

Master 2 internship in Grenoble (6 months, fulltime)

Design and operation of peptide micro-arrays for the detection of pathogenic bacteria

Laboratory : SyMMES, UMR 5819 UGA-CNRS-CEA, Grenoble

Research team : Chimie de la Reconnaissance et d'Etude des Assemblages Biologiques (CREAB)

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Internship objectives

This project lies at the intersection of Chemistry (peptide design), Material Science (micro-array production), and Biology (detection of key bacterial pathogens such as *E. coli* or *S. aureus*). The internship aims to 1) array synthetic peptides on biosensors (glass prisms with nanometric gold layers), 2) use surface plasmon resonance imaging (SPRi) to identify pathogenic bacteria, and 3) apply advanced data analysis (Principal Component Analysis) on SPRi data.

Methodology

This project is focused on the use of synthetic peptides, and self-assembling on Gold surfaces using an automated arrayer. Besides bio-organic chemistry, the student will acquire basic skills in micro-biology on model pathogenic bacteria, carried in Bio-Safety Level 2 (BSL2) facilities. By using SPRi as a detection technique, he/she will learn how to use this optical technique for the automatic pathogen classification. Experiments will be carried by controlled spiking of model sample (microbiological culture media) with pre-set amounts of pathogenic bacteria. SPRi image processing will be done by statistical data processing, using homemade software/programs (Python) formerly developed for principal component analysis.

Project abstract

The fast identification of pathogenic bacteria is a critical issue both in food safety and biomedical domains. Few years ago, our laboratory developed and patented a method enabling, for the very first time, the one-step detection of bacterial pathogens using antibody micro-arrays and SPRi. More recently, we took advantage of the easy synthesis of peptides for the development of similar micro-arrays. As the detection these peptides show a wider affinity spectrum than antibodies, efforts have been made on the SPRi data analysis to extract information enabling the identification of pathogens. It was possible by using statistical analysis tools, initially developed for the modeling of neuronal networks, this approach has then be extended on many other domains, and inspired developments in artificial intelligence. In preliminary experiments, this proof of concept has been validated in our hands and published (E. Pardoux *et al.*, Talanta, 2019). More recently, several peptide sequences have been developed, and patented, in a collaborative framework between SyMMES lab, DCM (Grenoble campus), and CHU-Grenoble Alpes. **Today, we aim at testing these peptides, and other peptide derivatives, for their ability to bind and detect bacterial pathogens.** Experiments will be carried at the SyMMES lab, but the candidate will share his work and results with the other partners of our consortium.

Techniques and tools

Surface chemistry (bio-molecule self-assembling) using an automatic arrayer

Basic microbiology (liquid cultures, bacterial growth on solid media (Petri dish), work in sterile cabinet...)

Operation of a **Surface Plasmon Resonance imager**

Statistical data analysis for the identification of pathogenic bacteria

Candidate background and interest

Skills in Organic and Bio-organic chemistry - Although not mandatory, any previous experience in microbiology basics would be appreciated— scientific instrument operation and data analysis

Candidate hosting : Early January 2026 – End of June 2026