Materials Science & Engineering Seminar Series

Carnegie Mellon University
Materials Science & Engineering

presents

Bioinspired Materials Systems to Study and Regulate Stem Cell Biology

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ABSTRACT:

Highly regulated signals in the stem cell microenvironment such as matrix stiffness, ligand adhesion density, growth factor presentation and concentration, and tissue architecture have been implicated in modulating stem cell differentiation, maturation, and ultimately function. Therefore, it is desirable to have independent control over both the biochemical and mechanical cues presented to cells to analyze their relative and combined effects on stem cell function. Accordingly, we have developed a range of materials systems to study and regulate stem cell function. This presentation will discuss our progress in: 1) developing bioinspired synthetic hydrogels for transplanted stem cell survival and function; 2) self-organizing human cardiac microchambers mediated by geometric confinement; and, 3) *in vitro* disease specific tissue models (e.g., 'organs on a chip') to be used for high content drug screening and patient specific medicine. Emphasis will be placed on whether these biomaterial systems are the future of patient specific therapy, or just hype.

BIOGRAPHY:

He served as Chair of the Department of Bioengineering from 2011 to 2015. He received a B.Sc. in Chemical Engineering from the University of Rochester in 1983. He obtained graduate degrees in Bioengineering from the University of Pennsylvania (M.Sc.: 1985; Ph.D.: 1990). He is a thought leader and innovator working at the interface between stem cells and materials science to develop dynamic engineered systems to explore both fundamental biological phenomena and new applications in translational medicine. His group currently conducts research in the areas of: bioinspired stem cell microenvironments to control stem cell lineage specification and self-organization into microtissues or organs; bioinspired systems for regenerative medicine; biological interfaces; and, microphysiological systems for drug toxicity screening. Major discoveries from his laboratory have centered on the control of cell fate and tissue formation in contract with materials that are tunable in both their biological content and mechanical properties. These materials find applications in medicine, dentistry, and biotechnology. Prof. Healy has authored or co-authored more than 350 published articles, abstracts, or book chapters. He recently co-edited a multi-volume scholarly reference work on the biomaterials field, containing an all-encompassing comprehensive treatise that accurately captures the diversity, breadth, and dimensions of the field. He is an elected Fellow of the American Institute of Medical and Biological Engineering (AIMBE), Fellow in Biomaterials Science and Engineering (FBSE), and the American Association for the Advancement of Science (AAAS). He has chaired the Gordon Research Conference on Biomaterials and Biocompatibility, and has been honored with the 2011 Clemson award for outstanding contributions to basic biomaterials science. He is a named inventor on numerous issued United States and international patents relating to biomaterials, therapeutics, stem cells, and medical devices, and has founded several companies to develop these systems for applications in biotechnology and regenerative medicine. He is currently an Associate Editor of the Journal of Biomedical Materials Research. He has served on numerous panels and grant review study sections for N.I.H. and international scientific agencies. He has given more than 250 invited lectures in the fields of Biomedical Engineering and Biomaterials.

Doherty Hall 2210, 11:30AM
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