Biomedical Discussion Group

Microtechnologies for modelling and monitoring biomechanical cell and tissue systems

Friday March 2, 2018
1:00 – 2:00 pm, East Campus 4 (EC4-2101a)
Coffee and Timbits available - RSVP required

Dr. Craig Simmons
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Distinguished Professor, Institute of Biomaterials and Biomedical Engineering
Scientific Director, U of T Translational Biology and Engineering Program, Ted Rogers Centre for Heart Research

Abstract: Cells in the body reside in three-dimensional, soft extracellular matrices where they interact with other cells and often are subjected to dynamic mechanical loading. Traditional cell culture platforms poorly represent the in vivo environment, which limits the novelty and translatability of the biological information they generate. In this talk, I will describe in vitro microfluidic platforms that we are developing to address these limitations. These "organ-on-a-chip" models are designed to better mimic the cellular microenvironment than traditional cell culture models, including biomechanical stimulation due to blood flow-induced shear stress and tissue deformation. In some cases, we have incorporated biosensors for on-chip monitoring of cell and tissue function. Applications I will highlight include screening of biomaterial properties for stem cell-based tissue regeneration, modeling bacterial dissemination, and drug screening in microfluidic vascularized tissue arrays.

Biosketch: Craig received his B.Sc. (Eng.) from the University of Guelph (1991), S.M. from the Massachusetts Institute of Technology (1994), and Ph.D. from the University of Toronto (2000). He then completed an NSERC Postdoctoral Fellowship at the University of Michigan (2000-2002) and an American Heart Association Postdoctoral Fellowship at the University of Pennsylvania (2002-2004) before returning to the University of Toronto faculty in 2005. Craig leads a talented group of researchers and students to discover new treatments for heart valve, heart muscle, and blood vessel diseases, including strategies to regenerate cardiovascular tissues using stem cells and biomaterials. His group also creates novel microfluidic platforms to model vascularized tissues and organs for improved drug testing.

Keywords: Biomedical engineering, Applied mechanics and design, cellular mechanobiology, cell, tissue and biomaterial micromechanics; design and application of microdevices that mimic complex physiological environments

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