What is the ExposUM Doctoral Nexus?

PhD funding opportunities in Montpellier, France : ExposUM Doctoral Nexus

A Doctoral Nexus, as proposed by the ExposUM Institute, brings together networks of three to four PhD students from diverse disciplinary backgrounds, affiliated with at least two distinct research units.

Unlike traditional PhD programmes, a Doctoral Nexus is designed to enhance collaborative skills and the ability to develop transdisciplinary projects, while allowing students to deepen their own field of expertise.

Nexus doctoral students will benefit from a dedicated training programme and will have the opportunity to organise seminars within their Nexus network.

The ExposUM Institute provides full funding for four years, covering both the PhD students' salaries and an environmental allowance.

The context of the thesis: The proposed PhD thesis is part of the Doctoral Nexus network **EXPERT** consisting of 5 researchers and 3 PhD students, working on a common theme: "The microbial **EX**posome and drivers of **PER**sistenT infections in humans: an interdisciplinary approach to understand the interplay between bacterial pathogens of environmental and zoonotic origins and the host innate immune system." The microbial exposome includes a wide range of environmental and food-borne bacterial pathogens that continuously interact with the human host. Some of these bacteria can cause fatal infections, or persist within the host for prolonged periods after exposure, giving rise to chronic, often debilitating infections. These infections are particularly refractory to antibiotic treatments and prone to relapse, thus representing a major health issue that can result in medical complications, impaired life quality, and even death. The project studies the interaction of a panel of environmental-borne human opportunistic pathogens and a zoonotic pathogen, with macrophages *in vivo* using the zebrafish embryo model. This Nexus project integrates experimental approaches and uses mathematical modelling to deconvolute the heterogeneity of macrophage responses and to reveal the dynamics of processes that shape the post-exposure establishment of persistent human infections.

More specifically, this thesis focusses on bacteria belonging to the genus *Achromobacter*, Gram-negative beta-proteobacteria ubiquitously found in soil and water, and opportunistic human pathogens, mostly in vulnerable populations like immunocompromised individuals and people with cystic fibrosis (CF). These bacteria are able to survive in eukaryotic cells, although not much is known yet about the infection mechanisms. In the laboratory, a zebrafish embryo model has been established to study pathogenicity of *Achromobacter* spp. isolates of diverse origins (environments, patients), showing the bacteria are highly persistent in the host. Overall, acquiring knowledge about the potential threat of environmental bacteria for human health will provide information that can instruct future design of antimicrobial therapies.

Planned start date: 01/10/2026

The title of the doctoral student's position: Persistent human infections caused by the environmental-borne emerging pathogens of the genus *Achromobacter*: pathogenic potential and importance of the bacteria/phagocyte interaction

Main mission:

The PhD project is focused on better understanding the bacteria/macrophage interaction during persistent infection caused by *Achromobacter* spp.. The ability to survive in macrophages might stem from their association with free-living phagocytosing amoebae, ubiquitously present in nature. In parallel, the project will therefore also study the interaction of these bacteria with amoeba.

Activities:

- Host transcriptome (RNASeq) and qRT-PCR analyses to study changes in host response upon infection.
- Real time analysis using epi-fluorescence and confocal microscopy (including bacterial localization at the subcellular level, interaction with specific host cells using transgenic zebrafish lines). Analysis of macrophage polarisation will be performed during a secondment in the LPHI laboratory.
- Creation of mutants in specific bacterial determinants and analyse the impact of mutations on virulence and persistence traits, both *in vitro* and *in vivo*.
- Development of a new model for *Achromobacter* using the social amoeba *Dictyostelium discoideum.*
- Regular oral presentations at laboratory (VBIC and HSM) and network meetings. Poster and oral presentations at national and international meetings, networking, mandatory courses (doctoral school) etc. The student will acquire skills needed to perform independent research and pursue a successful career in science. These include technical, (inter)personal, management, and time management skills. Participation in University teaching may also be possible.
- Organisation of a meeting in the third year together with the other PhD students of the network. The Nexus network provides an opportunity to enhance collaborative skills and work in a transdisciplinary environment. A specific focus is given on inter- and trans disciplinarity through an additional common program.
- Writing a thesis manuscript, and a scientific publication following the rules of the doctoral school CBS2.

Expected skills and qualifications:

Essential:

- Strong background in bacteriology, immunology and molecular genetics, and experience working under biological safety level 2 conditions.
- Experience with the zebrafish embryo model, and proven skills in the technique of micro injection.
- Experience in microscopical techniques (epi-fluorescence, confocal), image analysis, and interpretation of in vivo data.
- Due to the international environment and publication in English, the student should be fluent in spoken and written English.

Desirable

- Experience in molecular biological techniques (DNA cloning, mutagenesis, etc).
- Good communication skills and ability to work in a multidisciplinary research environment, and in close collaboration with both PhD supervisors.
- Experience using Excel, Powerpoint, Graphpad Prism, imaging software, etc. Knowledge in statistics.
- Strong scientific writing skills.
- Good work ethics and organisational skills.
- Problem-solving ability, resilience, and ability to work to deadlines.
- High level of motivation, creativity, initiative, and curiosity.

Diploma/field required:

Applicants should hold a Master 2 degree in biology and health, microbiology, biochemistry, or biomedical sciences. Master students that do not have the diploma yet should provide the most recent transcripts from their Master 1 and Master 2 (semester 1 and/or semester 2).

Key words:

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Other key words: *Achromobacter*, zebrafish infection model, persistence, virulence, macrophages, amoebae.

CNU section to which the applicant belongs: 45, 47, 65

Application procedure

The application must include the following

- A CV.
- A motivation letter.
- One or two letters of recommendation.
- A copy of the diploma required for enrolment or, if unavailable, the most recent transcripts from Master 2 (semester 1 and/or semester 2) and those of Master 1.

If you would like to apply for this position, please send an e-mail to the thesis director Annette VERGUNST (annette.vergunst@umontpellier.fr) and the co-director Hélène MARCHANDIN (helene.marchandin@umontpellier.fr), with a CC to Anne BLANC-POTARD (anne.blanc-potard@umontpellier.fr) and the ExposUM Institute (exposum-aap@umontpellier.fr) to inform them of your interest. Sending your application via l'ADUM is not required and not requested.

Application deadline : **Before 04 May 2026**

The University of Montpellier

KEY FIGURES

RESEARCH CENTERS

From space exploration and robotics to ecological engineering and chronic diseases, UM researchers are inventing tomorrow's solutions for mankind and the environment. Dynamic research, conducted in close collaboration with research organizations and benefiting from high-level technological platforms to meet the needs of 21st century society.
The UM is committed to promoting its cutting-edge research by forging close links with local industry, particularly in the biomedical and new technologies sectors.
More Information: https://www.umontpellier.fr/en/recherche/unites-de-recherche

SCIENTIFIC APPEAL

Open to the world, the University of Montpellier contributes to the structuring of the European higher education area, and strengthens its international positioning and attractiveness, in close collaboration with its partners in the I-SITE Program of Excellence, through programs adapted to the major scientific challenges it faces.
More Information: https://www.umontpellier.fr/en/international/attractivite-scientifique