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# Quiescent pluripotent stem cells reside within murine peripheral nerves and can be stimulated to proliferate by rhBMP2 or by nerve trauma

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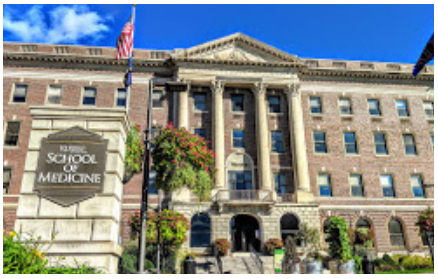
## Abstract

A novel and distinct newly discovered source of pluripotent stem cells obtainable from the peripheral nerves of mouse, rat and human that are believed to solve the most vexing problems presently hampering efforts to apply the use of use of stem cells to safe and effective clinical treatments will be described. A large population of quiescent cells within peripheral nerves which in response to nerve injury or stimulation with the cytokine BMP2, proliferate and generate populations of pluripotent stem cells has been documented. The cells express Sox2, Klf4, Oct4 and c-Myc, the four transcription factors that confer embryonic pluripotency, as verified by double stain immunohistochemistry and by real time PCR. The discovery should allow harvest of patient-specific auto grafts provided by growing these cells from a nerve specimen obtained from the patient in need of treatment of an appropriate expendable nerve, such as a branch if the purely sensory sural nerve. The cells propagate well in restrictive media, and are readily induced to form tissues from all three germ layers. They have been induced to differentiate into (endodermal) osteoblasts and endothelial cells, as well as definitive endoderm and (ectodermal) primitive nerve cells and fibroblasts. This represents a newly discovered type of naturally occurring pluripotent stem cells whose natural function appears to be to heal injuries, not to generate an embryo. We have also studied skin wound healing in a standardized murine skin healing model. Wounds treated with fluorescently labelled stem cells or with fibroblasts derived from them healed more quickly than controls, and abundant fluorescently labelled cells were found incorporated in the scar. As nerves are nearly ubiquitous in the body, we propose that nerve injury and the consequent proliferation of these stem cells will occur as a fundamental healing process in response to essentially any injury. Further, this insight could make self-to-self auto grafts of stem cells or differentiated cells derived from them routine, and this may offer a promising option for cellular therapies that would bypass existing problems of ethical and immune rejection issues with embryo derived stem cells, and of malignant transformation in iPCs. It has not escaped our attention that the human diseases which are accompanied by poor wound healing (Diabetes, Leprosy and Syphilis), are also associated with depletion of viable Schwann cells within the peripheral nerves. There are also many animal models (amphibian, mammalian, and invertebrate) where non-functional nerves are associated with impaired healing.

## Biography

M Heggeness, completed his PhD at UC San Diego in membrane biology, and a postdoc at Rockefeller University in Virology. He received his MD from the University of Miami. After a residency in Orthopaedic Surgery, he was completing a fellowship in Spine Surgery at the University of Toronto. He then joined the faculty at Baylor College of Medicine where he became Chairman of Orthopaedic Surgery in 2004. He moved take the Orthopaedic Surgery Chair at University of Kansas in Wichita in 2013. He has 84 publications and 4 issued patents.

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