OIST SEMINAR

Hosted by Cellular & Molecular Synaptic Function Unit

Speaker: Dr. Satyajit Mahapatra

DATE: Tuesday, 27th June, 2017
TIME: 16:00 - 17:00
VENUE: Meeting Room D014, Level D, Lab 1

Title:

" Dynamin-1: a vesicle fission protein or more than that?"

Abstract:

Dynamin-1 is a large guanosine triphosphatase (GTPase) thought to be critically essential for the fission of synaptic vesicles (SVs) during endocytic recycling[1]. Inhibition of dynamin function studies (pharmacologically and by use of mutants) corroborated this idea[1,2,3,4]. However, studies on conventional dynamin-1 knockout mice with limited postnatal viability, suggest dynamin-1 is required only during intense synaptic activity but is dispensable for basal endocytic vesicle recycling need[5,6]. These contrasting results from dynamin inhibition and knockout studies led us to understand what role does dynamin-1 play in mature, native brain circuits. Using tissue-specific conditional knockout (cKO) of dynamin-1 at the calyx of Held synapses ex-vivo in mice (P16-20) that are normal outwardly, we found ablation of dynamin-1 did not affect the vesicle resupply rate, basal transmission, and the common synaptic properties[7]. However, strong synaptic stimulation for a short[7], as well as for longer time periods[8], enhanced the neurotransmitter release[7,8] in cKO. Presynaptic membrane capacitance recordings and other data suggest that greater release in the absence of dynamin-1 was due to enhanced availability of release sites within 500 ms[7], and increase in the size of SVs within 10s[8], both achieved through an augmented actin-dependent endocytic membrane retrieval process[7,8]. Thus, implying, in addition to its role in membrane fission, dynamin-1 in native brain circuits may have a role in slowing the endocytosis pace[7] to quality control better the size of synaptic vesicles[8].

References:

1. Ferguson SM and De Camilli P. (2012). *Nat Rev Mol Cell Biol*. 13(2): 75 - 88.

2. Yamashita et al., (2005). *Science*. 307 (5706): 124 - 127.

3. Koenig JH and Ikeda K. (1989). *J. Neurosci*. 9 (11): 3844 - 3860

4. Takei et al., (1995). *Nature*. 374 (6518): 186-90

5. Ferguson et al., (2007). *Science.* 316 (5824): 570-574

6. Lou et al., (2008). *PNAS*. 105 (45): 17555-60

7. Mahapatra et al., (2016). *PNAS*. 113 (22): E3150-8

8. Mahapatra et al., (2017). *J.Physiol*. 595 (1): 193-206

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