Tata Institute of Fundamental Research
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Seminar

SNARE-mediated Membrane Fusion driven by entropic forces

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Exocytosis and trafficking depend on membrane fusion reactions mediated by a cellular fusion machinery whose core comprises the SNARE proteins. In secretion, from insulin release to release of neurotransmitters (NTs) at neuronal synapses, fusion is catalyzed when vesicle associated v-SNAREs and target membrane-associated t-SNAREs zipper into SNAREpin complexes, pulling membranes into proximity and triggering fusion. The mechanism is poorly understood and the number of SNAREpins required for fusion is controversial. Here we developed a highly coarse-grained MD simulation to expose the cooperative behavior of SNAREs at the fusion site and to compute the waiting times for fusion between a docked vesicle and target membrane. Our results present a picture radically different to the traditional one according to which the SNARE zippering energy is somehow funneled into the membranes to fuse them. We find the ~65 kT of zippering energy is entirely dissipated, and entropic forces impose multiple collisions between the membranes. The more SNAREs, the greater the entropic forces, the higher the collision frequency and the faster fusion.

Wednesday, Jan 9th 2019

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

Seminar Hall, TIFR-H