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Virus-like Mechanisms of Intercellular Communication in the Nervous System

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Abstract

The neuronal gene Arc is essential for long-lasting information storage in the mammalian brain, mediates various forms of synaptic plasticity, and has been implicated in neurodevelopmental disorders. However, little is known about Arc's molecular function and evolutionary origins. We recently discovered that Arc self-assembles into virus-like capsids that encapsulate RNA. Endogenous Arc protein is released from neurons in extracellular vesicles that mediate the transfer of Arc mRNA into new target cells, where it can undergo activity-dependent translation. Evolutionary analysis indicates that Arc is derived from a vertebrate lineage of Ty3/gypsy retrotransposons, which are also ancestral to retroviruses such as HIV. These findings suggest that Gag retroelements have been repurposed during evolution to mediate intercellular communication in the nervous system.

About the Speaker

Jason Shepherd is an Associate Professor in the Department of Neurobiology and holds the Jon M. Huntsman Presidential Chair at the University of Utah. He obtained his BSc (Hons) at the University of Otago, his Ph.D. at the Johns Hopkins School of Medicine and postdoctoral training at the Massachusetts Institute of Technology. The Shepherd lab focuses on elucidating how the brain stores information from the molecular level through in vivo neuronal networks, and how these processes go awry in neurological disorders. He is the recipient of the Peter and Patricia Gruber International Research Award in Neuroscience, the International Society for Neurochemistry Young Investigator Award, the Chan Zuckerberg Initiative Ben Barres Early Career Acceleration Award, a NIH Director's Transformative Research Award and is a National Academy of Sciences Kavli Fellow.