

## What is the ExposUM Doctoral Nexus?

The Doctoral Nexus proposed by the [ExposUM Institute](#) are networks of 3 to 4 PhD students from different disciplines and affiliated to at least two different research units.

Compared with a traditional PhD, taking part in a Doctoral Nexus will encourage the ability to work in a team and to design projects in a transdisciplinary way while deepening one's own field of expertise.

A specific teaching programme will be offered and the doctoral students concerned will also have the opportunity to organise a seminar within the Nexus network.

Theses are funded from the outset for 4 years, including the PhD student's salary and an environmental allowance



**Title:** Preclinical study of the influence of heatwave-like thermal stress on brain activity and on cognitive and social performance.

**Context:** The increase in heatwaves, a direct consequence of climate change (CC), represents a major health challenge. In France, the frequency and intensity of heatwaves have increased considerably during the last decades. These periods of extreme heat have immediate effects on human physiology, and significant consequences for mental health<sup>1-3</sup>. Indeed, several studies have shown an increase in psychological disorders, notably anxiety, depression and mood disorders<sup>1,3</sup>, which are often linked to physiological disturbances such as sleep deprivation caused by excessively hot nights<sup>4</sup>.

Adolescence is a critical phase of prefrontal cortex maturation, the brain region that controls executive functions including planning, decision-making, social interaction, impulse and emotional control, and working memory. During adolescence, the prefrontal cortex undergoes structural and functional remodeling that optimizes neuronal connections through a process of synaptic pruning and increased myelination<sup>5</sup>. Longitudinal studies have suggested that chronic exposure to drugs during this period of high vulnerability may trigger, reveal or aggravate psychiatric illnesses<sup>6,7</sup>. What about heatwaves? Could these heatwaves, if frequent and occurring at periods of high vulnerability in brain development such as adolescence, have long-term consequences and lead to susceptibility to psychiatric disorders (depression and anxiety) and/or persistent cognitive impairments?

Similarly, it has been suggested that, in vulnerable populations (the elderly in particular), sleep disturbances caused by high ambient temperatures and air pollution - both consequences of climate change - could promote certain neurodegenerative pathologies<sup>1,8</sup>.

**Objective:** The aim of the study is to characterize the short- and long-term impact of repeated exposure to scorching temperatures on anxiety and depression levels, social behavior, sleep and



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cognitive abilities in male and female mice. The project will combine behavioral analyses with biochemical, proteomic, phosphoproteomic and immunohistochemical approaches.

**Expected benefits:** This study will contribute to a better understanding of the neurological consequences of CC on mental health and the development of neurodegenerative diseases. By identifying the neurobiological mechanisms underlying the anxiogenic, depressogenic and neurodegenerative effects of hyperthermia, it will pave the way for new preventive and therapeutic strategies. The findings may also provide valuable insights into related areas, such as neuronal resilience to environmental stress, the impact of CC on neuropsychiatric disorders, and neuroprotective approaches in the context of global warming.

**Scientific, material and financial conditions of the research project:** The expenses related to the implementation of the project will be covered by the team. These expenses will be funded by the team's recurrent allocation and by the research contracts obtained by C. Bécamel and L. Givalois for this project. The student will have at his/her disposal at the IGF an office with a computer, as well as a dedicated laboratory space fully equipped for carrying out the experiments. The student will follow regulatory training on safety and access to animal experimentation areas at the IGF. He/she will be trained in good laboratory practice.

**Candidate Profile and Required Skills:** We are seeking a highly motivated candidate to join our research team for a PhD project in experimental neurobiology. The ideal applicant will hold a Master's degree (Master 2) in Neuroscience or an equivalent qualification (Bac+5), recognized nationally or internationally, and demonstrate a solid academic background in experimental neurobiology.

Essential and Desired Skills:

- Strong theoretical and practical knowledge in neurobiology;
- Experience in behavioral approaches in mice, with prior experience in behavioral data analysis and interpretation (preferred);
- Skills in biochemistry, including but not limited to ELISA assays and western blotting;
- Experience with immunohistochemistry techniques.

The project involves a substantial amount of experimental work on awake animal models (mice). Prior experience with such protocols is highly desirable. If not already acquired, a strong willingness to be trained and to actively engage in this demanding experimental context is essential.

We also value scientific rigor, autonomy, strong teamwork skills, and a genuine motivation to commit to a multi-year doctoral research project.

## Références :

1. Romanello M et al. The 2023 report of the Lancet Countdown on health and climate change: the imperative for a health-centred response in a world facing irreversible harms. *Lancet*. 2023 Dec 16;402(10419):2346–94.
2. Dodds J. The psychology of climate anxiety. *BJPsych Bull*. 2021 Aug;45(4):222–6.
3. Clayton S. Climate Change and Mental Health. *Curr Environ Health Rep*. 2021 Mar;8(1):1–6.
4. Rifkin DI et al. Climate change and sleep: A systematic review of the literature and conceptual framework. *Sleep Med Rev*. 2018 Dec;42:3–9.
5. Pöppel JA, Hanganu-Opatz IL. Development of Prefrontal Circuits and Cognitive Abilities. *Cold Spring Harb Perspect Biol*. 2024 Oct 1;16(10):a041502.
6. Berthoux C et al. Early 5-HT6 receptor blockade prevents symptom onset in a model of adolescent cannabis abuse. *EMBO Mol Med*. 2020 May 8;12(5):e10605.
7. Moore THM et al. Cannabis use and risk of psychotic or affective mental health outcomes: a systematic review. *Lancet*. 2007 Jul 28;370(9584):319–28.



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8. Aderinto N et al. Molecular basis of complex relationships between climate change, sleep disorders, and Alzheimer's disease. Egypt J Neurol Psychiatry Neurosurg. 2025 Apr 1;61(1):27.
9. Li H et al. The combination of HT-ac and HBET improves the cognitive and learning abilities of heat-stressed mice by maintaining

## Application procedure

The application must include the following

- a CV
- a letter of motivation
- a copy of the degree required for registration
- any additional specific information requested by the **doctoral school CBS2**  
[https://edcbs2.umontpellier.fr/index.html?language=fr&page=future\\_students&section=thesistopics](https://edcbs2.umontpellier.fr/index.html?language=fr&page=future_students&section=thesistopics)

If you would like to apply for this position, please send an e-mail to à [carine.becamel@igf.cnrs.fr](mailto:carine.becamel@igf.cnrs.fr) and [laurent.givalois@igf.cnrs.fr](mailto:laurent.givalois@igf.cnrs.fr) with a CC to copie [marie-Laure.parmentier@igf.cnrs.fr](mailto:marie-Laure.parmentier@igf.cnrs.fr) and [exposum-aap@umontpellier.fr](mailto:exposum-aap@umontpellier.fr) to inform them of your interest.

**Before Monday 31 May, 2:00 PM CET**



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# The University of Montpellier

## KEY FIGURES

**51857**  
students



**73**  
research facilities

**15**  
technology platforms

**657**  
National and  
institutional diplomas

**17**  
faculties, schools and  
institutes

**9**  
doctoral schools

**TOP 200**  
in the Shanghai  
ranking

**5132** employees  
including **2818** teachers, researchers and research assistants

**7800**  
scientific publications  
in 2022

## 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>



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