Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Internal Seminar

Advanced optical imaging to probe intracellular organization and dynamics

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Heterochromatin, traditionally identified as transcriptionally repressed chromatin due to its condensed nature, is one of the most prominent sub-nuclear structures. It is implicated to play major roles in several complex biological processes like development, aging and cancer. Heterochromatin domains are often found enriched in proteins, such as Suvar family proteins Suvar39h1 and HP1, which are involved in either writing or interpreting epigenetic marks on the level of histones. The mechanism of how these proteins get enriched in heterochromatin however remains unclear. To address this question, we have performed single molecule tracking of Suvar39H1 and the heterochromatin protein-1 (HP1) isoforms on different chromatin regions (euchromatin and heterochromatin) in the nuclei. Our analysis of Suvar39H1 trajectories indicate that while in general these molecules exhibit longer binding residence times within heterochromatic regions, the magnitude of the differences in binding residence times alone is not sufficient to generate the observed (steady-state) distribution of Suvar39H1 in the nucleus. Of greater relevance is our observation that the trajectories of these molecules are severely restricted in angular diffusion in denser heterochromatic regions of chromatin. Based on Monte Carlo simulations of reaction-diffusion mechanisms, it appears that the observed distribution of Suvar39H1 into domains can only be replicated when angular restriction of diffusion is categorically imposed. Taken together, these results highlight that the heterogeneous distribution of molecules in the nucleus is not merely mediated by the presence of binding sites (and the corresponding binding residence times), but also involves trapping within certain regions of the chromatin. It is extremely likely that the effect of trapping alters the kinetics of protein-chromatin interactions in these regions and plays a role in chromatin organization in the nucleus.

Friday, Feb 02nd 2018

02:00 PM (Tea/Coffee at 01:30 PM)

Seminar Hall, TIFR-H