UFR de Chimie et de Biologie
UNIVERSITÉ Grenoble Alpes

Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2024-2025

Laboratory/Institute: Grenoble Institut des Neurosciences (GIN) **Director:** E. Barbier
Team: Neurocytoskeleton Dynamics and Structure **Head of the team:** I. Arnal / A. Andrieux

Name and status of the scientist in charge of the project: A. Antkowiak (MCF)

HDR: yes ☐ no ☒

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Program of the Master's degree in Biology:

☐ Microbiology, Infectious Diseases and Immunology ☐ Structural Biology of Pathogens
☒ Physiology, Epigenetics, Differentiation, Cancer ☒ Neurosciences and Neurobiology

Title of the project: Characterization of brain-cytoplasmic actin proprieties

Objectives (up to 3 lines):

The main aims of this project are to 1) purify and specifically label brain actin, 2) study its dynamic properties and 3) reconstitute a neurocytoskeleton in the presence of both purified microtubules and actin from brains.

Abstract (up to 10 lines):

The cell cytoskeleton, and actin in particular, regulates major biological functions such as cell differentiation, division and migration. While actin is encoded by 6 different genes in humans, most of the data available to date on this protein comes from actin expressed in muscles. Recent data obtained in the lab suggest that cytoplasmic actin found in the brain cannot coassemble with muscle actin, even though these proteins are over 93% identical. The project of this M2 internship is therefore to explore the specific dynamic properties of brain-cytoplasmic actin and its ability to be regulated by known binding proteins (nucleators, stabilizers, etc.). In a second step, we will explore the ability of brain-cytoplasmic actin to assemble into organized networks as found in cells, and we will recapitulate *in vitro*, from purified proteins, a neurocytoskeleton composed of organized actin networks and microtubules. This project will provide the basis for in-depth studies into the role of neuronal regulators on the neuronal cytoskeleton.

Methods (up to 3 lines):

Protein expression (bacteria) and purification (chromatography, affinity, polymerization strategy), protein labelling, SDS-PAGE. Imaging (video-microscopy, TIRF). Spectrofluorimetric method to monitor actin polymerization. Analysis (ImageJ/Fiji, R).

Up to 3 relevant publications of the team:

* Elie E *et al*. (2015) Tau co-organizes dynamic microtubule and actin networks. Sci Rep 5:9964
* Antkowiak *et al*. (2019) Sizes of actin networks sharing a common environment are determined by the relative rates of assembly PLoS Biol 17(6): e3000317.
* Bagdadi *et al.* (2024) Stable GDP-tubulin islands rescue dynamic microtubules. J Cell Biol (2024) 223 (8): e202307074.

Requested domains of expertise (up to 5 keywords):

Protein biochemistry, Photonic microscopy, Data analysis, Ability to follow protocols, Ability to write and present results.