

Joint MBG Focus talk & DANDRITE Topical Seminar

Wednesday 15 June 2016
13.15 – 14.00

The Conference room, building 3130, 3rd floor
Gustav Wieds Vej 10C, 8000 Aarhus C



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Ion Channel Clustering in the Axon Initial Segment Revealed by Super-Resolution Imaging

The axon initial segment (AIS) is a highly specialized subdomain of neurons defined by its dense enrichment of voltage-gated sodium (Nav) and potassium (Kv) channels. Forming the interface between the cell body and the axonal branch, the AIS serves two essential functions; 1) to initiate the electrical impulses which underlie the communicative abilities of neurons, and 2) to maintain the axon-dendrite polarity of the cell. Interestingly, while much has been learned regarding the identity and functional implication of the proteins expressed in the AIS, little is known on how they are structurally organized and regulated. Here, we have investigated ion channel clustering in the AIS of cultured hippocampal neurons by structured illumination microscopy (SIM). In line with recent findings, we first uncovered the existence of a subcortical periodic stripe pattern for the cytoskeletal proteins; actin and ankyrin G. Further, by use of two-color SIM, we find that the periodic stripe pattern present in AIS is composed of alternating actin and ankyrin G. Whereas the localization of Nav channels occur in a stripe pattern that follows the signal from ankyrin G, we find that the AIS localization of Kv2.1 channels occurs in high-density clusters merged between the ankyrin G stripes. We are currently expanding the work to include more AIS enriched ion channels to provide new insight into the nano-scale architecture of this functionally important neuronal subdomain.

The scientific study was carried out by Camilla Stampe Jensen¹, Laure Plantard¹ and Hiroaki Misonou²

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