MNTF Graduate Center

Seminar Talk

Time and Place:

July 13th, 14:00
in room 506R
(physics building)

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Assembly of tight junction belts by surface condensation and actin elongation

At the cell-cell contact site of the living cell membrane, Tight junctions form to seal tissues. Assembly of Tight junctions involves oligomerization of membrane receptors, surface binding, and phase separation of cytosolic scaffold proteins. Interestingly, this surface phase separation process occurs in the undersaturated cytosolic scaffold protein concentration. The underneath mechanism is not explored yet. Here we investigate why the surface phase separation happens at a concentration far below the saturation level and explore how the receptor controls the shape and spatial localization of tight junctions. We derive a thermodynamic theory for a three-dimensional cytosolic domain in the presence of a two-dimensional flat membrane. Protein molecules in the cytosolic domain can not only diffuse freely but also bind to the membrane, forming a membrane-bound layer. Combining the experiments and theory, we find that strong binding affinity facilitates the surface phase separation in the two-dimensional membrane at very low cytosolic concentration. Moreover, total receptor amount and oligomerization control the pattern of surface condensates in the membrane. Our work suggests that surface binding combined receptor oligomerization represents a versatile mechanism to control the formation of the protein-rich domain at intra-cellular surfaces.

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