



Faculty of Engineering and Applied Science Chemical Engineering Seminar Series



Fabrication of Vascular Tissues Through Scaffold-guided Regulation of Smooth Muscle Cell Phenotype



Dr. Kibret Mequanint / University of Western Ontario

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Dupuis Hall, Room 215

ABSTRACT

The in vitro fabrication of vascular tissues incorporating appropriate extracellular matrix (ECM) components, contractile smooth muscle cells and an endothelial cell monolayer for clinical and in vitro testing applications has proven to be a formidable engineering task. Unlike cardiac or skeletal muscle cells, vascular smooth muscle cells (VSMCs) have a high capacity to modulate their phenotype in response to changing environmental cues. Understanding and regulating the local environmental cues required for phenotype modulation is key to the engineering of living vascular tissues. When cultured on 3D scaffolds, VSMCs must be first in a synthetic phenotype for cellular proliferation and ECM secretion to occur for tissue generation and maturation. The synthetic phenotype is also anticipated to accelerate elastin synthesis, a critical ECM component that is notably absent in currently engineered vascular tissues. Following tissue maturation, VSMCs must switch to a quiescent and contractile phenotype to mimic the functional properties of the native blood vessel. These events are likely to be influenced by biochemical and biomechanical signals, and by the presence of endothelial cells (ECs). Our efforts towards understanding elastin synthesis and the regulation of VSMC phenotype to enable the production of functional engineered vascular tissues will be discussed.