SPRING 2008 COLLOQUIUM SEMINAR

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Departments of Biomedical Engineering ; Chemical & Biochemical Engineering
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"Engineering dynamics of nanoscale biointerfaces for enhanced cell motility and matrix assembly"

An ongoing challenge is to confer engineered bioactive materials with the ability to dynamically guiding tissue repair and regeneration. Cells of the skin in particular engage in highly dynamic interactions with their matrix, which offers a platform to engineer nanoscale matrix display and modulate cell behaviors important for re-epithelialization and matrix remodeling during wound repair. We examined the possibility of engineering dynamic biointerfaces, through the display of cell-interactive biological ligands from nanoscale albumin-based particle-substrates that would permit dynamic cell-material interactions following cell adhesion, including nanoparticle endocytosis. The underlying hypothesis is that matrix adhesion ligands can concertedly "superactivate" cells through dynamic ligand fates (mobility, cytointernalization) beyond ligand clustering and ligand-receptor binding. Features of the underlying ligand carriers can be used to systematically engineer these dynamics. We report that over a certain regimen, the size scale of such ligand carriers can indeed accelerate ligand clearance dynamics, leading to efficient cellular processes such as motility. In contrast, different scale regimen control other cell behaviors, such as cell contractility and matrix assembly. Ongoing challenges include elucidation of the mechanisms of biological signaling and tracking intracellular single nanoparticle dynamics. Opportunities for tissue engineering and wound repair therapies include developing dynamic biointerfaces for navigating cells in 2-D as well as in 3-D.

Date: April 22, 2008

Time: 4:00 PM (Reception at 3:30 PM in 826 Mudd)

Location: 825 Mudd

Department of Chemical Engineering

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