Research Interests

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  Neuroprotection of the injured spinal cord
  Regenerative medicine for spinal cord injury using stem cell and tissue
engineering approaches
  Mechanisms of glial-axonal signalling using electrophysiological and
imaging approaches.
  Spinal cord and brain repair with a focus on Cerebral Palsy
  Clinical trials bringing lab-tested therapeutics to clinic
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Our laboratory integrates molecular, imaging, electrophysiological and neurobehavioural approaches to examine the pathophysiology and treatment of central nervous system injury, using spinal cord injury as a model system. Current studies in SCI are focused on understanding the mechanisms of neuronal and glial apoptosis after SCI, axonal-glial signaling, development of novel neuroprotective strategies and the use of stem cell transplantation strategies to repair the spinal cord. The translation from benchside to bedside is a key goal of our research and is exemplified in the team□s involvement in clinical trials.

Our laboratory plays a leading role in SCI-NET (Spinal Cord Injury New Emerging Team)–a unique, interdisciplinary team of clinicians and scientists with expertise in micro-neurosurgery and neurotrauma (Fehlings and Tator, UHN), stem cell and growth factor biology (van der Kooy, Nagy and Morshead, U of T), tissue engineering and nanotechnology (Shoichet, U of T) and magnetic resolution imaging (Stroman, Queen□s University).

SCI-NET is examining three integrated strategies to treat SCI:

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  Application of cell-adhesive tubular constructs and neural stem cells for
spinal cord repair and regeneration;
  Optimization of cell survival after SCI with novel bio-engineered drug
delivery systems
  Enhancement of endogenous populations of neural stem cells for spinal cord
repair and regeneration.
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The SCI-NET team is a key part of the regenerative medicine program at the McLaughlin Center for Molecular Medicine which provides an excellent, collaborative research environment.

A more recent area of research is a forward and reverse translation investigation of therapies for Cerebral Palsy. In this study, the focus is on more fully understanding the underlying mechanisms of constraint induced movement therapy (CIMT), which is already in use in the clinic, in order to optimize timing and duration. In addition, the team will study stem cell therapies as a means of augmenting therapies already in use.

Finally, Dr. Fehlings is involved with several clinical trials.

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  Examining the use of Riluzole in cervical spondylotic myelopathy (CSM), a
common spinal condition.
  Examining the use of Riluzole in spinal cord injury.
  Approaches for the treatment of metastatic epidural spinal cord
compression and CSM.
  Surgical Timing in Acute Spinal Cord Injury Study (STASCIS). (published)
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