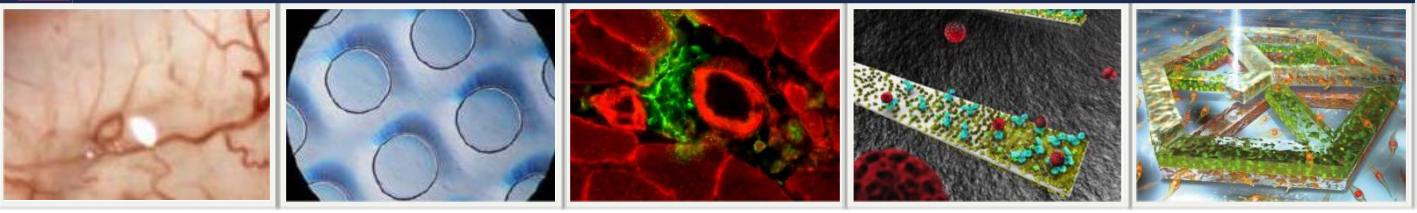
BioNanotechnology Seminar Series

Spring 2011



Engineering Cellular Microenvironments for Biomedicine

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Date: **Tuesday, April 12, 2011**
Time: **12:00 – 1:00 p.m. CDT**
Location: **1000 MNTL**

Abstract:

The extracellular matrix (ECM) is a complex organization of structural proteins such as collagens and proteoglycans. Heterogeneous tissues with spatially and temporally modulated properties and their biomaterial mimics play an important role in organism physiology and regenerative medicine. With the understanding that the microstructure, mechanics, and composition of the ECM is dynamic and often spatially patterned or heterogeneous over the length-scale of traditional biomaterials, there has recently been significant effort aimed at moving away from static, monolithic biomaterials towards instructive biomaterials that provide specialized cell behavioral cues in spatially and temporally defined manners. We have been developing patterned, tunable biomaterial systems to explore the practical significance of how cell/matrix cues can be optimized to improve biomaterial regenerative potential and the mechanistic details of how individual (stem) cells sense, integrate, and respond to multiple microenvironmental signals. Here I will present the development of biomaterials for traditional regenerative medicine applications as well as stem cell fate engineering. We are developing collagen scaffolds and photolithography-based biomolecule patterning tools for the regenerative repair of orthopedic defects. We are also creating multi-gradient and combinatorial biomaterials for rigorous investigation of fundamental questions regarding niche-mediated regulation of hematopoietic stem cell (HSC) behavior. Here microfluidic tools aid our investigation of the role played by matrix elasticity, ligand presentation, and paracrine-mediated signaling on HSC fate.

References:

1. T. Martin[‡], S.R. Caliari[‡], P. Williford, B.A. Harley[§], R.C. Bailey[§], 'The generation of biomolecular patterns in highly porous collagen-GAG scaffolds using direct photolithograph,' *Biomaterials*, 32(16):3949-57, 2011.
2. S.R. Caliari, B.A.C. Harley, 'The effect of anisotropic collagen-GAG scaffolds and growth factor supplementation on tendon cell recruitment, alignment, and metabolic activity,' In Press, *Biomaterials*, 2011.
3. B. Mahadik, T. Wheeler, P. Kenis, B.A. Harley, 'Development of multigradient hydrogels to decode extrinsic regulation of hematopoietic stem cell fate,' In preparation, 2011.
4. J.S. Choi, B.A. Harley, 'The role of the extracellular matrix environment on hematopoietic stem cell morphology and viability,' In preparation, 2011.

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