PhD student in microbiology and mathematical modelling

Organization/company:
Location: INSERM U1070, Poitiers
Country: France
Website: https://phar.labo.univ-poitiers.fr/
Mandatory degree: Master 2
Application deadline: 11th June 2023
Starting date: 01/09/2023
Type of contract: Full-time 3 years
Funding: ANR/JPIAMR programs
Net salary: approximately 1650 €/month

Offer Description :

The candidate will work on two international collaborative projects DeCa-P[1] and STARS-TAP[2]. These international projects will involve extensive collaboration with the microbiology team of Christian Lesterlin and Sarah Bigot in Lyon, France[3].

In DeCa-P, we aim to better understand emergence of multi-drug resistant bacteria through study of plasmidic transfer. More precisely we aim to find genetic and environmental factors influencing the plasmidic transfer abilities and rate. To do so, we will focus on the pOXA-48a conjugative plasmid that encodes an OXA-family carbapenemase responsible for carbapenem resistance among *Enterobacteriaceae*.

In STARS-TAP, plasmids rather than being foes are turned into friends. Indeed, Targeted-Antibacterial-Plasmids[3] (TAPs) are plasmids that use DNA conjugation to deliver CRISPR/Cas systems to specifically target and kill specific bacterial strains based on their genome. If successful, the use of TAPs would enable preventive removal of strains harboring drug-resistance strains from microbiomes.

In this project the candidate will have two main tasks: 1) perform *in vitro* microbiology experiments (MIC, time-kill curves) where the effect of antibiotics on plasmidic transfer ability and rate (DeCa-P) and evaluate the combined efficacy of TAPs with antibiotics (STARS-TAP); 2) develop mathematical models to quantify plasmidic transfer rates, genetic and environmental impact on these rates, TAPs + antibiotic efficacy. The models will be based on *in vitro* data generated in both projects by the candidate and the project partners.

The successful candidate will be part of our research unit affiliated to the University of Poitiers and INSERM. We are a transversal group created in 2012 with the aim to optimize antibiotic usage through collaboration between microbiologists, pharmacologists, pharmacometricians, drug formulation researchers, cellular biologists, chemical analysts and clinicians.

We are developing innovative pharmacokinetic-pharmacodynamic (PKPD) modelling approaches to select the best dosing regimen of antibiotics administered alone or in combination as well as the best route of administration and best formulation. We conduct translational research, from cell culture to patients, by integrating microbiology, analytical chemistry, drug formulation, and in vivo preclinical experiments.

[1] https://anr.fr/en/funded-projects-and-impact/funded-projects/project/funded/project/b2d9d3668f92a3b9fbbf7866072501ef-19df2359fe/?tx_anrprojects_funded%5Bcontroller%5D=Funded&cHash=840f705f08c8232483d580523e9f56b98
[2] https://www.jpiamr.eu/old-projects/stars-tap/
[3] http://tacc.ibcp.fr/index.html
[4] https://academic.oup.com/nar/article/49/6/3584/6154464

Qualifications :
- A masters 2 (MSc. With 240 credits) in pharmacometrics / pharmaockinetics / pharmacodynamics / bioinformatics / microbiology or a related field is mandatory.
- Basic knowledge and practice of pharmacometric PKPD modelling and/or mathematical modelling of genetic and plasmidic transfer dynamics is mandatory.
- Basic knowledge and practice of basic microbiology experiments (Work in a BSL2 environment, MIC measurement of an antibiotic by microdilution, time-kill experiments) and flow cytometry is mandatory.
- Proficiency in written and oral English is a merit, B2 European level is a minimum.
- Familiarity with scientific programming languages (e.g. R, Python) is a merit

Application procedure:
- Send an email with a cover letter and a CV and one or two professional reference contact to julien.buyck@univ-poitiers.fr, nicolas.gregoire@univ-poitiers.fr and a cc to sandrine.marchand@univ-poitiers.fr