Skeletal Tissue Mechanics Symposium Speaker – CSB 2018

Samuel P. Veres, BEng (Dalhousie), PhD (University of Auckland)

Affiliation: Primary: Division of Engineering, Saint Mary's University; secondary: School of Biomedical Engineering, Dalhousie University

Title of Talk: *Achieving tissue function through control of collagen fibril structure: how native variations in crosslinking alter load-bearing ability and resistance to disruption*

Abstract: Collagen fibrils, and consequently load-bearing collagenous tissues, gain mechanical competence through enzymatic intermolecular crosslinking. The collagen crosslinking profiles of musculoskeletal tissues appear to be carefully regulated according to functional requirements. Even between different anatomical instances of the same tissue type, significant variations are seen. In low stress tissues, such as digital extensor tendon, excessive loading can cause significant sliding between collagen molecules within fibrils, leading to permanent structural damage that must be repaired through cellular remodeling. Meanwhile, the collagen fibrils of high stress tissues, such as the patellar tendon, develop collagen crosslinking profiles that are able to effectively resist excessive intermolecular sliding when loaded at physiologically relevant rates. While nanoscale plasticity in low stress tissues appears to be effective in increasing tissue toughness and resistance to rupture during overload, the increased crosslinking density in high stress tissues appears necessary for resisting a lifetime of repeated loading with little reparative remodeling.

Bio: Sam Veres studies structure-function relationships in collagenous tissues with the goal of understanding the development and maintenance of physiologic performance in healthy tissue, and the interplay between disruption or alteration to tissue structure and disease. Investigations are often multiscale in nature, extending through the collagen hierarchy from macro to nanoscale. In relation to pathology, key areas of focus have included overload strain injury and repetitive overuse injury in tendon, and development of annular tears and herniation in intervertebral discs. Sam earned a Bachelor of Engineering (mechanical) from Dalhousie University, and a PhD in Chemical and Materials Engineering from the University of Auckland, New Zealand, under the supervision of Dr. Neil Broom. This was followed by a Killam post-doctoral fellowship at Dalhousie's School of Biomedical Engineering working with Dr. Michael Lee. He is currently an Associate Professor in the Division of Engineering at Saint Mary's University.