**Master 2 internship project**

**Year 2025-2026**

**Laboratory/Institute:** HP2 **Director:** Pr Jean-Louis Pépin

**Team:** Cardiometabolic consequences of intermittent **Head of the team:** Dr Claire Arnaud

hypoxia

**Name and status of the scientist in charge of the project:** Dr Stéphanie Paradis

 **HDR: yes ☐ no x**

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

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

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

**Title of the project: Effect of photobiomodulation on aggravation of infarct size induced by intermittent hypoxia: proof-of-concept study using the isolated perfused heart model**

Objectives (up to 3 lines):

1) To provide proof-of-concept for the cardioprotective effects of photobiomodulation (PBM) in rodent exposed to intermittent hypoxia (IH) and ex vivo ischemia-reperfusion (I/R); 2) To determine the mechanisms involved, with a particular focus on cardiac oxidative stress and mitochondrial function.

Abstract (up to 10 lines):

Obstructive sleep apnea is a public health issue due to its associated cardiovascular morbidity and mortality, including increased susceptibility to myocardial I/R. A better understanding of the mechanisms induced by IH, its main component, is therefore necessary to reduce cardiovascular risk in apneic patients.

In a murine model, we previously showed that IH worsens infarct size by inducing oxidative stress and mitochondrial dysfunction, the latter playing a key role in protection against I/R. We also showed that photobiomodulation (PBM), a non-invasive light therapy targeting mitochondria, prevents IH-induced insulin resistance by limiting hepatic oxidative stress.

The aims of this internship are to 1) investigate if photobiomodulation (PBM) can limit infarct size following myocardial I/R, and 2) determine the mechanisms involved on its effects. If our hypotheses are confirmed, PBM could be proposed as an innovative therapy to limit infarct size in apneic patients, and thus improve post-infarction prognosis.

Methods (up to 3 lines):

Exposure to IH of animals and physiological parameters monitoring.

Ex-vivo myocardial ischemia-reperfusion and evaluation of infarct size.

Oxidative stress measurement and mitochondrial function evaluation.

Up to 3 relevant publications of the team:

Moulin, S., et al., *Curcumin prevents chronic intermittent hypoxia-induced myocardial injury.* Ther Adv Chronic Dis, 2020. 11: p. 2040622320922104.

Moulin, S., et al., *Intermittent Hypoxia-Induced Cardiomyocyte Death Is Mediated by HIF-1 Dependent MAM Disruption.* Antioxidants (Basel), 2022. 11(8).

Paradis, S., et al., *Photobiomodulation alleviates insulin resistance induced by intermittent hypoxia, through preservation of adipose tissue insulin signaling and reduction of hepatic oxidative stress in mice.* Acta Physiol. Under review.

Requested domains of expertise (up to 5 keywords):

Cardiac ischemia-reperfusion, hypoxia, photobiomodulation, oxidative stress and mitochondria, animal experimentation.