matter -- More 'talkative' than once thought

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Johns Hopkins scientists have discovered to their surprise that nerves in the mammalian brain's white matter do more than just ferry information between different brain regions, but in fact process information the way gray matter cells do.

The discovery in mouse cells, outlined in the cover story of the March issue of *Nature Neuroscience*, shows that brain cells "talk" with each other in more ways than previously thought.

"We were surprised to see these nerve axons talking to other cells in the white matter," says Dwight Bergles, Ph.D., an associate professor of neuroscience at Hopkins.

The discovery focuses on oligodendrocyte precursor cells (OPCs), whose main role when they mature into oligodendrocytes is to wrap themselves around and insulate nerves with a whitish coat of protective myelin. The immature cells simply hang around and divide very slowly, waiting to be spurred into action.

To learn more about OPCs that reside in the brain's white matter, the Johns Hopkins researchers measured activity from individual precursor cells in the corpus callosum, a region of white matter that connects the two brain hemispheres. To their surprise, OPCs were found to have electrical signals produced by the neurotransmitter glutamate, similar to the signals used as the principle means of cell-to-cell communication and information processing in the gray matter. The phenomenon was

unlikely, they said, because in the mouse brain, OPCs in the myelin-rich white matter are far from synapses, the points of contact between nerves where glutamate is released.

Theorizing that OPCs might have experienced glutamate in some less obvious way in this area of the brain, Bergles and his team studied nearby nerve cells to figure out where the glutamate might be coming from.

By forcing single nerve cells to become excited one at a time, they discovered that as electrical impulses are carried along the nerves, glutamate is released and causes electrical signals in the OPCs. A further microscopic hunt revealed that pools of glutamate were present in the nerve fibers wherever they touched OPCs. All of the nerve cells in the white matter that released glutamate within reach of OPCs, moreover, had something in common: no myelin insulation.

Normally myelin speeds electrical impulses. Cells lacking the coating fire 20 to 90 times slower than cells coated with myelin. Myelin loss is well known to impair signaling and information processing, causing nerve cells to die and creating such neurodegenerative conditions as multiple sclerosis.

Bergles speculates that this white matter activity his team discovered may help “naked” nerve cells signal nearby OPCs and say “cover me with myelin because we need to replace another cell that has been damaged.”

Source: Johns Hopkins Medical Institutions