

Implantable neuromodulation: Using ionic direct current to treat chronic pain



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TREATMENT OF CHRONIC PAIN USING ELECTRICAL STIMULATION

Background: This subgroup is a part of the Neuropathic Pain Research group at the Translational Neuroscience Facility. We are interested in developing new ways to treat chronic pain using electrical stimulation via neural implants. Our ultimate goal is to develop and translate new technologies to communicate with the nervous system.

Our research:

Development of an implanted device that interfaces with peripheral nerves to deliver direct electrical current.



Fabrication and biocompatibility testing of soft implantable neural interfaces.



Surgery to perform chronic constriction injury of the sciatic nerve to model peripheral nerve damage.



Investigating how neuromodulation devices can be used to treat chronic pain while maintaining normal somatosensory function.



AVAILABLE PROJECTS

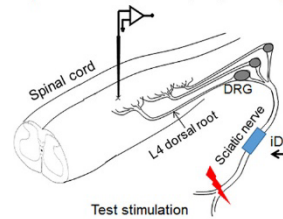
- Test the acute effects of direct current on the health of peripheral and spinal nerves.
- Examine the potential for simultaneous recording and neuromodulation of a nerve for “closed-loop” control.
- Investigate how neuromodulation affects spinal cord responses at the input (dorsal horn) vs output (spinothalamic tract).
- Optimise the design and surgical placement of a flexible sciatic nerve cuff for chronic implantation.

OUR TOOLS

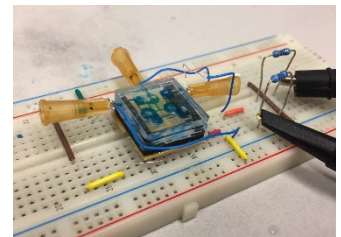
Resources/Technologies available:

- Animal models of nervous system damage
- High fidelity spinal cord and peripheral nerve electrophysiology recordings
- Soft silicone/paper device fabrication and electronics design
- Immunohistochemistry and confocal microscopy

A Spinal local field potential (LFP) recording



Experimental setup



Device testing

STUDY AIMS

- Understanding how the nervous system interacts with neuromodulation devices.
- Validation and translation of ionic direct current as a chronic treatment of neuropathic pain.
- Developing novel approaches for interfacing the nervous system with computers and technology.

OUR GROUP

The implantable neuromodulation group currently consists of:

- 1 postdoc (Felix Aplin);
- 1 PhD student (Catherine Guo); and
- 1 honours student (Tom Su).

