Tata Institute of Fundamental Research
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Seminar

Cell matrix adhesions are formed of modular integrin nanoclusters that bridge thin matrix fibers

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Cell matrix adhesions attach the cell to the extracellular matrix, sense its force and geometry and convert that information into biochemical signals so that the cell can mount an appropriate response. How do fibroblasts present in connective tissues of various stiffness respond correctly to substrate stiffness and how are these signals converted into biochemical signals? To get insights into these questions, we combine super-resolution microscopy and live-cell microscopy with nanopatterning of the substrates. We discovered that modular nanoclusters on integrins are laid out on substrates of all rigidities as a starting point for the formation of cell-matrix adhesions. They form as a first response to sensing the biochemical ligand and help the cell to sense the substrate rigidity. They serve as differential signaling platforms wherein EGFR signaling is activated specifically on rigid substrates which is essential for cell adhesion and growth. Using nanopatterned metal lines, we discovered that each nanocluster is anchored in two dimensions, whereas it is unstable on one-dimensional geometry represented by single thin fibers. This geometric requirement allows the bridging of thin extracellular matrix fibers. Together, this provides insights into the formation of cell-matrix adhesions and regulation of downstream signaling in response to traction force and geometric arrangement of the extracellular matrix fibers.

Thursday, Mar 26th 2020

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TIFR-H