Master de Sciences et Technologies
Mention Biologie Intégrative et Physiologie
Parcours : Neurosciences
Responsable : Professeur Régis Lambert

Internship Proposal
Academic Year 2018-2019

1. Host team :

Research Unit (e.g. Department or Institute) :
Research Unit Director : Thierry GALLI
Research Team Director : Zsolt LENKEI
Team name : Dynamics of Neuronal Structure in Health and Disease

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Supervisor of the Research Intern for this project:
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2. Internship project title:

Role of structural plasticity in cannabis-induced changes in pre-synaptic function

3. Internship Description :

The endocannabinoid system is an important regulator of functional plasticity within the mammalian brain and is essential for learning and memory. Functional plasticity may be direct linked to structural plasticity, as was recently shown by electron microscopy studies at pre-synapses describing a re-organisation of synaptic vesicles after activation of the cannabinoid type I receptor (CB1). One research axis of our team is to unravel the molecular mechanisms beyond structural plasticity and we have recently found that the cannabinoid system is activating non-muscular myosin II, thus contracting cell bodies, dendrites as well as the axonal growth cone (Rolland et al., eLife, 2014). Ongoing work of the team shows that myosin-dependent structural plasticity is also essential for the establishment of correct brain wiring and for several important forms of functional synaptic plasticity. We have now set-up a microscope allowing super-resolution (SR) microscopy to monitor structural plasticity in culture primary neurones at the pre-synapse.

In this context, the project we propose is to dissect the dynamics and molecular mechanism of cannabinoid-induced structural plasticity by SR microscopy. The nanoscopic localization of important actors of this pathway (actin, myosin II, synaptic vesicles) will be analysed at pre-synapses under cannabinoid treatment. Myosin will be inactivated by genetic approaches as well as drug treatments. Finally, the relevance of this pathway will be validated with a functional study by monitoring synaptic vesicles exocytosis. To note is that this project can be extended to a PhD, in which, in addition to microscopy-based approaches, functional and structural plasticity will be evaluated *in vivo* in rodents with novel highly resolved imaging approaches co-developed in the team (Osmanski et al., Nature Communications 2014, Errico et al. Nature 2015).