Laboratory title : CNRS UMR 5293 - Erwan Bézard

Supervisor

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Thesis title :
Cellular and synaptic basis of primary motor cortical activity in Parkinson’s disease.

Keywords : Motor cortex M1, Neural network, calcium imaging, Patch-clamp, Parkinson's disease

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Abstract

The host laboratory is working on dysfunction of neural networks in neurodegenerative disorders. Parkinson's disease is characterized by a progressive degeneration of dopaminergic neurons in the substantia nigra, a structure of the basal ganglia involved in the control of voluntary movement. The resulting lack of dopamine is the cause of the typical symptoms observed: rigidity, resting tremor and akinesia. Most of the current research focuses on the basal ganglia, little work is done on motor cortex. However, it has been shown in vivo that the activity of neurons in the primary motor cortex is altered in monkeys rendered parkinsonian. Indeed, neurons exhibiting tonic activity in normal condition switch to bursts of discharge which are synchronized among neurons in the primate model of parkinson's disease. The aim of the thesis is to decipher the function of these motor cortical microcircuits on acute slice of mice primary motor cortex under physiological and pathophysiological conditions. Using an experimental approach that combines conventional electrophysiology techniques (patch clamp) and functional calcium imaging to monitor in real time the activity of many neurons, we will 1) describe and characterize the complex in vitro activity of cortical microcircuits in physiological and pathophysiological conditions, 2) try to understand and determine the cellular and synaptic mechanisms underlying these different patterns of activity and 3) investigate the role of the dopaminergic innervation on the activity of these cortical microcircuits.

Qualification required

Applicant should have a strong Neuroscience background and a strong motivation to deal with all the technical tools (electrophysiology, calcium imaging …).