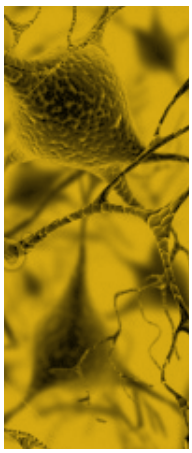
EpiNet: Understanding and manipulating epileptic networks with optical stimulation and advanced population recording techniques

Austria Canada Finland France Germany Italy Israel Luxemburg Poland Romania Spain

Project Description Epilepsy is one of the most common neurological disorders (~8.000.000 patients in the EU). The cardinal symptom of epilepsy - seizures - consistsof synchronized neuronal discharges. So far, the complexity of neuronal networks has hampered the investigation of the cellular basis of seizures using conventional electrode-based stimulation and recording techniques. We will use novel light based recording and stimulation techniques that allow to analyze the activity of hundreds of nerve cells in a network simultaneously while stimulating individual synaptic connections, or defined populations of neurons. Together with novel morphological approaches to reconstruct neuronal microcircuits, this will permit us to dissect functional changes in neuronal circuitry underlying neurological disorders such as epilepsy. We will focus our work on the role of inhibitory neurons, which powerfully control neuronal excitability and rhythmogenesis. In addition, we will transfer these studies to the in-vivo level. We will determine changes in neuronal excitability and synaptic inputs in awake behaving animals using extracellular and intracellular recording techniques and utilize light based stimulation in-vivo to control epilepsy and seizures. In addition to understanding the network basis of epilepsy, we expect these paradigms to be useful to study the neuronal and network basis of other common neurological disorders.



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