Scientists coax nerve fibers to re-grow after spinal cord injury

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Researchers at the University of Michigan Medical School and Johns Hopkins University have developed a treatment that helps animals with traumatic spinal cord injuries grow new nerve fibers.

The study has implications for treating people who may face amputation of an arm after an injury in which nerves are wrenched from the spinal cord. Called brachial plexus avulsion, this type of injury occurs when an arm is pulled violently away from the body. In people, it most often occurs in motorcycle accidents or during childbirth.

The findings will be published in the July 18 issue of the *Proceedings of the National Academy of Sciences*.

The researchers chose to mimic this type of injury in their study, because it involves nerves at the boundary between the spinal cord and the peripheral nervous system that connects to the rest of the body.

Rats with nerve injuries that received a nerve-transplant and were treated with an enzyme called sialidase, grew more than twice as many new nerve fibers in the spinal cord compared to untreated rats. Moreover, the researchers found that the new fibers were made by nerve cells residing in the spinal cord.

"A new treatment to enhance our current surgical management of brachial plexus avulsion in people would be welcomed by patients and surgeons alike," says Lynda Yang, M.D., assistant professor of

neurosurgery at the University of Michigan Medical School and lead author of the study.

While surgeons can sometimes reattach the yanked nerves to the spinal cord, this treatment is not as effective as physicians or patients would like. This is in part because nerves in the brain and spinal cord, unlike those in the rest of the body, fail to grow new nerve fibers.

"If you sever your finger, it can be surgically reattached, and nerve fibers typically grow back so that you can use your finger again; in contrast, the injured brain and spinal cord are rocky terrain for nerve fiber growth. Finding ways to smooth that road might help the nerve fibers to re-grow," says co-author Ronald Schnaar, Ph.D., professor of pharmacology and neuroscience at the Institute of Basic Biomedical Sciences at Johns Hopkins University.

Nerves in the brain and spinal cord are surrounded by signals from other cells in the injured area that stop them from growing. Molecules in the spinal cord, called axon regeneration inhibitors, ARIs, are known to stop nerve fibers from growing. The researchers tested three enzymes, including sialidase, which are known to destroy ARIs.

Rats that received a nerve transplant followed by treatment with sialidase showed the greatest improvement in nerve re-growth.

In the next phase of research, Yang will determine whether the new nerves are able to re-establish muscle control. "We're very interested in seeing how much function you can get back," she says.

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