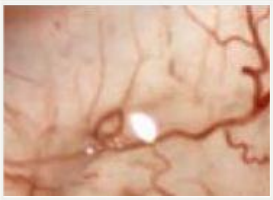
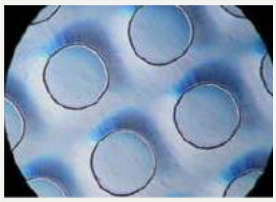
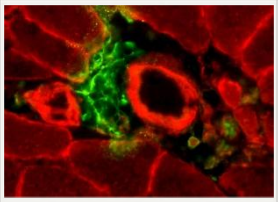
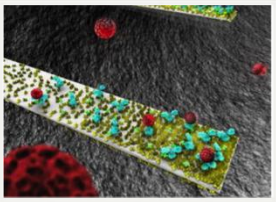
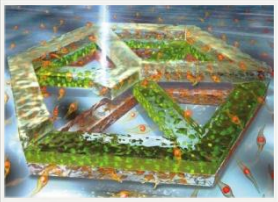
BioNanotechnology Seminar Series

Fall 2012

A Materials Approach to Deconstructing the Stem Cell Microenvironment

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Date: **Tuesday, November 27, 2012**

Time: **12:00 – 1:00 p.m. CST (10:00 – 11:00 a.m. PST)**

Location: **1000 MNTL at Illinois (SSM 150 at UC Merced)**

Abstract:

Cell culture materials that are engineered at the molecular, nano and micro scale can be used to guide pathways associated with cell fate specification. In this presentation, I will discuss our efforts in designing surfaces for studying signaling in adherent mesenchymal stem cells (MSCs). First I will show how soft lithography can be used to capture single stem cells in precise geometries to study how cell shape influences fate. MSCs cultured in small islands become quiescent and express elevated levels of multipotency markers; MSCs that are allowed to spread and proliferate express higher levels of osteogenesis markers. Using small molecule inhibitors of actomyosin contractility, we find that reduced cytoskeletal tension promotes maintenance of multipotency. Next I will demonstrate how cell geometry, matrix mechanics and ligand composition can be used together to maximize preferred differentiation outcomes. Cells that are cultured on polyacrylamide hydrogels express markers for both osteogenesis and myogenesis. By modulating the geometry of single MSCs on these hydrogel substrates we can preferentially direct specific differentiation outcomes. Finally, I will present our work using nanostructured porous silicon substrates to engineer the adhesion microenvironment for directing the fate of MSCs. Using these engineering approaches we can recapitulate aspects of the stem cell microenvironment to decipher the mechanochemical signals that direct cell fate.

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