**Master 2 internship project**

**Year 2025-2026**

**Laboratory/Institute:** HP2 and GIN **Director:** Jean Louis Pépin (HP2) / Emmanuel Barbier(GIN)

**Team:** HP2 axis 2, GIN team n°5 **Head of the team:**

**Name and status of the scientist in charge of the project:**

Dr Anne Briançon-Marjollet (HP2) and Dr Claire Rome (GIN)

 **HDR: yes x☐ no ☐**

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**Program of the Master’s degree in Biology:**

**☐** Microbiology, Infectious Diseases and Immunology **☐** Biochemistry & Structure

**☐x** Physiology, Epigenetics, Differentiation, Cancer **☐x** Neurosciences and Neurobiology

**Title of the project: Is intermittent hypoxia associated with glymphatic system dysfunction?**

Objectives (up to 3 lines):

To characterize the impact of intermittent hypoxia exposure, as a model of Obstructive Sleep Apnea, on the function of the glymphatic system in rats’ brain.

Abstract (up to 10 lines):

Obstructive sleep apnea (OSA) is a chronic respiratory condition with systemic severe repercussions, including cerebral impairments, which span cognitive disorders and increased risk of stroke. The pathophysiological hallmark of OSA is intermittent hypoxia (IH). In rodent models, IH is associated with cerebral inflammation and oxidative stress. The glymphatic system, a key fluid-transport system that clears brain from waste may be impaired by neuroinflammation. Recent evidence based on MRI analyses in OSA patients suggests an altered function of the glymphatic system, but the underlying mechanisms remain unknown. We hypothesize that a glymphatic system impairment may be induced by deleterious IH levels through neuroinflammation and oxidative stress.

Thus, we aim to investigate markers of the glymphatic pathway in rodent brains after exposure to IH for 4 weeks. We will focus on aquaporin-4 expression and polarization, together with astrocyte and microglial markers and characterization of the inflammatory and oxidative status of the brains, in different brain regions such as hippocampus, cortex and thalamus.

Methods (up to 3 lines):

Immunohistology: brain cryosections, immunostaining, followed by image analysis

Quantitative PCR and western blot on brain samples

(Note that animal exposure to IH and brain samples collection will be completed before the beginning of the M2 internship, that will mainly include sample analysis).

Up to 3 relevant publications of the team:

El Amine B, Fournier J, Minoves M, Baillieul S, Roche F, Perek N, Pépin JL, Tamisier R, Khouri C, Rome C, Briançon-Marjollet A. Cerebral oxidative stress, inflammation and apoptosis induced by intermittent hypoxia: a systematic review and meta-analysis of rodent data. *Eur Respir Rev*. 2024 Dec 18;33(174):240162. doi: 10.1183/16000617.0162-2024.

Bayan El Amine, Benjamin Lemasson, Aurélien Delphin, Marc-Adrien Reveyaz, Nora Collomb, Emeline Lemarié, Sophie Bouyon, Antoine Boutin-Paradis, Hisham Altoufaily, Olivier Detante, Anne Briançon-Marjollet, Claire Rome.Multimodal and Longitudinal Characterization of Malonate-induced Stroke Model: Multiparametric MRI, Histology, and Molecular Profiling. *Submitted to* *Stroke journal.*

Bayan El Amine, Aurélien Delphin, Marc-Adrien Reveyaz, Célian Peyronnel, Emeline Lemarié, Sophie Bouyon, Antoine Boutin-Paradis, Nora Collomb, Hisham Altoufaily, Sébastien Baillieul, Benjamin Lemasson, Claire Rome, Anne Briançon-Marjollet.Intermittent Hypoxia Alters Cerebrovascular and Neuronal Recovery After Stroke. *Manuscript in preparation*.

Requested domains of expertise (up to 5 keywords):

Neurophysiology, inflammation, cell biology, rodent model