



Singapore-MIT Alliance for Research and Technology



From Biomolecules to Biofilms

Focused Seminar Series on Biomolecules and Biofilms

11 April — 6 June 2016, Level 5 Seminar Room, Enterprise Wing @ UTown, S'138602

Seminar 2: Talin mediated force transmission and mechanosensing

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Date: 18 April 2016, Monday

Time: 4pm to 5pm

Venue: Perseverance Room, Enterprise Wing Level 5 @ UTown



Abstract

Cells adhere to extracellular matrix (ECM) through focal adhesion. Talin is a cytoplasmic adapter protein that links the actin cytoskeleton to focal adhesion, playing a central role in regulation of formation and maturation of focal adhesions. Talin's functions depend on the binding of talin rod domains to a cytoplasmic protein vinculin in a force dependent manner. The force in the talin mediated force transmission pathway has been estimated in the range of 7-10 pN, but how this force level is maintained remains unknown. In addition, the interaction between talin and vinculin in this force range is poorly understood. In this presentation, I will show that stochastic unfolding and refolding transitions of talin rod domains make talin rod an effective force buffer, capable of maintaining tension in talin in a range of 7-10 pN over a wide range of extension change of talin. Further, this level of force is found able to expose the cryptic vinculin-binding sites, promoting subsequent binding of the head domain of vinculin with a nano Molar affinity. Together, these results provide important insights into the mechanosensing at focal adhesion that is crucial for cells to sense and respond to their microenvironment.

Biography

While being trained in theoretical physics, Dr Jie Yan built a strong interest in studying molecular cell biology using a combination of novel single-molecule biophysical methods and theoretical modeling. Since he joined the Department of Physics of NUS in 2005, he has been leading a group to study DNA-protein interactions and micromechanics of biopolymers. He became a Principal Investigator in MBI in 2009, which he will focus on studies of genome packaging in cells, gene regulation in bacteria, and mechanical responses of mechanosensing proteins to external forces.