

LS14-095 - Imaging neuronal circuits of the prefrontal cortex during a gambling task

Abstract

We will use Ca²⁺ imaging of neuronal activity to determine how distinct prefrontal cell types contribute to decisions in a modified Iowa gambling task: A rat has to choose between certain but low amounts of reward or high amounts of reward which are not delivered on every occasion. For the imaging of neuronal activity during the task performance we will use a recently developed mini-microscope that can be mounted on the skull of freely-moving rats. This microscope allows the live-imaging of Ca²⁺ activity of hundreds of neurons simultaneously. Furthermore, we will develop a novel mathematical method that will allow the matching of neurons between live Ca²⁺ imaging pictures and post-hoc histological sections. Therefore we will be able to identify the cell types of imaged neurons with histological techniques. We will determine how identified cell types and assemblies of neurons contribute to different phases of the gambling task. We will determine which information is distributed to different brain areas via different types of pyramidal cells. Also, we will determine how distinct types of GABAergic interneuron gate the neuronal cell assemblies during the different phases of the task including reward delivery, lack of reward, strategy switching and execution of a decision. Overall, this project aims at imaging the temporal activities in large neuronal assemblies of prefrontal networks and at determining how distinct types of prefrontal neuron steer the decision making process.

Scientific disciplines:

Neurobiology (80%) | Medical informatics (20%)

Keywords:

Ca-imaging, prefrontal cortex, cell assemblies, Iowa gambling task, mini-microscope

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Further links to the persons involved and to the project can be found under

<https://www.wwtf.at/funding/programmes/ls/LS14-095/>