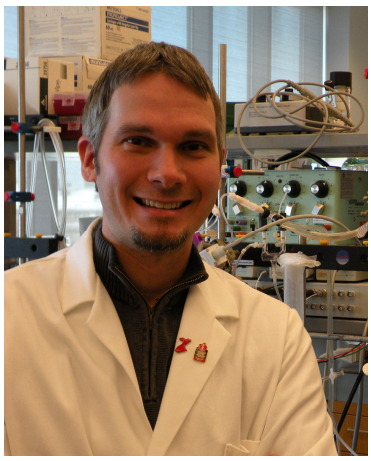
Spring 2009 Seminar Series

Department of Biomedical Engineering

Wednesday, March 4th @ 3PM in Steinman T-402



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Tissue Engineering Strategies for Cardiac Repair and Replacement

Occlusion of the coronary artery by atherosclerotic plaques can lead to myocardial infarction (MI) and eventual heart failure. None of the current treatments aimed at preventing or treating heart failure post-MI results in the adequate repair, replacement or regeneration of infarcted myocardial tissue. One potential solution is the use of tissue-engineering strategies to create functional and viable myocardium in vitro for implantation in vivo. In the first part of this seminar, I will focus on my development of a myocardial equivalent (ME), or "heart patch", created by entrapping cardiac cells in fibrin gel and guiding the cell-mediated fibrin remodeling into a tissue construct. I will start by elucidating some of the critical design factors in the creation of engineered myocardium as a method for cardiac repair. I will then present my work studying one of these factors using this system: the effects of cell/tissue alignment on ME contractile function.

In the second part of this seminar, I will discuss my involvement in recent research at the University of Minnesota that seeks to grow an entire heart in vitro. This work, which was recently published in Nature Medicine, involves the paradigm-shifting technique of perfusion decellularization to create a tissue engineering scaffold from the native heart's extracellular matrix. The scaffold can then be recellularized for the growing of an entire heart in vitro. I will specifically highlight some of the potential advantages of this technique with regards to scaffold architecture and functionality. In concluding the seminar, I will discuss some of the remaining challenges in translating these two tissue-engineering strategies to clinical practice and highlight some of the potential future research areas in cardiac repair and replacement.