Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Webinar

Secondary Structures of Peptides – Their Stability and the Role of Mechanical Forces in Their Folding-Unfolding

Nayana E C

IIT, Palakkad

Protein function is critically dependent on correct folding, with secondary structures acting as fundamental building blocks of the native state. This work explores the stability and folding mechanisms of protein secondary structures under the influence of non-covalent interactions, solvent environments, and mechanical forces. Using helical and β-hairpin motifs, we show that tertiary contacts and side-chain interactions play a dominant role in stabilizing folded conformations beyond backbone hydrogen bonding alone. Solvent conditions and mechanical perturbations significantly modulate folding pathways and structural integrity. We further demonstrate that externally applied mechanical forces reshape energy landscapes, giving rise to distinct folding intermediates and force-dependent mechanisms. These findings provide molecular-level insight into how physical and environmental factors govern protein folding and stability, with implications for understanding misfolding-related diseases.

Friday, Feb 13th 2026

11:30 Hrs