

## **Seminar**

# **The Role of Liquid-Liquid Phase Separation in DNA Damage Repair and Gene Transcription Regulation**

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Cellular processes often require the local concentration of protein complexes to perform biochemical reactions in a regulated manner. Traditionally, this is achieved through membrane-bound organelles. However, recent studies have shown that membrane-less condensates, formed via liquid-liquid phase separation (LLPS), can also mediate these reactions by concentrating proteins at specific cellular sites. My talk will explore two instances where LLPS impacts major cellular processes: DNA damage repair and signalling-dependent gene transcription.

Firstly, I examined the role of Heterochromatin Protein 1 (HP1) in DNA damage repair, highlighting how HP1 $\alpha$  and HP1 $\beta$  isoforms exhibit differential dynamics and localisation at double-strand breaks (DSBs) in heterochromatin, influencing repair pathway choice and genomic stability. Secondly, I investigated how transcription factor ER $\alpha$  and ER $\alpha$ -mediated condensates regulate gene transcription within the same topologically associated domain (TAD), affecting the expression of genes TFF1 and TFF3 during acute signalling. The findings underscore the significance of phase separation in fine-tuning chromatin-associated biological processes in maintaining genomic stability and regulating gene expression.

***Wednesday, Jan 8<sup>th</sup> 2025***

***11:30 Hrs (Tea / Coffee 11:15 Hrs)***

***Auditorium, TIFRH***