Master de Sciences et Technologies
Mention Biologie Intégrative et Physiologie
Parcours : Neurosciences
Responsable : Professeur Régis Lambert

Internship Proposal
Academic Year 2018-2019

1. Host team : Centre Interdisciplinaire de Recherche en Biologie

Research Unit (e.g. Department or Institute) : Collège de France
Research Unit Director : Alain Prochiantz
Research Team Director : Martine Cohen-Salmon
Team name : The gliovascular unit team

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2. Internship project title:

Deciphering the molecular bases of gliovascular functions in the brain:
Local protein synthesis in astroglial perivascular processes

3. Internship Description :

Astrocytes are the most numerous neuroglial cells in the brain and constitute a predominant influence for the cerebrovascular system through polarized endfeet-terminated processes that contact blood vessels. Astrocyte polarity toward the cerebrovascular system is of critical importance for the brain physiology and pathophysiology. Nevertheless, how astrocytes accomplish their regulatory functions at the vascular interface is far from being understood. Moreover, mechanistic insights on the way astrocyte polarity is set at the vascular interface to maintain these functions are lacking. In a recent study, we demonstrated that distribution of specific mRNAs and local translation occur in astrocyte perivascular endfeet. We described the presence of smooth and rough endoplasmic reticulum and the Golgi apparatus in astrocyte perivascular processes and endfeet, suggesting for local maturation of membrane and secreted proteins. Finally, developing specific tools to purify the gliovascular unit and combining them with an astrocyte-specific translating ribosome affinity purification (TRAP) strategy, we identified the endfeetome, a pool of ribosome-bound mRNAs in astrocyte perivascular endfeet, encoding mainly secreted and membrane proteins.

We propose now to explore the mechanisms setting local translation in astrocyte endfeet and the endfeetome, and address their role in the gliovascular physiology and pathophysiology, through multi-disciplinary cutting-edge in vivo and in vitro approaches combining microfluidics molecular and cellular biology and imaging.

Local translation plays crucial roles in maintaining polarized cellular functions and dysregulated mRNAs localization and translation cause defects in particular in the brain in

neuronal wiring and survival. Thus, the characterization of local translation mechanisms in astrocyte endfeet and of a novel gliovascular repertoire might provide essential knowledge on gliovascular functions in physiology and pathophysiology of cerebrovascular associated defects, which are etiological hallmarks of several neuropathologies.