OIST SEMINAR

Hosted by Cellular & Molecular Synaptic Function Unit

Speaker: Dr. Takafumi Miki

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DATE: Friday, March 24, 2017
TIME: 16:00 - 17:00
VENUE: Meeting Room D015, Level D, Lab 1

Title:

" Estimating docking site number and releasing vesicles reveals two sequential vesicular pool model at single glutamatergic synapses "

Abstract:

Neurotransmission is mediated by quantal neurotransmitter release attributed to synaptic vesicle exocytosis at presynaptic terminals. Variance analysis of postsynaptic current amplitudes suggests the presence of distinct docking sites (also called release sites) where vesicles pause before exocytosis. Docked vesicles participate in the readily releasable pool (RRP), but the relation between docking site number and RRP size remains unclear. It is also unclear whether all vesicles of the RRP are equally release competent, and how docking sites are morphologically organized at an active zone (AZ). We address here these questions at single glutamatergic synapses, counting released vesicles using a new developed method based on deconvolution analysis. Vesicular release counts at simple synapses follow binomial statistics with a maximum that varies from 2 to 10 among experiments. This maximum presumably reflects the number of docking sites at a given synapse. We find a remarkably low variance of cumulative vesicle counts during action potential trains. This, combined with Monte Carlo simulations, indicates that vesicles transit through 2 successive states before exocytosis, so that the RRP is up to 2-fold higher than the docking site number. With further analysis of localization of AZ proteins using SDS freeze-fracture replica labeling, I would like to discuss what can be the morphological counterpart of the functionally defined docking site at single bouton-type synapse.

Reference:

Miki, T., Malagon, G., Pulido, C., Llano, I., Neher, E., and Marty, A. (2016). Actin- and myosin-dependent vesicle loading of presynaptic docking sites prior to exocytosis. ***Neuron*** 91, 808–823.
Malagon, G., Miki, T., Llano, I., Neher, E., and Marty, A. (2016). Counting vesicular release events reveals binomial release statistics at single glutamatergic synapses. ***J. Neurosci.*** 36, 4010–4025.

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