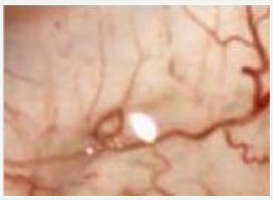
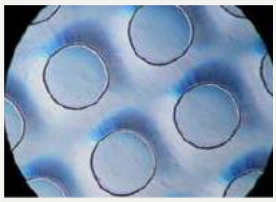
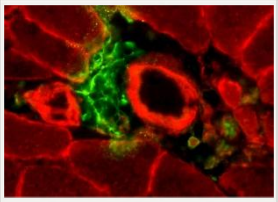
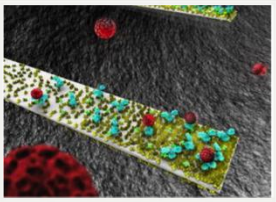
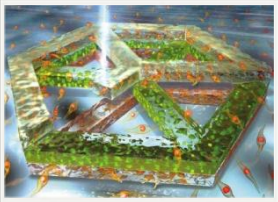
BioNanotechnology Seminar Series

Spring 2013

Integrating Mechanical Cues and Biomolecular Patterns in a Collagen-Glycosaminoglycan Scaffold for Tendon-Bone Junction Repair

Laura Mozdzen, CMMB IGERT Trainee

Laura is a PhD student in the Department Chemical and Biomolecular Engineering at the University of Illinois at Urbana-Champaign

Date: **Tuesday, April 9, 2013**
Time: **12:30 – 1:00 p.m. Central (10:30 – 11:00 a.m. Pacific)**
Location: **1000 MNTL at Illinois (KL 361 at UC Merced)**

Abstract:

The tendon-bone junction does not heal properly on its own, and current medical techniques are insufficient. Strategies to regenerate multi-tissue structures must consider the biochemical and mechanical heterogeneities of the tendon-bone junction (TBJ). We are developing a collagen-GAG scaffold on which mesenchymal stem cells (MSCs) will be driven towards an osteogenic or tenogenic lineage based on spatially patterned biomolecules and mechanical cues. We are immobilizing biomolecules in a spatially selective manner using benzophenone (BP) photo-lithographic patterning to mimic the natural heterogeneities of the TBJ, in addition to manipulating the geometry of the interface to disperse stress concentrations. We have demonstrated the ability to pattern proteins via BP chemistry with concanavalin A (ConA). We have also demonstrated the ability to vary the stiffness of our substrate without affecting protein patterning. By combining these two tools, we have been able to explore the effect of stiffness on biomolecular response. Another approach to creating a more robust interface is to focus on the junction, where stress is concentrated due to the differences in material properties. We are looking at biomimetic strategies, and are replicating the interdigitated geometry found in the scales of armored fish to efficiently transfer mechanical stresses from tendon to bone without failure. We varied the degree of interdigitation between compartments by changing the angle, and therefore number, of teeth across the interface and the diffusion time before scaffold creation. As more interfacial area was created, the greater the interfacial strength during tensile testing. Spatially patterned biomolecules across a multi-compartment scaffold with a mechanically robust junction will eventually be combined into a single scaffold for efficiently regenerating the tendon-bone junction.

Seminar Presented by:

Center for Cellular Mechanics
University of Illinois at Urbana-Champaign

IGERT Integrative Graduate Education and Research Traineeship
Cellular and Molecular Mechanics and BioNanotechnology

M-CNTC NCI Alliance for Nanotechnology in Cancer
Midwest Cancer Nanotechnology Training Center

CNST University of Illinois Center for Nanoscale Science and Technology