Mechanical modulation of cell function and tissue remodeling

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To date, much of what has been learned about mammalian cell function has been gleaned from in vitro studies of cells cultured on stiff glass or plastic substrates. In recent years, however, it has become clear that cells are highly sensitive to mechanical stimuli, and that the mechanical environment modulates the cells’ response to chemical stimuli. Based upon this realization, many researchers have adopted model systems with tunable mechanical environments, and the field of mechanobiology has rapidly emerged. This seminar will focus on two ongoing studies in our laboratory which highlight two distinct experimental approaches. The first study investigates the effects of stretch on cell-mediated remodeling of compliant model tissues. The second study focuses on how stiffness and stretch modulate the phenotype and morphology of individual cells. Mechanobiology research promises to provide important insight into wound healing, the etiology of fibrocontractive disease, stem cell differentiation, and to aid in developing more stable implant-device interfaces and engineered tissues.