Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2025-2026

Laboratory/Institute: IBS
Team: SAGAG

Director: Winfried Weissenhorn
Head of the team: Hugues Lortat-Jacob

Name and status of the scientist in charge of the project:
Rebekka Wild & Sarah Le Hir

HDR: yes ☐ no x

Address: IBS, 71 Avenue des Martyrs, CS 10090, 38044 Grenoble
Phone: 04 57 42 86 30 **e-mail:** rebekka.wild@ibs.fr

Program of the Master's degree in Biology:

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

Title of the project:

Investigate complex formation between Glypican 4 and CCN1, two key players in cortical development

Objectives (up to 3 lines):

This M2 proposal aims on dissecting the molecular interaction between the cell surface protein Glypican 4 and the matricellular protein CCN1 using biophysical and structural biology approaches.

Abstract (up to 10 lines) :

Glypican 4 is a heparan sulfate (HS) proteoglycan which interacts with a myriad of partners and thus mediates a broad range of biological and pathological processes. A very recent study revealed CCN1 (Cysteine-rich angiogenic inducer 61) as a novel interaction partner of Glypican 4 (Zheng et al., 2025, bioRxiv). Complex formation between CCN1 - Glypican 4 seems to play a role in neuronal stem cell maintenance. The aim of the M2 project is to study this complex formation using recombinantly expressed and purified proteins in combination with biophysical techniques such as mass photometry and biolayer interferometry. The ultimate goal will be to shed light on the moleclar basis of CCN1-Glypican 4 complex formation using single-particle cryo-electron microscopy. The M2 student will optimize the purification procedures of the two proteins and learn how to study their protein quality and protein interactions using divers biophysical technique. In addition, the student will learn how to prepare samples for cryo-electron microscopy experiments and gain first insight into cryo-EM data collection and processing.

Methods (up to 3 lines):

Expression (in bacteria and mammalian cells) and purification of proteins

Master's degree in Biology – Chemistry-Biology Department

Protein characterization using nanoDSF, mass photometry and bio layer interferometry
Cryo-electron microscopy grid preparation and screening

Up to 3 relevant publications of the team:

Leisico F, Omeiri J, Le Narvor C, Beaudouin J, Hons M, Fenel D, Schoehn G, Couté Y, Bonnaffé D, Rabia Sadir R, Lortat-Jacob H, Wild R (2022). Structure of human polymerase complex EXT1-EXT2. Nat Commun ; 13(1) :7110.

Bourgeais M Fouladkar F, Weber M, Boeri-Erba E, Wild R (2024). Chemo-enzymatic synthesis of tetrasaccharide linker peptides to study the divergent step in glycosaminoglycan biosynthesis. Glycobiology, 34 (5): cwae016.

Annaval T, Wild R, Crétinon Y, Sadir R, Vivès R, Lortat-Jacob H (2020). Heparan Sulfate Proteoglycans Biosynthesis and Post Synthesis Mechanisms Combine Few Enzymes and Few Core Proteins to Generate Extensive Structural and Functional Diversity. Molecules. 25(18):4215.

Requested domains of expertise (up to 5 keywords):

The candidate will be interested in or experienced in biochemistry, biophysics and structural biology.