

**MASTER 2 Neurosciences Fondamentales et Cliniques
UCB Lyon 1, Lyon, France**

**Internship proposal 2020-2021
(internship from January to end of May 2021)**

Host laboratory:

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Host team :

Rejane RUA, PhD

Group leader 'Immunosurveillance of the Central Nervous System'

<http://www.ciml.univ-mrs.fr/science/lab-rejane-rua/immunosurveillance-central-nervous-system>

Internship supervisors :

Dr. Rejane Rua, Group leader, Inserm position
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Project title :

Unravelling the neurotrophic roles of macrophages at the brain surface

Project summary :

The surface of the Central Nervous System (CNS) is connected to the periphery by layers of highly vascularized membranes, the meninges. Although the brain has been considered immune-privileged for decades, it has been recently shown by our team and others that the meninges are populated by a myriad of resident immune sentinels. Unexpectedly, immune cells specifically located in the meninges play a role in neuronal function, tissue homeostasis as well as infectious, inflammatory and age-related neurodegenerative diseases. Due to their strategic location at the interface between the periphery and the brain, the **meninges thus function as a nurturing tissue enveloping the CNS and also represent its first line of protection.**

Please send your proposal to emiliano.macaluso@univ-lyon1.fr and marion.richard@univ-lyon1.fr for publication on the Master of Neuroscience website.

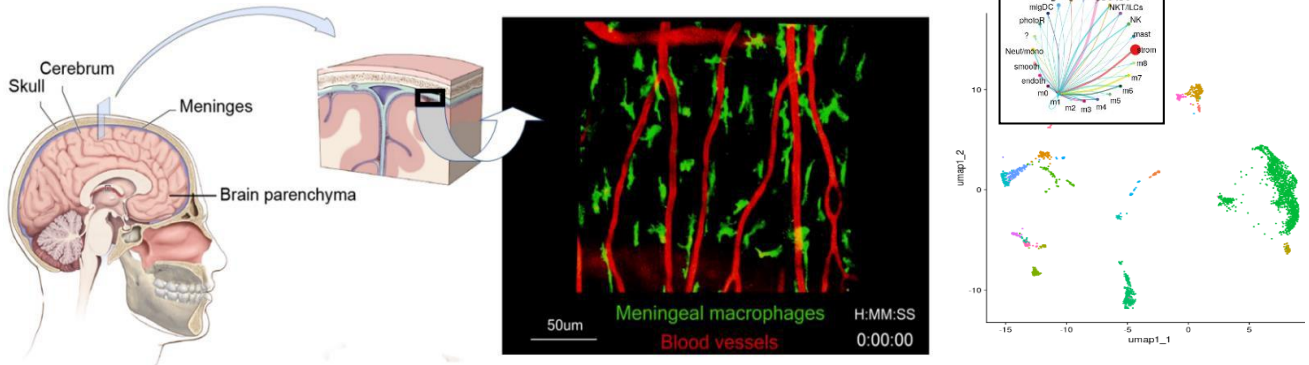
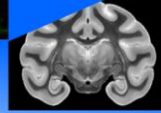


Figure 1. Location of the meninges at brain surface (left). Image extracted from an intravital movie of CX3CR1-GFP mouse showing a top-down view of meningeal macrophages (green) along the vasculature (red) (middle). UMAP representation of immune and non-immune meningeal populations and CellChatDB prediction of macrophage interactions (right).

Meningeal macrophages are organized in a vast network that constantly monitor and scan the entire brain surface. **The objective of this project is to understand how macrophages at the brain surface maintain and promote neuronal functions.**

We hypothesize that meningeal macrophages are heterogeneous and that distinct macrophage subpopulations differ in the magnitude and quality of their pro-neuronal versus antimicrobial response. To address these questions, we will combine multiparametric flow cytometry, state-of-the-art single-cell transcriptomics, CRISPR-Cas9 technology and intravital imaging approaches to analyze the heterogeneity and functions of meningeal macrophages in wild-type and transgenic mouse models.

3-5 recent publications :

Rua R, Pujol N. *IL-17: good fear no tears.* **Nat Immunol comments. 2020**

Rua R, et al. *Infection drives meningeal engraftment by inflammatory monocytes that impairs CNS immunity.* **Nat Immunol. 2019**

Rua R, McGavern DB. *Advances in Meningeal Immunity.* **Cell Press Trends Mol Med. 2018**

Kwong B*, **Rua R*** et al. *T-bet-dependent Nkp46+ innate lymphoid cells regulate the onset of TH17-induced neuroinflammation.* **Nat Immunol. 2017**

Rua R, McGavern DB. *Elucidation of monocyte/macrophage dynamics and function by intravital imaging.* **J Leukoc Biol. 2015**

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