LSI NEUROBIOLOGY PROGRAMME SEMINAR 2019

NUS National University of Singapore

Life Sciences Institute

The Actin-Modulating Protein Synaptopodin - An Organizer Of Smooth Endoplasmic Reticulum And Neuronal Plasticity In Hippocampal Neurons

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Date:
1 October, 2019, Tuesday

Time:
3pm to 4pm

Venue:
Centre for Life Sciences
Seminar Room 2

Seminar Chair:
A/Prof. Saji Kumar Sreedharan

BIOSKETCH:

Thomas Deller studied medicine in Frankfurt, Germany, and as an exchange scholar at the Yale School of Medicine, New Haven, USA. During his time at Yale he worked in the laboratory of Csaba Leranth and focused on NPY-positive neurons and their connections in the dentate gyrus. After returning to Germany, he obtained his medical degree and moved to Freiburg University, where he worked as a post-doc and later as a research group leader in the lab of Michael Frotscher (1993-2000). In 1998 he was a guest scientist at UCIrvine, USA, in the laboratory of Ivan Soltesz. During his post-doc time Thomas Deller started working on hippocampal structural plasticity, reorganization of the hippocampus following injury and the role of the actin-modulating protein Synaptopodin in neuronal plasticity. In 2000 he was recruited to Frankfurt University where he first became Associate Professor of Anatomy and later Professor of Anatomy and Director of the Institute of Clinical Neuroanatomy. In 2017 he became Chairman of Dr. Senckenberg Anatomy at Frankfurt University. Thomas Deller has received scholarships and research awards, including the Heinz-Maier-Leibnitz award of the German Research foundation (DFG), as well as an award for excellence in teaching (2013). In 2018 he was elected into the German Academy of Sciences (Leopoldina). He is currently Editor of Experimental Brain Research and member of collaborative research consortia focusing on neuronal homeostasis and plasticity, which remains his main research interest.

ABSTRACT:

The actin-modulating protein Synaptopodin (SP) is a plasticity-related protein. In cortical neurons SP can be found in dendritic spines and the axon initial segment, two major sites of neuronal plasticity. In both neuronal subcompartments SP organizes the endoplasmic reticulum (ER) and is essential for the formation of ER-organelles, i.e. the spine apparatus (SA) and the cisternal organelle (CO). Although these two organelles were described decades ago, their functions remained elusive. With regard to the SA, loss- and gain-of-function strategies revealed SP/SA as part of the downstream effector machinery of spines involved in executing plasticity-associated changes of synaptic strength at excitatory postsynapses. With regard to the CO, a role in the regulation of action potential generation has been proposed. In addition to these two sites, we have now found an inducible third localization of SP in the somata of activated and arc-positive granule cell ensembles encoding contextual information in the dentate gyrus. EM-analysis revealed SP-immunoprecipitate organizing perinuclear ER cisterns into stacks, which may affect synapse-to-nucleus Ca^{2+} signaling. In sum, depending on the specific plasticity-inducing conditions, SP organizes neuronal ER into subcellular effector organelles influencing the ability of neurons to express different forms of plasticity.