UNIVERSITY *of* DELAWARE

BIOMEDICAL ENGINEERING SEMINAR

MARCH 7, 2016

Jason Burdick, Ph.D.
PROFESSOR
BIOENGINEERING
UNIVERSITY OF PENNSYLVANIA

"Engineering Hydrogels for Tissue Repair"

Hydrogels represent a class of biomaterials that have great promise for the repair of tissues, particularly due to our ability to engineer their biophysical and biochemical properties. Hydrogels can provide instructive signals through material properties alone (e.g., mechanics, degradation, structure) or through the delivery of therapeutics that can influence tissue morphogenesis and repair. Importantly, hydrogel design should reflect both the clinical context and the natural healing cascades of the damaged tissue. Here, I will give examples of the design of hydrogels based on hyaluronic acid (HA) for the repair of two tissues (cardiac and cartilage) that have limited natural repair processes. Towards cardiac repair, my laboratory is interested in designing materials that can influence the left ventricular remodeling process that occurs after myocardial infarction. To permit percutaneous delivery of hydrogels (e.g., via catheters), we have developed a class of shear-thinning and self-assembling hydrogels that can be used for the delivery of mechanical signals, as well as cells and therapeutics (e.g., protease inhibitors). These hydrogels assemble based on guest-host interactions and can be designed to degrade via matrix metalloproteinases or to become more stable through secondary crosslinking. These iterations on material design are teaching us what important signals are needed in these hydrogels towards the next generation of translatable therapeutics for cardiac repair. Towards application in cartilage repair, we have developed multi-polymer fibrous hydrogels that permit control over scaffold porosity and therapeutic release via the engineering of specific fiber populations. Fibers are formed through an electrospinning and photocrosslinking process, where individual fiber degradation is controlled through macromer chemistry. We have investigated these scaffolds towards cartilage repair when combined with microfracture in a large animal (i.e., minipig) model with a focus on the influence of material choice and growth factor delivery on tissue repair.

10:30am in 322 ISE Lab. *Refreshments served at 10:15am.*

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Dare to be first.
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