



Master thesis proposal 2025- 2026:
Quorum sensing inhibition of bacteria to fight biofilm formation on materials

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Context. The formation of bacterial biofilms is at the origin of serious health problems responsible for infections related to hospitals and devices, with bacteria increasingly resistant to antibiotics. Nowadays, there is considerable interest in designing antibacterial coatings of biomaterials (ie. implants and biomedical devices) capable of combating bacterial contaminations. A promising approach is to inhibit communication between bacteria (before their colonization or within the biofilm), a phenomenon called Quorum Sensing (QS). Such a strategy has the advantage of silencing bacteria instead of killing them (by using antibiotics or biocids based on metals or chemicals), therefore avoiding their antibioresistance. Recently, at LSO, we developed a new class of QS inhibitors and showed that the hit compounds display a strong activity against gram-negative pathogens *P. aeruginosa* PAO1 and *A. baumannii* for the ability to attenuate biofilm formation in static assays. Activity has even been extended to Gram-positive pathogens, as the hit compound provided over 90% biofilm inhibition when tested against *S.aureus*.

Objective. The objectives of this internship are now to: (i) introduce functional groups onto the hit compounds to enable their immobilization on the surface of a selected material, and (ii) demonstrate their Quorum Sensing (QS) inhibition and anti-biofilm activity once immobilized on the (bio)material. Both gram-negative and gram-positive strains will be tested by these new conjugates. As proof of principle, we will work on a model substrate, a Si(111) crystalline silicon wafer, because it allows for well-controlled chemistry. The proposed strategy, shown below, is based on the well-known click chemistry to attach under physiological conditions mixtures of glycans and PEG molecules, also known to repel/avoid bacterial deposition.

Key-words: biofilm, surface functionalization, organic synthesis, click chemistry

Competences: mainly in organic chemistry with appetite in materials chemistry.

Possibility for a Doctoral thesis: Yes (we support applications to obtain funding from ED school)