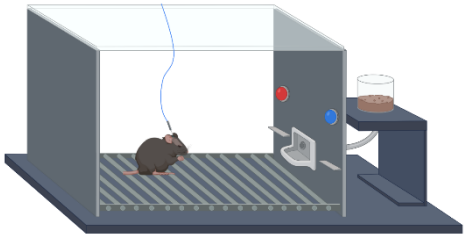
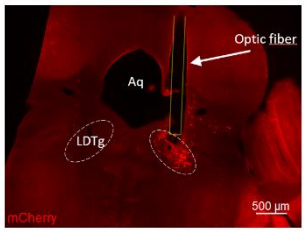
Team: H. Marie and J. Barik
Physiopathology of Neuronal Circuits and Behavior

Encadrant : Léa ROYON (04 93 95 77 44 – royon@ipmc.cnrs.fr , Sebastian FERNANDEZ (04 93 95 34 39 - fernandez@ipmc.cnrs.fr)

Subject: *Salience detection in the laterodorsal tegmental nucleus*

Keywords: *LDTg, reward, aversion, skinner box, optogenetics, viral tools.*





The brain is hardwired to pursue rewards and to avoid/escape dangers, a basic function that assures survival among all organisms. Many brain regions have long been associated with the processing of either positive (reward) or negative (aversion) salience, including the amygdala, the ventral tegmental area and the nucleus accumbens. However, recent studies have shown that this polarization of functions was an oversimplification, and many brain regions are activated by both types of stimuli. The laterodorsal tegmental nucleus (LDTg) has long been known to be important for the regulation of the wake-sleep cycle, but novel tracing techniques showed the LDTg as a highly connected nucleus, therefore extending the LDTg possible association with other functions. Recent results from our lab and others have shown that LDTg neurons are activated by natural rewards but also by aversive experiences. However, it is presently unclear what are the circuit mechanisms behind this diverse salience processing. In particular, whether different neuronal types specialize on signalling rewarding or aversive stimuli is not known.

The objective of this project is to investigate whether the LDTg different neuronal types, namely cholinergic, GABAergic and glutamatergic, are signalling aversive and/or rewarding stimuli. Using optogenetics tools in transgenic mice lines and operant chambers (skinner box), we will stimulate the different cell types to identify the rewarding or aversive properties of each neurons. Moreover, using viral injections and immunohistological techniques, we will dissect the projection from the LDTg to different regions of the brain which could be implicated in the processing of positive or negative stimuli.

Techniques: mouse behaviour, optogenetics, histology and neuroanatomy, microscopy.
Profile of the candidate: we are seeking a highly motivated student (M1 or M2), with an interest in understanding psychiatric disorders, and curiosity to learn novel approaches to study the brain. The student should be comfortable working with mice.
Publications:
Fernandez et al, 2018 Nat. Commun.
Morel/Fernandez et al, 2017 Molecular Psychiatry
Barik et al, 2013 Science.