The Centre for Blood Research presents

CBR SUMMER SEMINAR SERIES

"Strategies for spinal cord repair: in vitro model and microelectrodes"

Date & Time: Wednesday, June 21 | 1:00PM - 2:00PM PT
Hybrid: Life Sciences Centre Room 1003 (LSC3) & Zoom

From the lab of: Dr. Karen Cheung, *Professor*
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Presented by: Tanya Bennet, Tara Caffrey, Paul Juralowicz, Iryna Liubchak, Emad Naseri, Joseph Sadden and Yas Oloumi Yazdi

Mend the Gap is an interdisciplinary project bringing together scientists, engineers, clinicians, and translation specialists to address the challenge of repairing the spinal cord after injury. The overall goal of Mend the Gap is to develop a treatment for spinal cord injury (SCI) using injectable biomaterials to support axonal growth across the spinal cord lesion. The hypothesis is that alignable structures within an injectable hydrogel will direct and extend axonal growth across the SCI lesion site and promote functional recovery. Our team contributes to the overall goal of Mend the Gap in three main research areas. First, we test the properties of injectable biomaterial bridges with a variety of in vitro platforms. We have developed a spinal cord injury chip that allows us to examine 3D neurite growth in a biomaterial after injury. Additionally, we fabricate mock spinal cord lesions using digital light processing 3D printing for examination of hydrogel injection and imaging of alignable structures in an enclosed volume. Currently we are optimizing a candidate injectable hydrogel using photoinitators to crosslink gelatin methacryloyl with visible light. Second, we are developing a controllable electromagnet to align magnetic structures within hydrogels. A configurable magnetic field generator is being developed to align the magnetic microstructures in various scales ranging from in vitro SCI chips to large animal models. Numerical simulations in MATLAB have been developed to model magnetic fields generated by various electromagnet designs; drawing insights from the simulations, prototypes have also been designed and fabricated. Third, we are developing flexible implantable microelectrodes to stimulate neuronal activity for use as a co-treatment with the injectable biomaterials bridge. We have designed the microelectrode array and made them using standard thin-film microfabrication techniques. This manufacturing process involves the deposition and patterning of repeated layers of insulative polyimide and conductive gold electrodes. Basic 2-electrode designs have been fully developed, and the manufacturing process has proven to work consistently among production runs.

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