Universität Basel

Research Project

Brain_Wire - Functional and molecular characterization of excitatory layer IV neurons in mouse visual cortex

Third-party funded project

Project title Brain_Wire - Functional and molecular characterization of excitatory layer IV neurons in mouse visual cortex
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Organisation / Research unit
Departement Biozentrum / Neural Networks (Mrsic-Flogel)
Department
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The main goal of this proposal is to characterize the contribution of molecular determinants to shaping the connectivity and visual response properties of excitatory neurons in the input layer of mouse visual cortex. To achieve this goal we will combine the techniques of in vivo calcium imaging to measure neuronal responses, and single-cell RNA-seq to characterize the transcriptional profiles of physiologically identified neurons. We will image the responses of layer IV neurons in mouse primary visual cortex to visual stimuli to map out their receptive fields or other visual response properties. We will then apply the methods developed in the host lab (Ko et al. 2011) to identify the neurons, whose visual responses we previously characterized, in an acute slice preparation and target them for whole-cell patch-clamp recording and RNA isolation by cytoplasmic extraction. We will prepare mRNA libraries from single physiologically characterized neurons and evaluate their transcriptional profiles using RNA-seq. This approach will allow us to relate differences in gene expression between single neurons and their visual response properties - an approach that could uncover hidden neuronal subclasses with distinct connectivity and molecular identity. The main goal of this proposal is to characterize the contribution of molecular determinants toshaping the connectivity and visual response properties of excitatory neurons in the input layer ofmouse visual cortex. To achieve this goal we will combine the techniques of in vivo calciumimaging to measure neuronal responses, and single-cell RNA-seq to characterize thetranscriptional profiles of physiologically identified neurons.We will image the responses of layer IV neurons in mouse primary visualcortex to visual stimuli to map out their receptive fields or other visual response properties. Wewill then apply the methods developed in the host lab (Ko et al. 2011) to identify the neurons,whose visual responses we previously characterized, in an acute slice preparation and target themfor whole-cell patch-clamp recording and RNA isolation by cytoplasmic extraction.We will prepare mRNA libraries from single physiologically characterizedneurons and evaluate their transcriptional profiles using RNA-seq. This approach will allow us torelate differences in gene expression between single neurons and their visual response properties -an approach that could uncover hidden neuronal subclasses with distinct connectivity andmolecular identity.

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