Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2025-2026

Laboratory/Institute: Grenoble Institut Neurosciences **Director:** Dr. E. Barbier
Team: Translational control in normal and pathological conditions
Head of the team: Dr. S. Belin

Name and status of the scientist in charge of the project: Stéphane Belin, DR2 INSERM
HDR: yes ☒ **no** ☐
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Program of the Master's degree in Biology:

☐ Microbiology, Infectious Diseases and Immunology ☐ Biochemistry & Structure
☐ Physiology, Epigenetics, Differentiation, Cancer ☒ Neurosciences and Neurobiology

Title of the project:

Mechanisms of neuroprotection and regeneration in the central nervous system

Objectives (up to 3 lines):

The goal of the project is to determine neuronal molecular mechanism key to promote neuroprotection and regeneration after an injury in the central nervous system. For this we are particularly interested by the role of protein synthesis and ribosome in these processes

Abstract (up to 10 lines):

Unlike the peripheral nervous system, neurons from the central nervous system (brain, spinal cord) are not able to regrow axons after injury. Therefore, any lesion to the CNS leads to permanent motor and/or cognitive impairment. To this day, no treatment is available to overcome CNS injuries. It is now well established that modulating neurons themselves promotes axonal growth. The challenge now is to identify neuronal targets and molecular pathways that are required for axon regeneration. The project is to determine the role of protein synthesis regulation after CNS injury in order to define new way to promote axon regeneration. We will explore the notion of specialized ribosome to determine new target promoting axon regeneration.
We are using a combination of in-vitro, in-vivo assay, molecular biology and biochemistry to characterized new cellular pathway implicated in neuroprotection and axonal growth in order to develop new therapeutic strategies.

Methods (up to 3 lines):

Methods developed in the team are: in-vivo model of central nervous system injury, western-blot analysis, immunofluorescence and microscopy, images analysis. Biochemistry technics link to the analysis of ribosome and ribosomal proteins.

Up to 3 relevant publications of the team:

1- Customization of translational complex regulates mRNA-specific translation to control CNS regeneration. Julia Schaeffer, Noemie Vilallongue, Beatrice Blot, Nacera El Bakdouri, Charlotte Decourt, Elise Plissonnier, Blandine Excoffier, Antoine Paccard, Jean-Jacques Diaz, Sandrine Humbert, Frederic Catez, Frederic Saudou, Homaira Nawabi, Stephane Belin. Neuron.

2- The RSK2-RPS6 axis promotes axonal regeneration in the peripheral and central nervous systems Charlotte Decourt, Julia Schaeffer, Beatrice Blot, Antoine Paccard, Blandine Excoffier, Mario Pende, Homaira Nawabi, Stephane Belin. PLoS Biol. 2023 Apr 17;21(4):e3002044. doi:10.1371/journal.pbio.3002044. eCollection 2023 Apr.

3- Proteomics-based characterization of ribosome heterogeneity in adult mouse organs.
Brunchault MR, Hesse AM, Schaeffer J, Fröhlich A, Saintpierre A, Decourt C, Combes F, Nawabi H, Couté Y, Belin S. Cell Mol Life Sci. 2025 Apr 24;82(1):175. doi: 10.1007/s00018-025-05708-7.
PMID: 40272563

Requested domains of expertise (up to 5 keywords):

regeneration, translation, ribosome, molecular and cellular biology