**Master 2 internship project**

**Year 2023-2024**

**Laboratory/Institute:** CERMAV **Director:** Laurent HEUX

**Team:** Molecular and Structural Glycobiology **Head of the team:** Annabelle VARROT

**Name and status of the scientist in charge of the project:** A. Varrot /A. Imberty **HDR: yes X**

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**Program of the Master’s degree in Biology:**

**☐** Microbiology, Infectious Diseases and Immunology **X** Structural Biology of Pathogens

**☐** Physiology, Epigenetics, Differentiation, Cancer **☐** Neurosciences and Neurobiology

**Title of the project: Identification, biochemical and structural characterization of new lectins from pathogens**

Objectives (up to 3 lines):

Microbial pathogens mediate interactions with host epithelial cells with carbohydrate binding proteins called lectins. Lectins will be identified through genomic search in bacteria and fungi, overexpressed prior characterizing their binding to human glycans through biophysical methods.

Abstract (up to 10 lines):

Many pathogens use lectins for specific recognition of and adhesion to glycoconjugates on host tissues. Several soluble lectins from opportunistic bacteria and microfungi have been studied in our group and are targeted for the development of new anti-infectives molecules. We also developed a database that contain all predicted lectins from available genomes. The project will start by datamining for putative lectins in emerging pathogens of interest such as the ESKAPE bacteria with in particular *Klebsiella pneumoniae,* in emerging fungi and viruses. 1 or 2 lectins will be chosen to be produced in recombinant form and purified by classical chromatography. Their specificity and affinity will be determined by different biophysical approaches such as ITC, SPR or BLI. Finally, lectin-ligand Interactions will be dissected at the atomic level by X-ray crystallography.

Methods (up to 3 lines):

Bioinformatics, molecular biology, recombinant expression, biochemistry, characterization of protein ligand interactions (titration microcalorimetry, surface plasmon resonance, biolayer interferometry) and protein X-ray crystallography

Up to 3 relevant publications of the team:

Bermeo R et al. Targeting a Multidrug-Resistant Pathogen: Design, Synthesis and Evaluation of *Burkholderia cenocepacia’s* BC2L-C antagonists. ACS Chem Biol, 2022, 17: 2899, doi: 10.1021/acschembio.2c00532.

Martínez-Alarcón D et al. SapL1: A New Target Lectin for the Development of Antiadhesive Therapy Against *Scedosporium apiospermum*. Sci Rep, 2021, 11:16109. doi: 10.1038/s41598-021-95008-4.

Bonnardel F et al. LectomeXplore, an update of UniLectin for the discovery of carbohydrate-binding proteins based on a new lectin classification. NAR, 2021, 49(D1):D1548. doi: 10.1093/nar/gkaa1019.

Requested domains of expertise (up to 5 keywords):

Molecular biology, biochemistry, interest in protein-ligand interactions