

# DOCTORAL NETWORK

European  
Commission

Marie  
Skłodowska-Curie  
Actions

Grant agreement  
101119261



## PhD POSITION N°7

Project title

Molecular and phenotypic thresholds of antibiotics to protect aquatic microbial community structure and functioning

Recruiting institution

Helmholtz-Centre for Environmental Research, UFZ, Multiple Stressor Ecology group of the Department of Ecotoxicology (Germany)

## BACKGROUND

This doctoral position is 1 of 10 doctoral positions offered within the [HORIZON Marie Skłodowska-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

Attached living aquatic microbial communities, also known as biofilms are mainly composed of bacteria, microalgae and fungi and play an important role in biodiversity and functioning of aquatic ecosystems. They are constantly exposed to multiple stressors, including pharmaceuticals and climate-related stressors.

To address the Triple Planetary Crisis of pollution, climate change and biodiversity loss this PhD-project aims to analyse the interdependency of antibiotics exposure and heat waves on biofilms by using a multi-omics approach. The objectives of the thesis are:

- (i) to define molecular response traits of biofilms to antibiotics,
- (ii) quantitatively link molecular responses to phenotypic functional responses and changes in community structure,
- (iii) to define biodiversity-functional relationships based on response traits
- (iv) to provide a workflow for ecologically robust molecular thresholds for regulation and management to protect periphyton biodiversity and functioning.

To this end, model ecosystems (microcosms) will be used to expose biofilm communities to selected antibiotics and apply a factorial design to assess the interactive effects of climate-related stressors and antibiotic exposure. In close co-operation with PhD#8 a range of multi-omics approaches (metabolomics in combination with other omics levels such as metatranscriptomics or metaproteomics) will be implemented to identify interacting metabolic pathways upon combined exposure. Bioinformatics and biostatistics workflows will then be applied to derive molecular sensitivity thresholds and causal relationships for comparison across biological scales.

To further root molecular responses to functional and biodiversity changes as well as community tolerance, community-structural analyses (Metabarcoding) and functional analysis (e.g. primary and bacterial production of the respective autotrophic and heterotrophic biofilm component) will be combined.

## PRACTICAL INFORMATION

Recruiting institution	Helmholtz-Centre for Environmental Research, UFZ, Multiple Stressor Ecology group of the Department of Ecotoxicology (Germany)
Doctoral school	HIGRADE, UFZ; Ludwigs-Maximilians University of Munich (LMU), Germany
Supervisors	Dr. Mechthild Schmitt-Jansen (UFZ, Germany), Dr. Nicolas Creusot (INRAE, France)
Non-academic mentor	Dr. Adrian C. Love (ABT, Malta)
Main host laboratory	UFZ, Leipzig, Germany, Dr. Mechthild Schmitt-Jansen (Multiple Stressor Ecology group of the Department of Ecotoxicology) to perform experimental work and omics analyses.
Secondments (1 to 6 hosting months)	1) INRAE, France, to perform a joint microcosm experiment with fellow 8 to determine functional toxicity thresholds, including tolerance acquisition, of selected antibiotics under the supervision of Dr. Nicolas Creusot and Dr. Chloé Bonnineau 2) ABT, Malta, to perform dose-response toxicity tests for the antibiotics selected on single species for further comparison with periphyton response, under the supervision of Dr. Adrian C. Love.

# RECRUITMENT CRITERIA

## General criteria

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- 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 PhD7

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- Good knowledge in molecular biology techniques and microbial aquatic ecology
- Basic knowledge in bioinformatics and statistical tools
- Master degree in Molecular Biology, Biochemistry, Microbial Ecology, Environmental Sciences or similar programs

# APPLICATION

## Documentation to be sent in by the applicants

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- 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?

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- 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](mailto: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

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April 2024, 14<sup>th</sup> - 6:00 pm French time

## Contact

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[pharm-era@inrae.fr](mailto:pharm-era@inrae.fr)