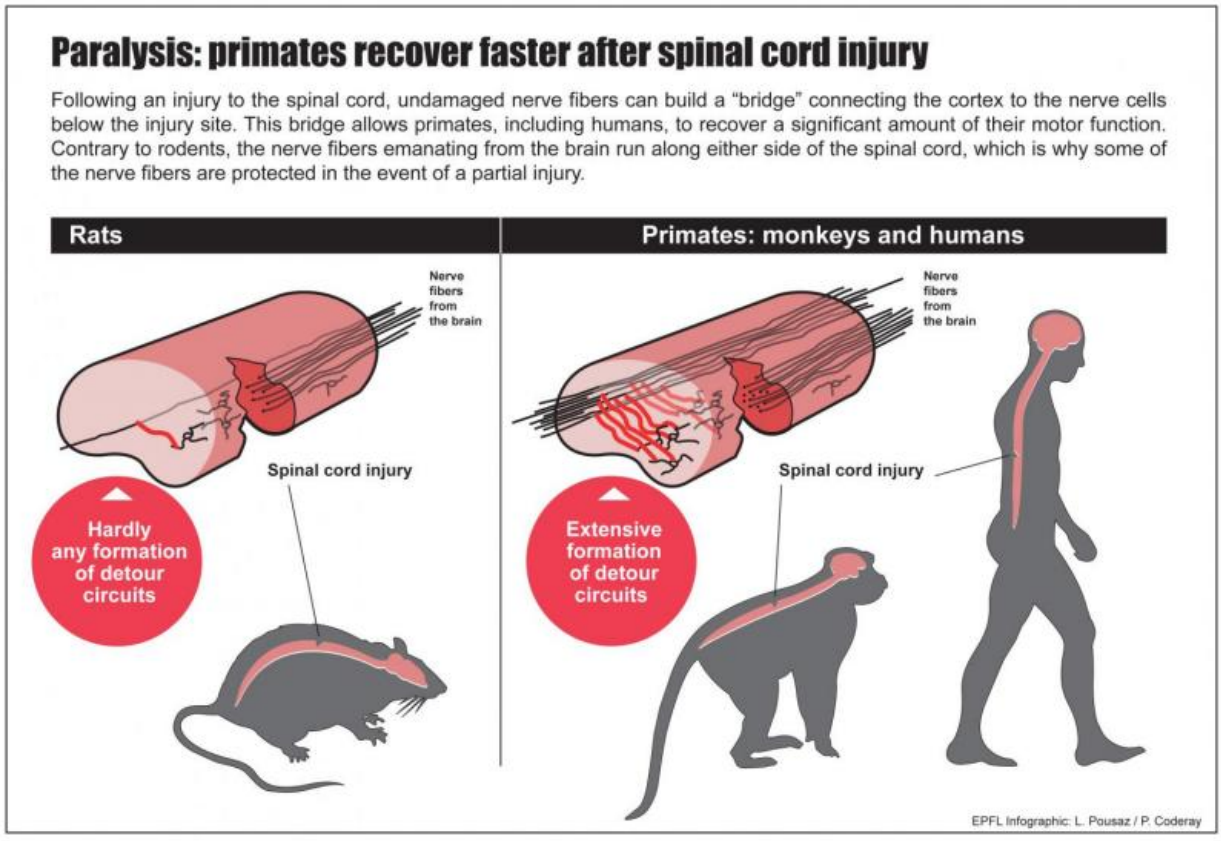
MedicalXpress

Paralysis: Primates recover better than rodents, offer more accurate human model

August 26 2015



This infographic shows why primates are better at recovering their function after a spinal cord lesion. Credit: © EPFL, P. Coderay / L. Pousaz

Monkeys and humans exhibit greater motor recovery than rats after similar spinal cord injury, according to a study conducted in Grégoire

Courtine's lab at EPFL. The study results have been published in *Science Translational Medicine*.

Spontaneous improvement occurs during the first six months after a spinal cord injury, allowing a hemiplegic patient to recover partial motor control. The researchers are using this observation to improve clinical trials and patient therapies. The neuronal mechanisms underlying this extensive recovery in primates are nearly absent in laboratory rats, according to the EPFL researchers.

"Research on rats is essential for developing regenerative therapies," said Dr. Courtine, "but rodents show fundamental differences from primates in terms of neuronal reorganization and functional recovery." The reason for this lies in differences in anatomy and function of the corticospinal tract, which are the fibers through which the cortex communicates with the spinal cord. In rats, the corticospinal tract is mainly located in the dorsal column and is restricted to one side of the spinal cord, whereas in monkeys and humans this pathway migrated to the lateral column, expand in size, and became bilateral.

"Because of these anatomical specificities, many fibers are spared after an injury," said Dr. Courtine. "The corticospinal tract forms detour circuits around the lesion, restoring communication between the brain and the neuronal circuits that control the movement of the arms and legs. This neuroplasticity is minimal in rats."

The more complex the movement required - such as grasping an object or walking along a horizontal ladder - the greater the differences between the two species. While rats recover the ability to walk on flat ground, they are no longer capable of picking up food or positioning their paws accurately. Monkeys and humans, on the other hand, recover fine motor control and the ability to grasp objects.

The difference is even more pronounced if the lesions are lateralized rather than symmetric, because the fibers are found on both sides of the spinal column in primates. These observations are consistent with those of more than 400 human patients with cervical lesions.

The identification of this primate-specific mechanism of recovery has major implications for future research. Using primate models rather than rat models will improve the design of therapies to repair the human spinal cord and increase the accuracy of predictive models of recovery.

More information: Pronounced species divergence in corticospinal tract reorganization and functional recovery after lateralized spinal cord injury favors primates, stm.sciencemag.org/lookup/doi/ … scitranslmed.aac5811

Provided by Ecole Polytechnique Federale de Lausanne

Citation: Paralysis: Primates recover better than rodents, offer more accurate human model (2015, August 26) retrieved 25 April 2024 from https://medicalxpress.com/news/2015-08-paralysis-primates-recover-rodents-accurate.html