Implication and Application of Cell-Topography Interactions

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Topography of extracellular microenvironment can influence cellular responses from attachment and migration to differentiation and production of new tissue. Cells in their natural environment interact with extracellular matrix that contains structures in the nanometer scale. Nanoscaled topography of synthetic materials, through its resemblance to *in vivo* surroundings, may provide potent cues to influence the behavior of the seeded cells in regenerative medicine applications.

This presentation will cover our findings on how cells respond to substrates with topographical features fabricated by nanoimprinting or soft lithography. In particular we will discuss our recent work on gaining mechanistic insights of cell-nanotopography interactions. Our results show that zyxin protein plays a key role in the hMSC response to nanotopography. Zyxin expression is downregulated on 350 nm gratings, leading to smaller and more dynamic focal adhesion. Since the association of zyxin with focal adhesions is force-dependent, smaller zyxin-positive adhesion as well as its higher turnover rate suggests that the traction force in focal adhesion on 350 nm topography is decreased. These changes lead to faster and more directional migration on 350 nm gratings. These findings demonstrate that nanotopography decreases the mechanical forces acting on focal adhesions in hMSC and suggest that force-dependent changes in zyxin protein expression and kinetics underlie the focal adhesion remodeling in response to 350 nm grating topography, resulting in modulation of hMSC function.

The presentation will also discuss the potential of applying topography to enhance nonviral transfection and modulate the subtypes of induced neurons derived from reprogramming of fibroblasts.

Seminar
November 30th
Livermore Center 101
3:00 – 4:00 pm