SPINAL CORD INJURY TREATMENTS

ADULT STEM CELLS VS. EMBRYONIC STEM CELLS

Touted ESCR Spinal Cord Injury Studies in Animals:

2005 California researchers used human embryonic stem cells to treat rats with acute but not chronic spinal cord injury. The stem cells were turned into the nerve cells that surround spinal cords, and the rats showed modest functional improvement. The experiment was not continued long enough to test for tumors. Keirstead H et al., "Human embryonic stem cell derived oligodendrocyte progenitor cell transplants remyelinate and restore locomotion after spinal cord injury," *J Neuroscience* 25, 4694-4705, May 11, 2005.

2005 Researchers used human embryonic stem cells to remyelinate the protective sheath around injured rat spinal cords. However, there was no test for any functional recovery. Nistor GI et al., "Human embryonic stem cells differentiate into oligodendrocytes in high purity and myelinate after spinal cord transplantation," *Glia* 49, 385-396, February 2005.

1999 Researchers used human embryonic stem cells in rats with spinal cord injury. The rats showed some functional improvement. McDonald JW et al., "Transplanted embryonic stem cells survive, differentiate and promote recovery in injured rat spinal cord," *Nature Medicine* 12, 1410-1412, December 1999.

1999 German researchers showed that embryonic stem cells could form protective myelin sheaths around nerves in rats with spinal cord injury. There was no test for any functional recovery. Brüstle O et al., "Embryonic Stem Cell-Derived Glial Precursers: A Source of Myelinating Transplants," *Science* 285, 754-756, July 30, 1999.

Adult Stem Cells Treat Spinal Cord Injury in Humans and Animals:

2005 Extending earlier results, Wisconsin and Swedish researchers injected neural stem cells into rats with spinal cord injury. The study shows reduction of pain, and increased recovery of function and feeling. Hofstetter CP et al., "Allodynia limits the usefulness of intraspinal neural stem cell grafts; directed differentitation improves outcome," *Nature Neuroscience* 8, 346-353, March 2005.

2004 Dr. Carlos Lima in Portugal transplanted nasal stem cells into patients with spinal cord injury and they regained some motor function. 34 patients have received the nasal stem cell transplant and have shown some improvement of motor function. Reported in the Telegraph, Highfield, Roger, "New hope for paralysed woman," June 12, 2004. (http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2004/12/06/ncell06.xml&sSheet=/news/2004/12/06/ixnewstop.html) For Congressional testimony of Lima's collaborator, Dr. Jean Peduzzi, see: http://www.stemcellresearch.org/testimony/peduzzi-nelson.htm.

2004 Ohio State researchers transplanted bone marrow stromal cells into rats that had contusive spinal cord injuries, and found that the adult stem cells provided a protective environment that preserved spinal cord tissue and helped guide nerve regeneration. Ankeny DP et al., "Bone marrow transplants provide tissue protection and directional guidance for axons after contusive spinal cord injury in rats," *Experimental Neurology* 190, 17-31, 2004.

2004 Japanese scientists tested the effects of bone marrow stromal cells on repair of injured spinal cord. The study demonstrated that the adult stem cells promoted both tissue recovery and behavioral improvements in rats. Ohta M et al., "Bone marrow stromal cells infused into the cerebrospinal fluid promote functional recovery of the injured rat spinal cord with reduced cavity formation," *Experimental Neurology* 187, 266-278, 2004.

2003 University of South Florida and Korean researchers used human umbilical cord blood stem cells to treat rats with spinal cord injuries. They found that the cord blood stem cells migrated to areas of injury, and the rats showed significant behavioral improvements even when treated several days after the injury. Saporta S et al., "Human umbilical cord blood stem cells infusion in spinal cord injury: Engraftment and beneficial influence on behavior," *J Hematotherapy Stem Cell Research* 12, 271-278, 2003.

2002 A collaboration between researchers at Tulane and in Sweden found that adult bone marrow stromal cells promote healing of spinal cord injuries, and that the cells produced significant functional improvement. The study concluded that bone marrow stromal cells are an accessible, expandable source of cells that offer a promising future for spinal cord repair. Hofstetter CP et al., "Marrow stromal cells form guiding strands in the injured spinal cord and promote recovery," *Proc Natl Acad Sci USA* 99, 2199-2204, February 19, 2002.

2002 Australian scientists injected nasal stem cells into adult animals with severed spinal cords. The cells regenerated spinal cord and improved both the function and structure of the animals. The study concluded that nasal cells are among the best to repair damaged spinal cords. Lu J et al., "Olfactory ensheathing cells promote locomotor recovery after delayed transplantation into transected spinal cord," *Brain* 125, 14-21, 2002.

2001 Researchers transplanted bone marrow stem cells into rats with spinal injuries, and the cells repaired some spinal damage. The study concluded that bone marrow stem cells can differentiate in living animals and show ability to repair spinal injuries. M. Sasaki et al., "Transplantation of an acutely isolated bone marrow fraction repairs demyelinated adult rat spinal cord axons," *Glia* 35, 26-34, July 2001.

2000 Scientists in Spain used nasal stem cells to treat rats with severed spinal cords. The group notes that the adult stem cell transplants "promote functional recovery of paraplegic adult rats and long-distance motor axon regeneration in their completely transected spinal cords", and showed "dramatic functional improvement and anatomical repair." Ramon-Cueto A. et al., "Functional recovery of paraplegic rats and motor axon regeneration in their spinal cords by olfactory ensheathing glia," *Neuron* 25, 425-435, February 2000.