

PHD SUBJECT

TITLE: Exploration and Exploitation of microbial mats from Aquitania

ABSTRACT: Coastal microbial mats are laminated structures where highly diverse microorganisms covering a large range of metabolic groups are organized according to micro-gradients of oxygen, sulfur and light. Along their 3.5 10⁹ years existence, they have influenced Earth's evolution, at the origin of the oxygenation event and Eukaryote colonization. They represent adequate microbial-systems' models to investigate microbial processes in response to global changes.

We propose to combine, in a holistic view, macro-ecology and experimental strategies to identify the modifications in microbial communities and microbial mats functioning at global scale in order to provide new insights for coastal zone management. We also propose to explore the metabolic potential of microbial mats with a specific focus on the discovery of cell adhesion inhibitors, crucial metabolites for the maintenance of microbial mats with high biotechnology potential as anti-cancer molecules.

Keywords: Global changes, microbial diversity, functional diversity, biotechnology

WORKING CONDITIONS

Laboratories:

Institut des Sciences Analytiques et de Physico-chimie pour l'Environnement et les Matériaux (IPREM UMR 5254, Pau)
Littoral Environnement et Société (LIENSs UMR 7266, La Rochelle)

IPREM team: Environnement et Microbiologie - Web site: <https://iprem.univ-pau.fr/fr/index.html>

LIENSs Teams: BIOFEEL et BCBS - Web site: <https://lienss.univ-larochelle.fr/>

Starting Date: October 2018

Duration: 3 years

Employer: Université de Pau et des Pays de l'Adour (UPPA)

Monthly salary before taxes: 1685 € (doctoral contract UPPA et Nouvelle Aquitaine Region)

HOST LABORATORY PROFILE

IPREM: Microbial Ecology, Environmental Microbiology

LIENSs: Ecology, Biotechnology

MISSION – PRINCIPAL ACTIVITIES

The thesis work plan has been divided into three main scientific tasks aimed at characterizing the composition and functioning of *in situ* microbial mats (Task 1) and in various global change scenarios (Task 2), as well as biotechnological exploration of microbial mats (Task 3) in the New Aquitaine Region. The thesis will implement interdisciplinary approaches, and at the end of the thesis, the (a) doctor can claim to have interdisciplinary skills: microbial ecology, biochemistry and molecular biology.

- **Description of microbial composition and interactions** by establishing molecular inventories (rRNA-barcoding, NGS-Illumina MiSeq) of microbial populations in the three domains of living organisms (bacteria, Archaea and Eukarya) and functional groups (sulphate-reducing, methanogens, phototrophs, ...). Microbial distribution profiles will be identified by numerical statistical approaches (network, correlation and co-occurrence). These analyzes will be performed at IPREM.
- **Predation pressure characterization** by determining grazing activities by estimating prey reduction and increasing predators by counting in flow cytometry and microscopy. Another approach can be experimentally implemented by natural isotopic enrichment (enrichment in stable isotopes) of microorganisms and monitoring of these isotopes in predators. The

diversity of these predators, the microfauna, the meiofauna, will be determined. These analyzes will be performed at LIENSs. Viral predation will be examined by quantitative PCR and phage-specific gene diversity analysis (capsid, DNA polymerase). These last analyzes will be performed at IPREM.

• **Activities, production and functions:** O₂, H₂S, H₂, N₂O and NO fluxes will be determined using different microelectrodes (Unisense) using a micro-profiling system. The activity of the microbial mats will be estimated by the production of chemotaxonomic biomarkers (fatty acids, photosynthetic pigments) and by the characterization of exopolymers (EPS). Screening will be performed to isolate bacterial strains producing molecules of biological interest, and to extract and identify metabolites with high biotechnological potential. These analyzes will be performed at LIENSs.

REQUIRED COMPETENCES

MICROBIAL ECOLOGY

MOLECULAR BIOLOGY – MOLECULAR ECOLOGY

STATISTICS / BIOINFORMATICS

BIOTECHNOLOGY

SELECTION CRITERIA

Selection process steps: Establishment of the selection committee.

- Evaluation of the applicants' cv
- Interview with the selected candidates and ranking.

Criteria used in selection of the candidate:

- The candidate's motivation, scientific maturity and curiosity.
- Candidate's knowledge.
- Candidate's marks and rankings in M1 and M2.
- English proficiency
- Candidate's ability to present his work
- Professional experience of internship (s) in laboratory or other; any research work already carried out (reports, publications).

APPLICATION , DEADLINE

Application should be send by e-mail. The application should contain:

- CV
- Cover letter detailing candidate's motivations
- Candidate's MSc marks and ranking
- Any letters of recommendation
- Contact details (for 2 referees)

DEADLINE: 02/07/2018

CONTACT

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