“Regenerative Medicine Strategies for Soft Tissue Healing”

Mary Beth Browning Monroe, PhD
Assistant Research Engineer, Biomedical Engineering
Texas A&M University

Thursday, March 8
2:45 – 3:45 PM
Brauer Hall, Room 12

Abstract
Tissue engineers attempt to harness the body’s natural ability to heal itself by combining cells and bioactive agents with a biomaterial scaffold. My research spans all three components of tissue engineered scaffolds. In the design of an effective vascular graft, I synthesized a thromboresistant hydrogel that promotes endothelial cell-specific attachment using engineered collagens. I show that this material is resistant to platelet attachment and activation in a series of whole blood studies and that it enables tunable endothelial cell adhesion, spreading, and migration. Within the realm of bioactive agents, I designed a library of collagen-mimetic proteins with controlled cell and extracellular matrix binding for use in a wound dressing. This work shows that cell interactions with proteins can be controlled by altering binding sites, with potential to design a wound dressing that addresses each stage of healing. For the scaffold, I will focus on shape memory polymer foams for use as a hemostat to control bleeding in gunshot wounds. These biocompatible foams can be delivered in a compressed form to irregularly-shaped wounds where they rapidly expand and promote blood clotting. To enhance their utility, I incorporated honey-based antimicrobials and degradable linkages into the shape memory polymer backbone. Overall, this body of work lays the foundation for future research into shape memory polymer-based tissue engineered wound dressings.

Biography
Dr. Monroe received her Ph.D. in the laboratory of Elizabeth Cosgriff-Hernandez in Biomedical Engineering at Texas A&M University in 2013. Her dissertation research focused on the development of a synthetic vascular graft for bypass surgeries, and included polymer synthesis, scaffold fabrication, mechanical property evaluation, in vitro blood and cell interaction characterization, and animal model development and implementation. This work resulted in six, first-author publications, and it was supported by a number of prestigious awards, including the National Science Foundation Graduate Research Fellowship and the P.E.O. Scholar Award. Following graduation, Dr. Monroe was a National Institutes of Health National Research Service Award Postdoctoral Fellow in Dr. Magnus Hook’s lab at the Texas A&M Health Science Center in the Texas Medical Center in Houston. Her postdoctoral research focused on engineering proteins for regenerative medicine applications. This work resulted in two first-author publications that are in progress two patents. In her current position as an Assistant Research Engineer and Laboratory Manager in Dr. Duncan Maitland’s Biomedical Device Lab (BDL) at Texas A&M, Dr. Monroe modifies shape memory polymers to impart new functionalities. This work has resulted in 9 published manuscripts and 4 patents. Her primary research focus is based upon the development of hemostats for hemorrhage control in battlefield gunshot wounds.

Faculty, students, and the general public are invited. A light reception will follow the seminar outside of Brauer 12.