UFR de Chimie et de Biologie
UNIVERSITÉ Grenoble Alpes

Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2021-2022

Laboratory/Institute: PBRC/IBS **Director:** Winfried Weissenhorn
Team: Bacterial Pathogenesis and Cellular Responses **Head of the team:** Attrée Ina

Name and status of the scientist in charge of the project: Job Viviana **HDR: yes** ☐ **no** x
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Program of the Master's degree in Biology:

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

Title of the project: Study of the MreD interactome and its role in bacterial fitness and virulence

Objectives (up to 3 lines):

Determine the role of the elangosome protein MreD in bacterial survival/fitness in the rod shape opportunistic pathogen *Pseudomonas aeruginosa.* Identify new partners of the complex for structural studies.

Abstract (up to 10 lines):

The peptidoglycane (PG) is the main component of the cell wall, a rigid structure allowing the bacteria to survive to osmotic pressure. For this reason, the enzymes involved in the PG biosynthesis are promising drug targets. Many different antibiotics target the PBPs catalyzing the last step of the PG synthesis and some targets the cytoplasmic machinery composed of "Mur enzymes" that synthetize the lipid II, building block of the PG synthesis. The *mreBCD* operon encodes for the actine-like protein MreB, and MreC-MreD complex that in rod-shape bacteria is essential for the positioning of the PG synthesis machinery [1]. The structure of the MreC polymers [2] and the complex between MreC-PBP2 [3] have been recently solved. However, the exact role of the membrane protein MreD is still unknown. This project will characterize the MreD protein by functional in vivo approaches and its interaction with MreC and other potential partners, identified through genetic screens.

Methods (up to 3 lines):

CRISPRi to inactivate the *mreD* gene followed by phenotypic analysis. Validation of Tn-seq experiments performed in the laboratory. Pulldown assays to identify other protein partners.

Up to 3 relevant publications of the team:

[1] Liu X et al , ***PLoS Genet.*** (2020) **MreC** and MreD balance the interaction between the elongasome proteins PBP2 and RodA. doi: 10.1371/journal.pgen.1009276
[2] Martins A et al. ***Nat Commun.*** (2021) Self-association of **MreC** as a regulatory signal in bacterial cell wall elongation. doi: 10.1038/s41467-021-22957-9.
[3] Contreras-Martel C, et al. ***Nat Commun***. (2017) Molecular architecture of the PBP2-**MreC** core bacterial cell wall synthesis complex. doi: 10.1038/s41467-017-00783-2

Requested domains of expertise (up to 5 keywords):

Molecular biology, biochemistry of proteins, microbiology and fluorescence microscopy