Seminar/Talk

Understanding the molecular mechanisms underlying postsynaptic target cell type-dependent differences in presynaptic release properties

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Host: Johann Danzl

Title:Understanding the molecular mechanisms underlying postsynaptic target cell type-dependent differences in presynaptic release propertiesAbstract:It has been known for decades that chemical synapses of the CNS show tremendous functional and structural diversity. Understanding the molecular mechanisms underlying functional synaptic diversity is a major challenge and has been in the focus of our research in the past two decades. A special example of synaptic diversity is the so-called postsynaptic target cell type-dependent variations in the presynaptic properties of glutamatergic synapses. The probability of glutamate release from hippocampal pyramidal cell (PC) axon terminals that innervate oriens-lacunosum-moleculare (O-LM) interneurons is 10-fold lower that that innervating fast-spiking interneurons (FSINs). Our high-resolution immunolocalization experiments revealed that Munc13-2 has a high density in the active zone of PC axon terminals that innervate O-LM cells, but not in FSIN-innervating ones. Using Munc13-2 conditional KO mice and in vitro paired recordings we demonstrated that this Munc13 isoform plays no detectable role. Pharmacological experiments revealed that the major difference between these synapses is their differential sensitivity to PDBU, indicating differential priming states of the synaptic vesicles probably due to a differential modulation of Munc13-1. Our results are consistent with a sequential two state priming model of synaptic transmission in which PC O-LM synapses, a 5-fold smaller fraction of the vesicles is properly primed when compared to those at PC FSIN synapses. Our modelling also predicted that the fusion probability of properly primed vesicles differs only two-fold at these synapses, which is consistent with the results of pharmacological, in vitro Ca2+ imaging and molecular neuroanatomical experiments. Our results demonstrate that docked, but incompletely primed synaptic vesicle limit the output of PC O-LM cell synapses.

Tuesday, April 25, 2023 04:00pm - 05:00pm
Mondi Seminar Room 2, Central Building

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