MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2026-2027

(internship from January to June 2027)

Host laboratory:
CarMeN lab (Cardiovascular Metabolism Diabetology Nutrition)
Inserm U1060 Université Claude Bernard Lyon 1
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Host team:
IRIS team (Ischemia-reperfusion injury syndromes):
http://carmen.univ-lyon1.fr/equipe-3-ischemia-reperfusion-syndromes/

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Project title : Investigating the effects of drugs that modulate cAMP effector proteins in models of ischemic stroke

Project summary :

Ischemic stroke is a frequent and disabling disease. Understanding the pathophysiological mechanisms involved in the formation of cerebral lesions following stroke has become a priority for developing new therapeutic strategies for neuroprotection. Experimental studies have shown that raising the intracellular concentration of cyclic adenosine monophosphate (cAMP) can moderate brain damage following stroke (Biomedicines 2021), notably through an immunomodulatory action. We have identified one of the main cAMP effector proteins. To our knowledge, the role of this protein in the pathogenesis of stroke has not yet been studied. Our preliminary results show that it could be a promising therapeutic target in stroke.

The aim of the internship is to investigate the effects of drugs that modulate cAMP effector proteins in in-vitro and in-vivo models of ischemic stroke. Specifically, the objectives are: 1/ to optimize a model of primary culture of cerebral cells (comprising neurons, astrocytes and microglia) under oxygen and nutrients deprivation; 2/ to evaluate the impact of modulating

our protein of interest in this model and 3/ to rank microglia according to their morphological features on immunohistological slices following protein modulation in an in-vivo model of ischemic stroke. This will bring novel knowledge about the mechanistic understanding of the role of cAMP effector proteins in ischemic stroke. This project is funded by a grant from the Fondation pour la Recherche sur les AVC.

3-5 recent publications:

1. Ong et al. Mitochondria dysfunction, a potential target for cytoprotection against ischaemia-reperfusion injury in a mouse stroke model. Neurotherapeutics 2025 doi: 10.1016/j.neurot.2025.e00549
2. Benkeder et al. MorphoCellSorter: An Andrews plot-based sorting approach to rank microglia according to their morphological features. Elife. 2025 19;13:RP101630 doi: 10.7554/eLife.101630
3. Singh et al. Uncontrolled mitochondrial calcium uptake underlies the pathogenesis of neurodegeneration in MICU1-deficient mice and patients. Science Adv 2022, doi 10.1126/sciadv.abj4716
4. Hubert et al. Multimodal imaging with NanoGd reveals spatiotemporal features of neuroinflammation after experimental stroke. Adv Science 2021, doi