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

The Impact of Various $Ca_v2.1$ Splice Variants on mEPSCs and mIPSCs

The purpose of this project is to investigate the effects of different Cav2.1 calcium channel splice variants on miniature excitatory postsynaptic currents (mEPSCs) and miniature inhibitory postsynaptic currents (mIPSCs) in neuronal cultures. The $Ca_v2.1$ channel, also known as the P/Q-type calcium channel, plays a critical role in synaptic transmission and neuronal excitability. Gaining a deeper understanding of how different $Ca_v2.1$ splice variants contribute to synaptic signaling will enhance our knowledge of neuronal function and may reveal potential therapeutic targets for neurological disorders.

In this project, we aim to assess the impact of $Ca_v2.1$ splice variants on the amplitude, kinetics, and frequency of mEPSCs and mIPSCs.

Methods:

1. Prepare hippocampal cultures from a transgenic mouse model that enables the deletion of Cav2.1 calcium channels upon CRE activation.
2. Transfect neurons with CRE to eliminate all Cav2.1 splice variants.
3. Re-introduce specific Cav2.1 splice variants into neurons using transfection to examine their unique properties.
4. Utilize whole-cell patch-clamp techniques for electrophysiological recordings to measure mEPSCs and mIPSCs in neuronal cultures.
5. Employ analysis software, such as Clampfit or Minianalysis, to analyze the captured data. This analysis may involve quantifying the amplitude, frequency & kinetic properties of the miniature events.
6. Extract relevant data from the analysis and conduct statistical analyses to draw conclusions regarding the impact of different $Ca_v2.1$ splice variants on the characteristics of the miniature events.

By conducting this investigation, we aim to uncover valuable insights into the functional implications of $Ca_v2.1$ splice variants in regulating synaptic currents and neuronal excitability. This research has the potential to advance our understanding of synaptic transmission and may contribute to the development of innovative therapeutic strategies for neurological disorders.

If you are interested, please contact Rajit Rajappa (rarajapp@uni-mainz.de).

AG Functional Neurobiology
Biozentrum I
Hanns-Dieter Hüsch Weg 15
55128 Mainz