MedicalXpress

What research brings spinal cord-injured patients closer to a cure?

November 8 2010, by Annette Ostrand

Millions of people worldwide experience spinal cord injuries. Breakthroughs bring researchers progress, but a complete cure is a long way off.

Spinal cord repair focuses on finding ways to make axons regrow and connect properly, replace damaged neurons, protect surviving neurons from further injury and retrain neural circuits to repair body functions.

Professor Hans Werner Muller at the University of Dusseldorf (Germany) is testing the effect of a combinatorial treatment to make injured axons regenerate. “Nobody really believes in a pill or single injection that will cure paraplegia,” he said. ” That is a dream that will never come true, because the situation is so complex and each injury looks different. In the same patient there are also different problems. So it’s widely accepted in this field that we have to look for complementary treatments. There are inhibitors in the CNS preventing regeneration and growth factors supporting growth. Some people believe stem, glial or genetically modified cell implantation could be beneficial. There’s a plethora of different approaches and in all areas there are partial beneficial effects. Our initial approach was to prevent scar formation, an impediment for axon generation, and we managed to make axons in rats grow further with the treatment. If, for instance, you get 10-15 percent of the axons to generate it may be sufficient for a significant recovery. The CNS is very plastic. Even if another of the same kind of target cell is invaded by the axon the system will be able to learn. We don’t know what the proportion of learning and correct connection is; that’s why

rehabilitation is so important and means that the system learns. Our next step is to stimulate the axons to grow faster and I'm waiting for a major development in this field. So far clinical trials have been unsuccessful in showing functional recovery," M?ller said.

California-based Geron Corporation and the University of California showed over five years ago that animals which lost myelin insulation during spinal cord injuries improved their ability to move when injected with human embryonic stem cell (hESC)-derived oligodendrocyte progenitor cells (OPCs). These cells developed into glia cells and restored the myelin insulation needed for functional spinal cord impulse transmission. In October Geron announced that a patient paralysed by spinal cord injury had been treated with the hESC-derived OPCs. The company's first step is to evaluate treatment safety. On the long road to a cure the trial will also measure trunk and lower extremities sensation and improved neuromuscular control.

Instead of developing axon regeneration or stem cell treatment, Professor Sten Grillner at the Karolinska Institute in Sweden is studying the spinal cord central pattern generator networks which are changed in spinal cord- injured patients. "We are investigating which transmitters and ion channels are contributing to the networks which are generating locomotor movement. We are also investigating how we could use drugs to make it easier for the few remaining fibers to control the spinal cord circuits."

Another approach that might help spinal cord-injured patients through facilitating regrowth of neurons and nerve fibers includes a synthetic hydrogel scaffold. "After a spinal cord injury a cavity usually forms making it difficult for neurons to regrow or nerve fibers to cross the cavity. Our idea is to fill the cavity with hydrogel so fibers can grow through the injured area and growth factors can be brought in. Biocompatibility animal tests showed no damage from the gel itself,"

UCLA researcher Bingbing Song said.

Currently there are many promising projects, but even successful researchers in the field find it impossible to estimate how close they are to a major breakthrough that could significantly change millions of lives.

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