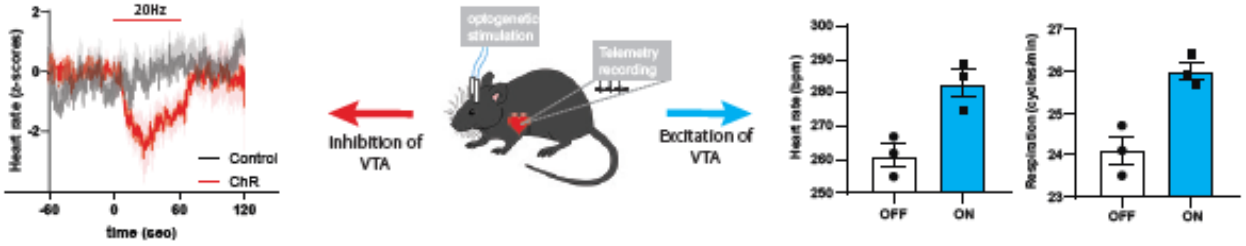
Team : H. Marie and J. Barik
Physiopathology of Neuronal Circuits and Behavior

Supervisors : Joana RIBEIRO (0493953441, ribeiro@ipmc.cnrs.fr) / Sebastian FERNANDEZ (0493953439 - fernandez@ipmc.cnrs.fr)
Subject : *Brain-heart interaction in stress processing and depression*
Keywords : *depression*, *reward circuits, stress, heart.*
AXIS I: neurobiology and neuropharmacology



Stress is a predominant factor in mental illnesses such as depression and anxiety. When faced with a stressful stimulus, the brain orchestrates a complex response that includes behavioural, hormonal and autonomic components. These stress responses are adaptive in nature allowing survival of the species, however, prolonged exposure or extremely intense stress can drive this response into allostatic overload, leading to psychiatric disorders. The stress response is organized in a top-down manner, involving high order forebrain structures, including the amygdala, the hippocampus and the prefrontal cortex. The output from these limbic structures converges on crucial subcortical relay sites, promoting defensive behaviours and strong sympathetic autonomic responses affecting cardiac, respiratory, hormonal and motor functions to prepare for threats. ***And thus, peripheral physiological parameters can be considered integrated signals of stress responses***. Chronic stress exposure has deleterious effects in the brain and body systems, and often results in comorbidities. For example, depressed patients have increased occurrence of cardiovascular disease, and conversely, 40-60% of cardiac patients develop symptoms of depression. However, a causal link between these diseases has not been established because most connecting evidence comes from observational clinical studies. However, a few studies have described changes in heart rate variability (HRV), i.e. the physiological phenomenon of variation in the time interval between heartbeats, in depressed patients. Some HRV parameters have been used to classify patients with major depression and healthy controls. These studies suggest that understanding the autonomous regulation of heart rate is a new avenue in the pathophysiology of depression. The goal of this project is to better understand the correlative activity of the brain stress system and cardiac function, and to extract physiological markers of depressive symptoms. We will use the chronic social defeat model of depression combined with behavioural readouts such as the social interaction, elevated O-maze, forced-swim and open field tests. In addition, we will evaluate cardiac function using wireless telemetry probes.
Techniques: mouse behaviour; *in vivo* telemetry recordings, histology and 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.
Publications:
Broussot et al, 2012 Molecular Psychiatry
Contesse et al, Neuropharmacology 2021
Fernandez et al, 2018 Nat. Commun.