

Master 2 Internship – 6 months
IBS – SAGAG team & SyMMES – CIBEST team, Grenoble

Engineering biomimetic cell surfaces to study proteoglycan–protein interactions

Context

Cell communication is strongly regulated by the molecular organization of the cell surface. In particular, **proteoglycans** carrying glycosaminoglycan (GAG) chains interact with numerous extracellular **signaling proteins** and contribute to their localization, availability and biological activity. Studying these interactions in cells is challenging because membrane composition, protein mobility and extracellular interactions are simultaneously coupled. Biomimetic surfaces and **supported lipid bilayers (SLBs)** provide a complementary approach in which selected components of the cell surface can be reconstructed under controlled conditions.

The SAGAG team at the Institut de Biologie Structurale (IBS) has expertise in GAG and proteoglycan biology and biochemistry. The CIBEST team at SyMMES develops biomimetic surfaces for studying how extracellular presentation regulates signaling proteins. Building on previous work using GAG-functionalized surfaces, the two teams aim to develop a new generation of biomimetic systems reproducing the dynamic presentation of cell-surface proteoglycans.

Project

The objective of this internship will be to develop and characterize **fluid SLBs** presenting **membrane-anchored proteoglycans**, as a minimal biomimetic model of the cell surface (Figure 1). The student will first establish and optimize SLB formation on silica/glass surfaces. Bilayer formation will be followed in real time using **Quartz Crystal Microbalance with Dissipation monitoring (QCM-D)**.

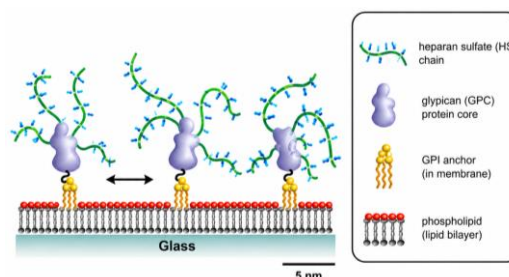


Figure 1 : Schematic representation of the biomimetic cell surface model

In a second step, membrane-anchored proteoglycans will be incorporated into the lipid bilayer. Their association with the membrane and their lateral mobility will be characterized using complementary surface and fluorescence techniques, including QCM-D and **Fluorescence Recovery After Photobleaching (FRAP)**.

Once established, the platform will be used to investigate interactions between membrane-associated proteoglycans and selected extracellular signaling proteins.

Depending on progress, the influence of parameters such as membrane composition and proteoglycan/GAG presentation may also be explored.

Techniques

The student will gain experience in lipid vesicle and SLB preparation, surface functionalization, QCM-D, fluorescence microscopy and FRAP, protein/proteoglycan handling, and quantitative analysis of molecular interactions at biomimetic interfaces.

The project is **highly interdisciplinary** and lies at the interface between biochemistry, glycobiology, membrane biophysics and biomaterials.

Candidate profile

We are looking for a highly motivated and experimentally oriented engineer or Master 2 student with a background in biochemistry, biotechnology, biophysics, chemistry, biomaterials or a related discipline. The project involves the establishment and optimization of experimental approaches. We are therefore particularly looking for a student with **strong practical laboratory experience, who enjoys experimental work and is comfortable with protocol development, troubleshooting and exploring new techniques**.

The candidate should be curious, rigorous and able to work with increasing autonomy. Previous experience with lipid membranes, protein biochemistry, fluorescence microscopy or surface characterization would be an advantage, but is not essential. More importantly, we are looking for someone who is **hands-on, proactive and interested in understanding why an experiment works—or does not work—rather than simply following an established protocol**.

Duration: 6 months

Location: Grenoble, France – IBS and SyMMES

Supervision: Elisa Migliorini, CIBEST/SyMMES, and Rebekka Wild SAGAG, IBS

Starting date: January/February 2027

Application: CV + short motivation letter to elisa.migliorini@cea.fr