Joint Faculty Candidate Seminar between Chemical and Biomedical Engineering

in

Cherry Auditorium, Kirk Hall, 1 PM

Presents on Thursday, February 20, 2014

Biomaterials for Scalable Cardiac Tissue Engineering

By

Dr. Martin Kolewe

Seminar Abstract

Clinical relevance of engineered tissue is limited by the size of functional tissue that can currently be produced, and the realization of scaled-up engineered tissue will require biomaterials with tailored properties across different engineering domains. Here I will focus on my recent work in developing scalable units for building vascular cardiac grafts. Cardiac tissue presents challenges including its hierarchical structure, which is the basis for its mechanical function, and demanding metabolic energy requirements. To guide the organization of cardiac tissue, we developed scaffolds with specific 3D structural patterns using microelectromechanical systems (MEMS) fabrication and packaging technologies. Critical design parameters were identified and manipulated to control the resulting tissue architecture. These scaffolds were made with a family of synthetic poly(ester amide) sebacate elastomers, which were modified to satisfy appropriate material properties including degradation rates and elastic stiffness. Towards meeting the metabolic demands of cardiac muscle, I will also describe the development of a microvessel framework to enable vascular support of these cardiac tissue constructs, including ongoing challenges in biomaterial design, transport, and assessment of cardiac functionality.

Biosketch

Dr. Martin E. Kolewe received his B.S. in chemical engineering from Johns Hopkins University in 2003 and his Ph.D. in chemical engineering from the University of Massachusetts Amherst in 2011. He is currently a postdoctoral associate at the Langer Laboratory at MIT and a resident at Draper Laboratory, a not-for-profit R&D organization in Cambridge, MA. After receiving his B.S., Dr. Kolewe worked as a process and controls engineer at Amgen Rhode Island, in the startup and operation of their BioNext manufacturing facility. His research interests cover a range of biomaterial and bioprocess design problems, from tissue engineering and regenerative medicine to sustainable bioengineering with applications in natural product pharmaceutical production to next-generation processes for the production of cultured meat.

Refreshments provided by the Joseph Estrin Endowment &
the Department of Electrical, Computer and Biomedical Engineering