Fachbereich Biologie (10)

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Institute for Developmental and Neurobiology (IDN)
AG Functional Neurobiology (AG Heine)

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Master and Bachelor projects

Early development of neuronal networks is associated with overproduction of synapses resulting in excessive connectivity and overexcitability of juvenile networks. Synapses that fail to mediate adequate level of synaptic transmission are subject to pruning leading to their elimination. Deficits in pruning of such surplus synapses were associated with autism spectrum disorders and emergence of aberrant patterns of connectivity later in development.

Auxiliary α2δ subunits of voltage-gated calcium channels are known to trigger formation of excitatory and inhibitory synapses in a calcium channel-independent manner. Changes in the expression of α2δ subunits in peripheral and central neurons were implicated in several pathological conditions and syndromes including chronic and neuropathic pain, epilepsy, and autism.

In this project, we will investigate acute and chronic effects of pharmacological inhibition of α2δ subunits on the synaptic density, synaptic transmission and connectivity in cultured networks of hippocampal neurons. For this purpose, we will combine primarily imaging (immunostaining, functional imaging) and electrophysiological (non-invasive multi-channel recording of network activity) approaches. Additionally, an experimental upregulation of α2δ1 subunit and cell type-specific optogenetic modulation of neuronal firing will be employed to dissect the impact of α2δ subunits on excitatory and inhibitory synaptic connectivity.

We are searching for Master and Bachelor students motivated to acquire and/or improve their skills in structural and functional analysis of cultured networks of hippocampal neurons. Necessary software, analytical tools and hands-on training will be provided.

If you are interested, please contact Artur Bikbaev (abikbaev@uni-mainz.de).

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