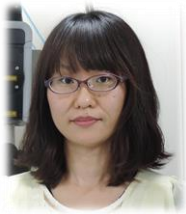
DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

AARHUS UNIVERSITY

DANDRITE Topical Seminar

Wednesday 6 July 2016
11.30 – 12.30

The Biomedicine Auditorium, building 1170, 3rd floor, room 347
Ole Worms Allé, 8000 Aarhus C



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Dendritic Filtration of Presynaptic Cell Assembly

Neuronal dendrites collect excitatory synaptic inputs from presynaptic neurons and convey them to the soma. During this intracellular processing, dendrites perform complex computations through their nonlinear electrical properties. Previous reports have suggested that the dendritic computations are influenced by the spatiotemporal patterns of excitatory synaptic inputs. However, due to the technical limitation, the strict relationship between the pattern of synaptic inputs and the somatic excitation is poorly understood. We developed functional multi-spine calcium imaging, which allows us to en masse visualize synaptic inputs to hundreds of spines in a single neuron with single synapse resolution. Using a Nipkow-disk confocal microscope, we imaged dendrites of CA3 pyramidal cells in organotypic hippocampal slices at 100 Hz in a confocal field of approximately 150×150 μm2. We discovered that approximately half of the excitatory synaptic inputs failed to excite the cell body. Some subsets of synchronous synaptic activity were preferably passed to the cell body, whereas others were more likely to be filtered out, suggesting that dendrites carry inputs from specific cell ensembles. This screening of synaptic activity resulted from local GABAergic inhibition, and intracellular perfusion with a GABA A receptor inhibitor increased the event frequency of EPSCs in the cell body. These data suggest that presynaptic network activity is preserved on dendritic branches within a single neuron and only specific combinations of synchronized synaptic inputs have the impact on the soma.

Host: Group Leader Keisuke Yonehara, DANDRITE, Dept. Biomedicine, Aarhus University