'Neural Bridge' Research on Paralysis Could Offer Hope for Future

On behalf of Johnston, Moore & Thompson

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Today, people with severe spinal cord injuries and paralysis face a fairly definite prognosis of a lifelong loss of function, with limited opportunity for improvement gained only through grueling work. However, ongoing medical research into stem-cell therapy and electronic stimulation may provide long-term hope that a catastrophic injury may someday no longer mean a life sentence for injured people and their families.

Research taking place now at UCLA has developed an electronic "neural bridge" for rats whose hind legs are completely paralyzed. Spinal cord injury researcher V. Reggie Edgerton and graduate student Parag Gad have succeeded in helping the paralyzed rats run on all fours again.

More research needs to be done before the technique could be moved forward for human development, but the UCLA research shows a great deal of promise for helping people suffering from spinal cord injuries and other forms of paralysis.

UCLA 'Neural Bridge' Allows Paralyzed Rats to Run

After a major spinal cord injury, the brain is unable to communicate with the muscles through the spinal cord, which is why some spinal cord injuries cause paralysis. However, researchers say that, even after a complete severing of the spinal cord, the body retains neural "circuitry" that can allow the spinal cord to send messages to the muscles.

The spinal cord and muscles retain the ability to perform complex functions like walking, and the sequence of movement required for walking is "stored" in the spinal cord -- it doesn't require conscious thought. The only problem is that, after a spinal cord injury, the brain can't tell the spinal cord and muscles to begin.

"The signal coming down from the brain isn't to activate this muscle and then this muscle and then this muscle," says Edgerton. "It's to activate a program that's built into the circuitry. A message comes down from the brain that says step. The spinal cord knows what stepping is; it just has to be told to do that."

Edgerton and Gad attach the "neural bridge" to electrodes that are placed on the outer membrane of the spinal cord. The bridge, combined with a muscle-stimulation technique called electromyography (EMG), tells the spinal cord what the brain would tell it: "Start walking."

Even more exciting, Edgerton and Gad have created a system where the trigger for the rats' hind legs to start walking is keyed to their attempt to walk with their front legs.

EMG is already being used to help amputees control their prosthetic limbs, but Edgerton and Gad have been able to create an even, rhythmic gait that goes beyond what has been achieved by stimulating the muscles directly through EMG.

"We want to see what kind of strategies could be used for a patient to be able to control when to turn it on and when to turn it off," says Edgerton. "[Gad] has developed a system so that the rat has control. It doesn't necessarily know that it has control, but when it moves the forelimbs, the hind limbs are going to be turned on."

Source: Technology Review, "Device Helps Paralyzed Rats Walk Again," Lauren Gravitz, December 3, 2010