

Helping Lost Neurons Find Their Way

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Spinal cord injuries are often a worst-case diagnosis for people who suffer accidents because they may mean permanent disability. Unlike a broken leg or pulled muscle, spinal cord injuries do not heal themselves over time.

One of the great hopes of modern medicine is that science, particularly the field of biomedical engineering, will someday help heal spinal cord injuries by guiding and stimulating the regenerating neurons to replace the lost connections. But regenerating neurons is not enough. The neurons must also get wired up correctly. They may not be able to do this on their own, however, because the scar tissue formed where the spinal injury occurs may be thick and impossible for neurons to grow across.

Now Thomas P Beebe, Jr. and his colleagues at the University of Delaware have developed a technology for patterning molecules on a surface in a way that can help guide the growth of new neurons. Naturally developing neurons use such patterns much like cars use GPS or global positioning systems to help guide them in the right direction as they grow. Beebe and his colleagues have made their patterned surfaces on glass and polymer surfaces, and they can watch neurons grow on these slides under the microscope. Right now, they are trying to find the optimal conditions that will help the neurons grow across the slide.

"Understanding what causes the neurons to grow fast, to turn around and grow the other way, or not to grow at all, is the first step in the eventual design of a new biotechnology aimed at spinal cord injuries," said Beebe. "This is promising, but we are years away from helping people to

walk again."

The idea is to use this basic neuronal technology to develop a healing scaffold—a device made of pliable mesh, porous gels, or some other implantable material that can be used to regenerate spinal cords. Application of this technology may also someday help in the treatment of neurodegenerative diseases in the brain and spinal cord. This technology, however, is not tested in the clinic, and it would have to prove to be safe and effective in clinical trials before becoming widely available.

Beebe's talk, "Patterned Protein Gradients of Extracellular Matrix Protein Affect Cell Attachment and Axonal Outgrowth" will be on Tuesday October 21, 2008, at the AVS 55th International Symposium in Boston.

Abstract: www.avssymposium.org/paper.asp?abstractID=1147 .

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