

**Master 2 internship project
Year 2025-2026**

Laboratory/Institute: Institut de Biologie Structurale

Director: Winfried Weissenhorn

Team: [Membrane and Pathogens](#)

Head of the team: Franck Fieschi

Name and status of the scientist in charge of the project: [Cedric Laguri](#)

HDR: yes ☒ no ☐

Address: 71 Avenue des Martyrs 38000 Grenoble

Phone: +33457428577

e-mail: cedric.laguri@ibs.fr

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: **Weaken the Barrier: Dynamic Modular Study of Lipopolysaccharide Early Transport by the Lpt Machinery**

Objectives (up to 3 lines):

This multidisciplinary project is aimed at describing an essential step in the Gram- outer-membrane assembly: the lipopolysaccharide (LPS) insertion into its transporter machinery. The studentship will be supervised by Dario De Vecchis (MD specialist) and Cedric Laguri (LPS specialist, CNRS researcher).

Abstract (up to 10 lines):

In this project, we will employ an interdisciplinary biophysical and computational approach to advance the currently limited knowledge of the LPS transport machinery (Lpt), an essential component of Gram-negative bacteria virulence. We will uncover how LPS is inserted into the machinery and squeezed out from protein to protein through the periplasm. The project will integrate cutting-edge computational techniques with structural biology to bridge the knowledge gap of Lpt structure and function at the molecular level. Molecular dynamics simulations will complement Lpt cryo-EM structures by exploring the complex dynamics and regulations of the transport machinery. The project, performed in close collaboration with biologists at Milan University, will create new research avenues to weaken the Gram-negative bacterial barrier and advance progress in Lpt-based drug discovery. Its findings will establish a knowledge framework transferable across ESKAPE bacteria, serving as an agile resource to prevent future global outbreaks of antimicrobial resistance.

Methods (up to 3 lines):

The project will involve production of membrane proteins for which production and purification have already been established, and their structural analysis by Cryo-EM in different states. These data will provide information used for molecular dynamics studies to model the LPS transport process.

Up to 3 relevant publications of the team:

de Vecchis, et al. (2024). Biophysical Journal, <https://doi.org/10.1016/j.bpj.2024.06.020>

Baeta,...,Polissi,.. Laguri, C. (2021). JBC, <https://doi.org/10.1016/j.jbc.2021.101313>

Falchi, F. A., .. Laguri, C., .. Polissi, A., & Sperandeo, P. (2023). MBio, <https://doi.org/10.1128/mbio.02202-22>

Requested domains of expertise (up to 5 keywords):

Membrane proteins, lipids, Cryo-EM, Docking, molecular modelling