Project title	Incidence of pharmaceuticals and microbial coalescence on sediment microbial communities and the occurrence of bacterial pathogens disseminating antimicrobial resistances
Recruiting institution	INRAE (UR RiverLy, Villeurbanne, FRANCE)

BACKGROUND

This doctoral position is 1 of 10 doctoral positions offered within the he HORIZON Marie Sklodowska-Curie Action (MSCA) Doctoral Network Pharm-ERA: "**Improving monitoring and Environmental Risk Assessment of PHARMaceuticals, antimicrobial resistance and pathogens from terrestrial to aquatic environments**".

Global contamination of soil and aquatic ecosystems by pharmaceutical and microbiological pollutants (such as antimicrobial-resistant microorganisms and/or pathogens) raises severe concerns about impacts on ecosystem health and repercussions on humans and animals. Preserving ecosystems from adverse ecotoxicological effects of pharmaceuticals and their transformation products, and limiting the environmental spread of antimicrobial resistance and pathogens is imperative to reach several UN Sustainable Development Goals as well as the European Green Deal, Water Framework Directive and Biodiversity Strategy for 2030. In this context, the main scientific objective of Pharm-ERA is to develop and implement innovative concepts, methods and strategies to improve the monitoring and assessment of the environmental effects and risks of pharmaceuticals, their transformation products, antimicrobial resistances and pathogens from terrestrial to aquatic environments. The ultimate goal is to provide scientific evidence and expertise to contribute to reducing the environmental spread and impact of these chemical and microbiological contaminants and to preserve microbial diversity and functions across the soil-water-sediment continuum.

By joining Pharm-ERA, you will integrate a high-level interdisciplinary and intersectoral research and training network based on 10 doctoral projects covering scientific disciplines including environmental and analytical chemistry, microbial ecology, ecotoxicology, molecular biology (incl. multi-omics approaches) and chemical fate/effect modelling. Pharm-ERA involves 9 Beneficiaries (including 2 non-academics) and 6 Associated Partners (including 5 non-academics), committed to contribute to research, training, dissemination, communication and exploitation of results targeting end-users such as environmental consultancies and agencies.

DESCRIPTION OF THE PhD PROJECT

The main goals of the project are 1/ to assess the resistance and resilience of riverbed native microbial communities exposed to mixed anthropogenic pressures leading to contamination by pharmaceuticals and exogenous soil bacteria; and 2/ to estimate the ability of exogenous soil bacteria including pathogens and antimicrobial-resistant bacteria to get established among native sediment bacterial communities exposed to pharmaceuticals.

To achieve these goals, laboratory microcosm experiments will be carried out for testing various exposure scenarios of sediment microbial communities to a panel of pharmaceuticals and exogenous soil microorganisms. Microbial responses of sediment communities will be assessed in terms of bacterial diversity, resistance and tolerance to selected pharmaceuticals, and other functional trait analyses. These will be achieved via the use of state-of-the art culture independent methods including high throughput sequencing of phylogenetic marker gene PCR amplicons (commonly termed “metabarcoding”), shotgun sequencing and qPCR of antimicrobial resistance and pathogen marker genes. Innovative pollution induced community tolerance (PICT) approaches will also be implemented. These microbial investigations will be combined with advanced chemical analyses to establish links between the observed microbial responses and the exposure scenarios. These, hand in hand with bioinformatics and biostatistics analyses, will make possible assessing correlations and the inference of associated causal relations.

PRACTICAL INFORMATION

Recruiting institution	INRAE (UR RiverLy, Villeurbanne, FRANCE)
Doctoral school	E2M2 (Ecosystems Evolution Modeling Microbiology), University of Lyon, France
Supervisors	Dr. Stéphane Pesce and Dr. Cécile Miège (INRAE), Dr. Sotirios Vasileadis (UTH, Greece)
Non-academic mentor	Dr. Alexandra Meziti (SMALLOMICS, Greece)
Main host laboratory	INRAE UR RiverLy, France, Dr. S. Pesce (Research Group on Aquatic Microbial Ecotoxicology) and Dr. C. Miège (Aquatic Environment Chemistry Laboratory) – to perform the microcosm experiments, the PICT measurements and the chemical analyses.
Secondments (1 to 6 hosting months)	1) UTH, Greece, Dr. S. Vasileadis - to get training on and realisation of real-time quantitative PCR (qPCR) and shotgun metagenomics for screening of ARG/mobilome marker genes 2) LEM, France, Dr. B.Cournoyer - to get training on and realisation of microbial source tracking (MST), quantification of selected pathogen genes through digital droplet PCR or qPCR and measurement of functional gene expression (q-reverse-transcriptase PCR) - (note that LEM is in the same city as the hosting institution) 3) SMALLOMICS, Greece, Dr. A. Meziti – to get training on shotgun metagenomics associated bioinformatics/biostatistics analysis. 4) UVIC, Spain, Dr. L. Proia, to investigate, in collaboration with another PhD from the Pharm-ERA project (PhD5), coalescence processes of AMR along the soil-periphyton-sediment continuum

RECRUITMENT CRITERIA

General criteria

- MSCA Mobility Rule: researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their date of recruitment
- All researchers recruited in a DN must be doctoral candidates (i.e. not already in possession of a doctoral degree at the date of the recruitment)
- Scientific excellence to fit the PhD project
- Fluent (oral and written) English skills as the project operates in English language
- Knowledge of the language of the host country may be considered a merit
- Team-mindedness

Criteria specific for PhD3

- Knowledge in Microbial Ecology, Molecular Biology, Biostatistics and/or Bioinformatics
- Master degree in Microbial Ecology or Microbiology or Ecotoxicology

APPLICATION

Documentation to be sent in by the applicants

- Application form completed
- CV + Letter of motivation
- Contact of two reference persons to be contacted by the selection committee (name, relation to the candidate, e-mail address and phone number)
- Complete list of publications and academic works
- Proof of language proficiencies
- Proof of master diploma or 2024 registration to master degree

How to apply?

- Download application form and fill it indicating all the offers you wish to apply for
- Send your application by email to pharm-era@inrae.fr**. The title of your email MUST be : Pharm-ERA PhD x, x, x application** (x, x, x being the number(s) of the PhD position(s) you want to apply for)
- **Be careful to join all documentation required** (see list above)

Deadline for application

April 2024, 14th - 6:00 pm French time

Contact

pharm-era@inrae.fr