

**Title of the PhD project:**

nanoLPS: Pathogen LPS recognition by immunity C-type lectins receptor in a cell-surface mimicking environment

**PhD supervisors:**

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**Host laboratory:**

Institut de Biologie Structurale, [NMR group](#)

**Project summary:**

The surface of Gram-negative bacteria is decorated with LPS glycolipids in which lipids and glycans are markers detected by the immune system. C-type Lectins Receptors (CLRs), at the surface of dendritic cells, interact with the glycan part of LPS and trigger immune responses. CLRs are multimeric proteins for which multivalence enables high affinity interaction with glycans, especially at the surface of pathogens. The intent of the present project is to develop nano-objects mimicking the bacterial surface to study CLR interactions with LPS from different pathogens in an experimental setup mimicking interactions at the surface of cells. A combination of Nuclear Magnetic Resonance as well as biophysical methods will provide atomic-scale models that should highlight important determinants of the interactions and rationalize the variation of kinetic, affinity and avidity in different systems.

**Required skills:**

Structural biology, Nuclear Magnetic Resonance, protein purification and characterisation (SPR, BLI...).

**Student role:**

The recruited PhD student will be in charge of the production, purification, and characterization of membrane nanodiscs. For this purpose, the candidate will be doing isotopically labelled bacterial cultures and extracting and purifying by chromatography the nanodiscs. The student will also perform the characterisation of the nano-objects by biophysical methods including by solution state and solid-state NMR in absence and presence of their protein partners. This will include assignment (atomic identification of NMR signals) of the different NMR spectra with significant time spent on specific NMR software. The student will participate in purification of the protein partners and in the setup of immobilised methods (SPR, BLI) to screen and quantify LPS/C-type lectins interactions.

**Keywords:**

LPS, immunity, NMR, C-type lectins, SPR, BLI.

**Relevant publications of the team:**

- Porkolab, V. et al. *Org. Biomol. Chem.* 10.1039/d0ob00781a
- Laguri, C. et al. *ACS Chem. Biol.* 10.1021/acscchembio.8b00271
- Maalej, M. et al. *ChemBioChem* 10.1002/cbic.201900087
- Thépaut, M. et al. *Biochemistry* 10.1021/bi802151w
- Laguri, C. et al. *Sci. Rep.* 10.1038/s41598-017-10136-0