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

Seminar

Regulation of synapse development through endocytosis-dependent neuronal signaling in Drosophila

Vimlesh Kumar

IISER, Bhopal

Adapter protein 2 (AP2)-dependent clathrin-mediated endocytosis is believed to be the major pathway for the retrieval of SV and membrane proteins. The smallest subunit of the AP2 complex, σ2-adaptin, apart from its role in vesicle regeneration, also acts as a negative regulator for synaptic growth. However, the mechanism by which σ2-adaptin coordinate with various growth signalling pathway components to regulate the neuronal growth remain poorly understood. We have shown that σ2-adaptin controls neuronal growth by attenuating the BMP and MAP kinase signalling cascades, two major growth signalling pathways at the Drosophila neuromuscular junction. Specifically, σ2-adaptin mutant shows neuronal overgrowth accompanied by elevated levels of BMP receptor Thickveins (Tkv) and MAP kinase kinase kinase Wallenda (Wnd). Interestingly, the levels of small GTPase Rab11, which is known to regulate the recycling of the Tkv receptor was down-regulated at the mutant synapses. In addition, the σ2-adaptin mutant shows defective autophagic degradation of Highwire (Hiw) resulting in its accumulation at the soma of motor neurons. Stabilizing Hiw by expressing Rae1 in the mutant neurons rescues the synaptic overgrowth. Analysis of signalling pathways in σ2-adaptin mutants revealed that synaptic overgrowth in these mutants was sensitive to the levels of BMP and MAP-kinase signalling. Thus, we support a model in which σ2-adaptin controls neuronal signalling and growth by regulating the degradation of E3-ubiquitin ligase- Highwire and the levels of type I BMP receptor Tkv.

Monday, Feb 17th 2020

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H