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

Internship Proposal
Academic Year 2019-2020

1. Host team :

Research Unit (e.g. Department or Institute): Institut de Recherche Biomédicale des Armées (IRBA) et CNRS UMR 7241 / Inserm U1050 Center for Interdisciplinary Research in Biology - CIRB
Research Unit Director: Françoise DARSES (Pr, PhD, HDR)
Research Team Director: Marion TROUSSELARD (Pr, MD, PhD, HDR)
Team name: Pharmacovigilance unit

Address : Institut de Recherche Biomédicale des Armées (IRBA)
Base aérienne 217 - Zone ouest BP 73
F- 91 223 Brétigny-sur-O Cédex

Supervisor of the Research Intern for this project: Armelle Rancillac and Frédéric CHAUVEAU
Telephone : 01.44.27.12.85 et 01 78 65 12 69
E-mail : armelle.rancillac@college-de-france.fr et fchauveau@gmail.com

2. Internship project title:

Optimization of sleep efficiency by astrocytes

3. Internship Description :

Mammals are subjected to cycles of alternation of three vigilance states: the awakening, the Non-Rapid Eye Movement (NREM) sleep and the REM sleep. Various neural networks are required to switch from one state of vigilance to another, involving the Ventrolateral Preoptic Nucleus (VLPO), of the anterior hypothalamus, to initiate and maintain NREM sleep. Although sleep is a universal and essential biological process, cellular and molecular mechanisms occurring in the VLPO during NREM sleep remain unclear. Their characterization represents a major challenge for the neurosciences.

According to their position in the animal kingdom, predators such as humans can allow long periods of uninterrupted sleep, unlike preys, such as the mouse, whose survival depends on their vigilance and therefore sleep during only short intervals. Thus, unlike the humans who performs a monophasic nocturnal sleep, the mouse is prone to multiphase sleep and performs several phases of sleep over a period of 24 hours. Thus, the mouse is mainly active in the dark and generally inactive during the light periods, but also expresses a sleep during the dark periods. The insertion and development of human astrocytes in mouse VLPO might therefore favor sleep consolidation, so that it is less polyphasic and more efficient, with more EEG δ power, which would be closer to the characteristics of human sleep.

To determine whether the unique structural complexity and functional properties of human astrocytes could improve the efficiency of the neural network within the VLPO, the aim of this internship will be to test the hypothesis that human astrocyte transplantation could improve sleep efficiency in mice. Thus, we will implant human astrocytic progenitor iPS in mouse brain VLPO and determine to what extent sleep efficiency is increased in these human glial chimeric mice. In particular, we will measure the amplitude of

delta waves, characteristics of sleep quality, and duration of sleep episodes. This project will bring new insights into the role of astrocytes in the physiology of slow waves sleep.