Using stem cells to promote nerve regeneration

9 October 2013

Johns Hopkins researchers from the Department of Plastic and Reconstructive Surgery report that a type of stem cell found easily in fat cells and also in bone marrow promoted nerve regeneration in rats with paralyzing leg injuries and in some of the rodents that received hind-leg transplants.

The findings mark a step forward in understanding how mesenchymal stem cells (MSCs) may improve nerve regeneration after injury and limb transplant, while potentially minimizing the need for lifelong immunosuppression after reconstructive surgery to replace a lost limb, say study leaders W.P. Andrew Lee, M.D., and Gerald Brandacher, M.D. Such immunosuppressive drug therapy carries many unwanted side effects.

"Mesenchymal stem cells may be a promising add-on therapy to help damaged nerves regenerate," says John Pang, a medical student at the Johns Hopkins University School of Medicine, who is expected to present the findings on Wednesday. "We obviously need to learn much more, but we are encouraged by what we learned from these experiments."

MSCs most frequently become bone, cartilage and fat in the bodies of mammals, and researchers have been able to coax them in test tubes into becoming nerve cells and skin that lines blood vessels and tissue.

Notably, MSCs are not recognized by the body as foreign, making them less likely to trigger an immune system response or attack. Instead, these stem cells appear to secrete proteins that suppress the immune system in specific ways. Pang says it is those properties researchers hope to harness and use to not only regenerate nerve cells, but also to help transplant patients avoid immunosuppressant drugs.

The Johns Hopkins team notes that harvesting MSCs is a relatively simple procedure, because accessible stores are found in body fat. They can also be extracted from bone marrow, a slightly more complicated process.

The Johns Hopkins researchers experimented with three groups of rats: those whose femoral nerves were cut and repaired; those that received a hind-leg transplant from the same biological type of rat; and animals that received a transplant from a different type. Some rats had MSCs injected directly into the sciatic nerve, while others received them intravenously into the bloodstream.

After 16 weeks, the researchers say the rats with severed and repaired nerves treated with MSCs showed significant improvements in nerve regrowth and nerve signaling. Those with transplants from similar rats appeared to also show benefit. The rats whose transplants came from dissimilar rodent types—the situation most similar to a human transplant from a cadaver—rejected their new limbs.

Provided by Johns Hopkins University School of Medicine

APA citation: Using stem cells to promote nerve regeneration (2013, October 9) retrieved 20 September 2020 from https://medicalxpress.com/news/2013-10-stem-cells-nerve-regeneration.html