



Proposition de stage

Parcours Master 2 « Microbiologie, Environnement, Santé »

1. Laboratoire / Entreprise d'accueil :

Intitulé : Génomique des Vibrio-Laboratoire de biologie intégrative des modèle marins, SU-CNRS 8227 Station biologique de Roscoff
Adresse : Place Georges Tessier, 29680 Roscoff
Responsable du Laboratoire / Entreprise : Stéphane Egée (unité), Frédérique Le Roux (équipe)
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Co-encadrant éventuel :

2. Titre, description du sujet, approches utilisées, références (1 page maximum) :

Dynamic of vibrio infection by virulent phages

Oysters live in close association with abundant and diverse microorganisms. Phages are abundant in the oyster microbiota and their predation of bacterial populations suggests they may impact bacterial pathogenicity. This also raises the possibility of using them in therapeutic applications. Our preliminary data revealed that *Vibrio crassostreae*, an oyster pathogen, presents a highly dynamic pattern of infection in diseased oysters. Co-occurring virulent phages are genetically diverse and specific for certain combinations of vibrio clades with families of phages. In laboratory conditions, a vibrio strain infected by a phage rapidly evolved resistance in culture media but not in hemolymph, suggesting a fitness cost of escaping predation. These preliminary data lead us to the hypothesis that predation by virulent phages affects *V. crassostreae* infection dynamics for two reasons: it reduces pathogen density and it selects for less virulent phage-resistant clones of vibrios.

This project aims to explore the dynamics of infection (i.e. adsorption rate, latency time, burst size and growth rate of phage; growth of the host) of specific phage-vibrio combinations in culture media.

It will also explore whether turbid plaques obtained for some combination of phage-vibrio results from a pseudolysogeny, abortive infection, a partial resistance of the host or other unknown mechanism.

An ERC-funded PhD position (3 years), starting in September 2021 will then aim at exploring the molecular mechanisms and evolution of infection of phages infecting *V. crassostreae*.

The Le Roux team (Department of Integrative Biology of Marine Models, Marine station of Sorbonne University, Roscoff, France) seeks to understand **the evolution of microbial populations in the wild** and their adaptation to the environment. To this aim they develop an integrated approach (from ecology to the gene, from mathematical modeling to genetic) to understand the evolution and adaptation of bacterial pathogens (the *Vibrionaceae*) threatening animal species (e.g. the oyster *Crassostrea gigas*) that are a major importance for both environmental and socio-economic reasons. Given the abundance of phages,

their potential impact on bacterial selection and potential applications for phage therapy in aquaculture, the team initiates **a new research project** to understand the co-evolutionary processes underlying interactions between bacteria and phages.

References

- 1- Bruto M, Labreuche Y, James A, Piel D, Chenivresse S, Petton B, Polz MF, **Le Roux F**. Ancestral gene acquisition as the key to virulence potential in environmental *Vibrio* populations. ISME J. 2018 Dec;12(12):2954-2966.
- 2- Labreuche Y, Chenivresse S, Jeudy A, Le Panse S, Boulo V, Ansquer D, Pagès S, Givaudan A, Czjzek M, **Le Roux F**. Nigritoxin is a bacterial toxin for crustaceans and insects. Nat Commun. 2017 Nov 1;8(1):1248.
- 3- Bruto M, James A, Petton B, Labreuche Y, Chenivresse S, Alunno-Bruscia M, Polz MF, **Le Roux F**. *Vibrio crassostreae*, a benign oyster colonizer turned into a pathogen after plasmid acquisition. ISME J. 2017 Apr;11(4):1043-1052.
- 4- Lemire A, Goudenège D, Versigny T, Petton B, Calteau A, Labreuche Y, **Le Roux F**. Populations, not clones, are the unit of vibrio pathogenesis in naturally infected oysters. ISME J. 2015 Jul;9(7):1523-31.

Eligibility criteria. To apply for the position, candidates must hold a Master 1 in molecular biology, microbiology. Very good written and spoken English is a requirement for the position. Application should include: i) a Curriculum Vitae; ii) the description of your past achievements (max. 1/2 page); iii) references.

Selection process. A first selection will be based on CV, past achievements and references letter. A second selection will be based on an interview with F. Le Roux.