

Molecular Assembly and Formation of Paraspeckles

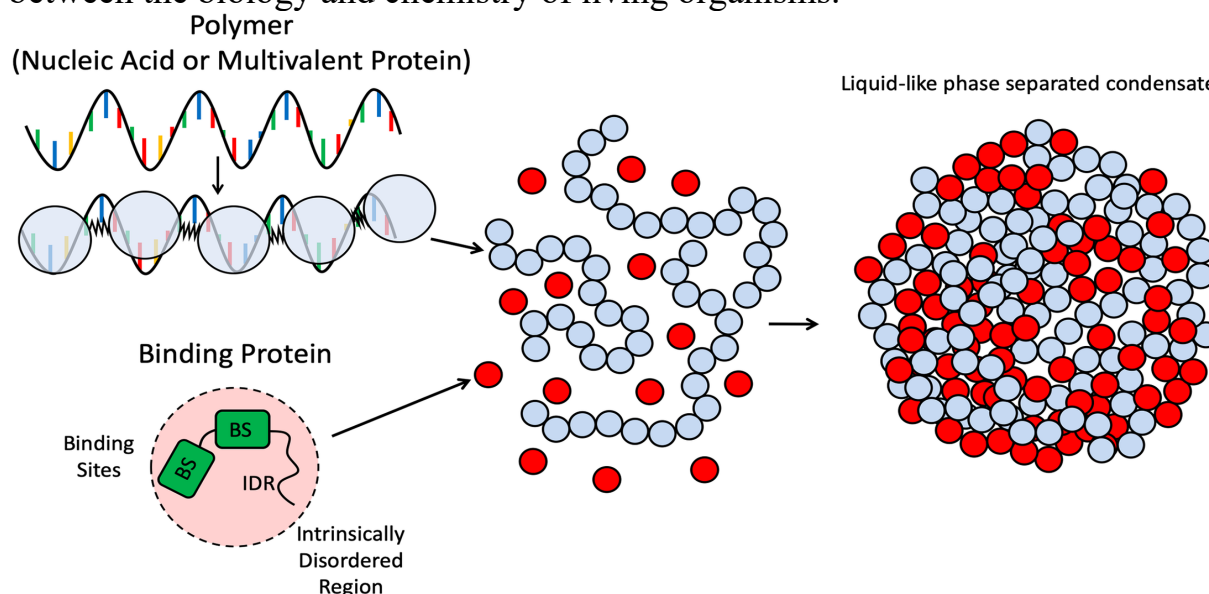
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Paraspeckles contain two elements, the long-noncoding RNA NEAT1, and several RNA-binding proteins. Paraspeckles remain an enigmatic organelle with a range of functions in the nucleolus, providing a fascinating model for studying the formation of membrane-less bodies found in the nuclear interchromatin space.¹ We are building mimics of this biological system outside the cell to understand better the mechanism of how paraspeckles are formed. To this end we investigate the liquid-liquid phase separation systems formed between short peptides when mixed with short chemical, or long biological RNA. Currently, we are focusing on which supramolecular chemistry factors influence the formation of liquid-liquid phase separated RNA and peptides droplets, which will expand knowledge of how membrane-less organelles form in cells. We have also synthesized a short light switchable peptide and complementary RNA that can inhibit or interfere with forming paraspeckles in abnormal cells such as cancer cells upon stimuli with light. This artificial cellular system will contribute to comprehending the difference between the biology and chemistry of living organisms.



Zumbro, E.; Alexander-Katz, A. Multivalent polymers can control phase boundary, dynamics, and organization of liquid-liquid phase separation. *PLoS One* **2021**, *16* (11), e0245405.

(1) Fox, A. H.; Lam, Y. W.; Leung, A. K.; Lyon, C. E.; Andersen, J.; Mann, M.; Lamond, A. I. Paraspeckles: a novel nuclear domain. *Curr Biol* **2002**, *12* (1), 13-25. DOI: 10.1016/s0960-9822(01)00632-7 From NLM.