UFR de Chimie et de Biologie
UNIVERSITÉ Grenoble Alpes

Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2023-2024

Laboratory/Institute: Grenoble Institut 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: Role of Tau protein on actin cytoskeleton remodeling

Objectives (up to 3 lines):

The main objectives of this project are 1) to reconstitute in a cell-free environment, the main actin networks found in neurons, 2) to determine if Tau can remodel and impact the actin dynamics and 3) to compare pathological variants of Tau on the actin cytoskeleton.

Abstract (up to 10 lines):

The cell cytoskeleton regulates major biological functions such as cell differentiation, cell migration and immune response, to name but a few. Importantly, actin microfilaments and microtubules interact with each other, and this interaction is key for many cellular functions in eukaryotic cells such as neurons. Some microtubule regulators such as Tau, also colocalize with the actin cytoskeleton in cells. Interestingly, in many brain diseases, the cytoskeleton is disrupted and proteins such as Tau can be modified. However, it is unclear to what extent Tau is able to directly affect the organization and dynamic properties of the cytoskeleton. The aim of this internship is to determine the **molecular impact of Tau on actin cytoskeleton** remodeling in cell-free systems reconstituted from purified proteins. This Learning-By-Building approach will enable us to decipher some of the molecular mechanisms induced by the proteins of interest on cytoskeleton remodeling.

Methods (up to 3 lines):

Protein expression (bacteria) and purification (chromatography, affinity, polymerization strategy), protein labelling, SDS-PAGE. Imaging (video-microscopy, TIRF). Analysis (ImageJ, 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.
* Fourest-Lieuvin et al. (2023) Controlled Tau Cleavage in Cells Reveals Abnormal Localizations of Tau Fragments. Neuroscience 518:162-177.

Requested domains of expertise (up to 5 keywords):

Protein biochemistry, Photonic microscopy, Data analysis, Ability to follow protocols.