**Establishment of A Robust Biomimetic Blood Vessel Model for Stem Cell and Drug Therapies**

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Vascular disease results from inflammation, injury and the accumulation of fatty deposits in the blood vessels. Blood vessels are composed of three distinct layers; intima, media and adventitia. Development of a three dimensional (3D) blood vessel construct (TEBV), comprised of human cardiac artery smooth muscle cells (HCASMCs) within a collagen gel and a layer of human umbilical vein epithelial cells (HUVECs), and a perfusion system would allow visualization of vascular disease pathophysiology and new treatment studies. The objective of this study was to produce a blood vessel construct (TEBV), establish a perfusion system, evaluate the therapeutic effect of endothelial progenitor cells (EPCs) and the effect of statins on homing capabilities of EPCs to areas of vascular injury. To assemble TEBV, smooth muscle cells were seeded into a collagen gel and the epithelial cells seeded on top of the gel over an aligned nanofiber mesh. Rat MSCs were perfused by generating laminar flow at physiological shear stresses then evaluating the attachment to/interaction with an intact TEBV. The MSCs were labelled with a fluorescent marker (CFSE). We successfully assembled a multilayer TEBV. Rat MSCs were perfused over an intact construct and some attachment to the construct has been observed. Perfused stem cells showed minimal attachment on intact intimal layer. Future efforts will include creating a lesion on the intimal layer of the TEBV and the investigation of EPC homing to the lesion site with and without statins at various concentrations