

Project 1.11. Synaptic plasticity of appetitive learning

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Background:

Learning and memory formation are extremely complex processes. They are based on the synaptic plasticity, which is a change in the strength and number of synaptic contacts between neurons, as a response to the stimuli from the surrounding world. The research will focus on synaptic adaptations that occur during the formation of appetitive memory – the memory about pleasurable events. Thus, we will expose mice to addictive and natural rewards and study synaptic plasticity adaptations. The key brain area in appetitive and aversive learning is the amygdala. For many decades it has been studied in the context of aversive learning, such as fear conditioning. It was recently discovered, however, that blocking synaptic plasticity processes in the central nucleus of the amygdala hinders the formation of appetitive associations. In this project, therefore, we will combine state-of-the-art imaging techniques, behavioral paradigms and electrophysiological recordings to visualize and study the function of synaptic projections within the amygdalar complex, including the analysis of the formation and fate of so called silent synapses. The mouse behavioral model of positive associations will be sweet water administration (natural reward) and cocaine injections (addictive reward).

Aim:

The aim of the project is to study synaptic adaptations occurring during positive memory formation. In particular, we aim to answer two specific questions:

- 1) Which neurons within the amygdala are engaged in appetitive learning?
- 2) What is the role of silent synapses in this process?

Requirements:

- professional title of magister (Master of Science) or equivalent
- enthusiasm towards scientific research,
- fluency in English
- previous experience in mouse behavioral tests or in electrophysiological techniques will be an advantage.