University of Puerto Rico
Chemistry Department
Departmental Seminar

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Friday, September 9th, 2016
Abbott – Q123
11:30 AM

Engineering Extracellular Matrix Mimetic Materials

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Abstract

Native tissues serve as ideal platforms for the design and engineering of biomaterials for fundamental studies and therapeutic applications. The native extracellular matrix (ECM) is a complex 3D environment composed of numerous biomacromolecules that provide structure as a number of cues (mechanical, physical, and biochemical) that dictate cellular behavior. Our research focuses on the engineering of biopolymeric-based structures that mimic native ECM. Towards that goal, we have developed 2D nanostructured films based on the layer-by-layer (LbL) technique and 3D structures based on electrospinning using ECM components as building blocks. In this talk, recent development on (1) polysaccharide-based LbL films and (2) electrospun collagen nanofibers will be presented. LbL films were constructed from a library of polysaccharides with tunable mechanical properties that control cellular behavior. Collagen based nanofibers were electrospun from a mild aqueous solvent that preserves its secondary structure. We demonstrate that we can tune fiber diameter and alignment by adjusting processing conditions. And we can tune the mechanical properties of the fibers by chemical crosslinking. This work demonstrates how versatile biopolymericnanomaterials that mimic native ECM can be engineer for both fundamental studies and therapeutic applications.
KEYWORDS: biomedical, biomaterials, layer-by-layer, electrospinning, ECM mimetic.