

MASTER THESIS IN NEUROBIOLOGY

PKC γ signaling in Purkinje cells of the cerebellum

Project Background

Purkinje cells are the principal cells of the cerebellar cortex as they provide the sole output from the cerebellar cortex. Purkinje cells have an elaborate dendritic tree with numerous dendritic spines receiving the synaptic inputs from climbing fibers and parallel fibers. Our laboratory has a long-standing interest in the molecules and mechanisms regulating growth and development of Purkinje cell dendrites. We have identified Protein Kinase C gamma (PKC γ) activity as a major regulator of Purkinje cell dendritic growth.

PKC γ is the major protein kinase C isoform in Purkinje cells and is an important signaling molecule. It acts downstream of the mGluR1 neurotransmitter receptor and is involved in many important functions of Purkinje cells such as LTD (long term depression) and calcium signaling. Purkinje cells develop their large highly branched dendritic trees postnatally and during the development it is required for a process called "multiple climbing fiber elimination" which shapes the afferent innervation of Purkinje cells.

PKC γ is also linked to Spinocerebellar ataxia type 14 (SCA-14), a hereditary cerebellar disease which is characterized by cerebellar dysfunction and Purkinje cell degeneration and which is caused by point mutations or deletions in the PKC γ gene. The mechanisms how the mutations in the PKC γ gene lead to Purkinje cell dysfunction in SCA-14 are still unclear. We are currently searching for the signaling molecules which are the targets of PKC γ and which are involved in the development of Purkinje cell dendrites.

Your Position

In the master project you will study genes which are regulated by SCA14 related mutant PKC γ and are likely to be involved in the downstream signaling after altered PKC γ activation resulting in changes in Purkinje cell dendritic development.

The project will mostly involve molecular biology such as cloning, RT-qPCR, biochemistry and microscopy methods. It will introduce you to cerebellar and Purkinje cell neurobiology.

Link

You will find more information about our laboratory at

<https://biomedizin.unibas.ch/en/research/research-groups/kapfhammer-lab/>

You may also read a recent article about our research

<https://www.frontiersin.org/journals/molecular-neuroscience/articles/10.3389/fnmol.2023.1182431/full>

Contact

Our laboratory is located in the Anatomical institute, just opposite of the new biocenter.

If you are interested in the topic, please contact us: Prof. Josef Kapfhammer (josef.kapfhammer@unibas.ch) or Dr. Zsafia Sziber (zsafia.sziber@unibas.ch).