

PhD Position

Cerebral Metabolic Rate of Oxygen by MRI and Anesthesia in Ischemic Stroke

Research Unit: CarMeN, U1060 INSERM, U1397 INRAE, **Team:** IRIS, Ischemia-Reperfusion Syndroms

Location: University Claude Bernard Lyon 1, [CarMeN laboratory](#), Hospitaux Est, 59 Bd Pinel, 69500 Bron

Start: September-October 2023, 3-year contract

Description of the project

The measurement of oxygen metabolism (cerebral metabolic rate of oxygen, CMRO₂) using MRI is a new imaging biomarker. It is currently under development to evaluate cerebral damage in cortical and subcortical regions in ischemic stroke (IS) ¹. The anesthetic agent, the depth and duration of anesthesia have major consequences on systemic and cerebral hemodynamic parameters². The patients are often exposed to anesthetic agents during the IS medical management or during surgical procedures occurring later after an ischemic stroke. The auto-regulation mechanisms of cerebral perfusion are strongly altered at the acute stage of IS³ and remained deeply modified at the subacute and chronic stages, with consequences on CMRO₂ in the lesion but also in the other brain regions. These mechanisms are still insufficiently explored to guide the choice of the anesthetic agents and the anesthesia depth from electroencephalographic (EEG) markers, especially in stroke patients⁴. We have developed an IS model mimicking the human pathology and its treatment by an endovascular mechanical thrombectomy⁵. We have characterized it by multiparametric imaging and showed the effect of a neuroprotective treatment using imaging biomarkers⁶. The hypothesis of this PhD project is that the combination of EEG and multiparametric MRI of the CMRO₂ in this model will allow to identify new biomarkers to guide the anesthesia of stroke patients and manage pain.

Objectives: the proof-of-concept of the new biomarkers will be established in the IS model to be applied in clinical contexts.

Methods: 1/ Analysis of MRI CMRO₂ to identify the relevant parameters after an ischemic stroke. 2/ Study of the effect of two different anesthetic agents with the new biomarkers (CMRO₂ and EEG) in the post-stroke stages.

References : **1.** Chalet L, et al. Front Cardiovasc Med. 2022;9:861913. **2.** Debatisse J et al. J Cereb Blood Flow Metab. 2021;41(4):745-760. **3.** Nogueira et al. Brain Sci. 2021 ; 11 :111. **4.** Dreier et al. Neuropharmacol. 2018 ; 134 (2018) 189e207. **5.** Debatisse J et al. J Cereb Blood Flow Metab. 2021;41(4):745-760. **6.** Debatisse J et al. Brain Commun. 2020;2(2):fcaa193. Debatisse J et al. Brain Commun. 2020;2(2):fcaa193.

We offer a full PHD position according to the University Claude Bernard Lyon 1 guidelines:

- You have a Master degree in neuroscience, biology, physiology, medicine, veterinary or equivalent
- You have knowledge in anesthesia and physiological parameters monitoring
- You are interested in signal and image analysis

Please send your application including a detailed CV to:

Canet Soulas, Emmanuelle, emmanuelle.canet@univ-lyon1.fr ;

Portier, Karine, karine.portier@vetagro-sup.fr;

Balanca, Baptiste, baptiste.balanca@chu-lyon.fr