Amgen Seminar Series in Chemical Engineering

in

Cherry Auditorium, Kirk Hall, 1 PM

Presents on March 20, 2014

Designer Biomaterial Surfaces for Drug Delivery and Regenerative Medicine

By

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Research in biomaterials is continuing to lead advances in treatments for a variety of critical medical conditions. In this seminar, I will discuss my research on developing biomaterials that are aimed at treating various aspects of traumatic injury including infection, inflammation, and bleeding. Current treatments for these conditions often result in significant systemic toxicity and exacerbate problems such as antibiotic-resistance. I will describe work on controlled release drug delivery coatings that can avoid many of these complications. The layer-by-layer (LbL) self-assembly technique was used to develop multilayer films that exhibit a range of favorable drug release profiles of a variety of therapeutics including potent antibiotics, non-steroidal anti-inflammatory drugs, and hemostatic agents. These drugs cover a wide range of chemical and structural properties including hydrophilic and hydrophobic small molecules and proteins. Several of these LbL film architectures have successfully been applied to a range of medical device surfaces including bandages, sutures, and intraocular lenses and have demonstrated *in vitro* and *in vivo* efficacy. Our current work is focused on improving drug loading in these multilayer films.

I will also discuss my work on designing biomimetic micropatterned surfaces to direct mesenchymal stem cell behavior. This research has tremendous potential to impact the design of biomaterials and tissue engineering scaffolds for regenerative medicine while advancing the fundamental understanding of stem cell mechanobiology.

This series at the University of Rhode Island is made possible through the generosity of Amgen, West Greenwich, R.I.

Refreshments provided by the Joseph Estrin Endowment.