

Stem cells used to successfully regenerate damage in corticospinal injury

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Writing in the March 28, 2016 issue of *Nature Medicine*, researchers at University of California, San Diego School of Medicine and Veterans Affairs San Diego Healthcare System, with colleagues in Japan and Wisconsin, report that they have successfully directed stem cell-derived neurons to regenerate lost tissue in damaged corticospinal tracts of rats, resulting in functional benefit.

"The corticospinal projection is the most important motor system in humans," said senior study author Mark Tuszynski, MD, PhD, professor in the UC San Diego School of Medicine Department of Neurosciences and director of the UC San Diego Translational Neuroscience Institute. "It has not been successfully regenerated before. Many have tried, many have failed—including us, in previous efforts."

"The new thing here was that we used [neural stem cells](#) for the first time to determine whether they, unlike any other cell type tested, would support regeneration. And to our surprise, they did."

Specifically, the researchers grafted multipotent [neural progenitor cells](#) into sites of [spinal cord](#) injury in rats. The stem cells were directed to *specifically* develop as a spinal cord, and they did so robustly, forming functional synapses that improved forelimb movements in the rats. The feat upends an existing belief that corticospinal neurons lacked internal mechanisms needed for regeneration.

Previous studies have reported functional recovery in rats following

various therapies for spinal cord injury, but none had involved regeneration of corticospinal axons. In humans, the corticospinal tract extends from the cerebral cortex in the upper brain down into the spinal cord.

"We humans use corticospinal axons for voluntary movement," said Tuszynski. "In the absence of regeneration of this system in previous studies, I was doubtful that most therapies taken to humans would improve function. Now that we can regenerate the most important motor system for humans, I think that the potential for translation is more promising."

Nonetheless, the road to testing and treatment in people remains long and uncertain.

"There is more work to do prior to moving to humans," Tuszynski said. We must establish long-term safety and long-term functional benefit in animals. We must devise methods for transferring this technology to humans in larger animal models. And we must identify the best type of [human](#) neural stem cell to bring to the clinic."

More information: Spinal cord reconstitution with homologous neural grafts enables robust corticospinal regeneration, *Nature Medicine*, [DOI: 10.1038/nm.4066](https://doi.org/10.1038/nm.4066)

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