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Integrin-Mediated Cell Adhesion Strengthening and the Role of Focal Adhesion Kinase: a Balancing Act in a Circus of Strength

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ABSTRACT OF THE TALK

Cell adhesion to the extracellular matrix (ECM) provides tissue structure and integrity as well as triggers signals that regulate complex biological processes such as cell cycle progression and tissue-specific cell differentiation. The process of cell adhesion therefore is central to numerous physiological and pathological processes, including embryonic development, cancer metastasis, and wound healing, as well as biotechnological applications, such as host responses to implanted devices and integration of tissue-engineered constructs. During the adhesion process, integrin receptors bind ECM proteins, cluster, and associate with the actin cytoskeleton via complexes of proteins known as focal adhesions. Due to the close association between biochemical and biophysical processes within adhesion complexes, mechanical analyses can provide important new insights into structure-function relationships involved in regulating the adhesion process. This seminar will focus uncovering function-specific signaling mechanisms of the protein tyrosine kinase FAK involved in the cell adhesion strengthening process. Using a novel combination of genetically engineered cells to control

FAK expression, a spinning disk adhesion assay to measure adhesion strength, and quantitative biochemical assays for analyzing molecular changes in adhesive complexes, we have demonstrated that FAK modulates adhesion strengthening via two mechanisms: (1) FAK expression results in elevated integrin activation leading to regulation of strengthening rate and (2) FAK regulates steady-state adhesion strength via vinculin recruitment to focal adhesion complexes.