

2024 DOCTORAL INPhINIT FELLOWSHIPS PROGRAMME – INCOMING

Forever Chemicals substitutes: unravelling environmental toxic effects

Area of Knowledge: LIFE SCIENCES

Group of disciplines: Plant, Animal & Environmental Biology, Physiology, Ecology & Conservation

Research project

Context: Per- and polyfluoroalkyl substances (PFASs), also known as the Forever Chemicals, are high-production volume chemicals that due to their unique physicochemical properties have been used in a wide variety of consumer products and industrial applications, including paper and cardboard food packaging; non-stick cookware; textiles; cosmetics; fire protection material. As a result of their remarkable persistence and extensive use over several decades, PFAS molecules have become ubiquitous in the environment. These chemicals can enter the environment through different sources, including point source pollution from a production plant, effluent from an industrial wastewater treatment facility, and landfill leachates. Due to their persistence, bioaccumulation potential, long-range transport, and epidemiological observations in humans, the usage of PFOS for industrial applications was restricted in 2009 (Stockholm convention) and a restriction program for PFOA has been initiated (REACH, 2017). As a countermeasure, the industry strives to replace PFOA and PFOS with a new generation of alternative PFAS molecules with either a shorter carbon chain length or a slightly modified structure. However, for most of these PFAS substitutes information on their hazardous properties, environmental fate and toxic effects is mostly inexistent.

Aim: This project addresses this knowledge gap by characterizing the toxicity of novel PFAS congeners and their mixtures at different biological levels, for guiding future risk assessment, regulation, and management of a pressing environmental issue of global concern Marine invertebrates will be used as a model species, and in vivo and in vitro approaches will be implemented to reveal putative developmental, physiological, cellular and molecular effects.

The research proposed meets the main interests of the CESAM research group of the proponents, contributing to the development and effective implementation of environmental policies.

Job position description

The ideal candidate for this challenging project should present background in ecotoxicology. Experience with marine invertebrate laboratory maintenance and exposure is necessary. The job includes extensive experimental work involving marine invertebrates sampling and exposure to different test conditions. The present proposal includes in vivo and in vitro chronic and acute exposures with adults and gametes of different species, representing estuarine environments. After exposure to different scenarios, the candidate will perform a suite of ecotoxicological tools, measuring the alterations induced at different biological levels, including the assessment of biochemical, physiological, immunological and histopathological responses. The candidate will develop knowledge that will contribute to wildlife biodiversity conservation and water safety, focusing on a better understanding and evaluation of the impacts resulting from PFAS, contributing to promote the UN's SDGs 13 and 14.

It is expected that this proposal meets the expectation of one Italian student, who has devoted her recent research to the ecotoxicological impacts of emerging pollutants on marine species. The contact with this student was established and she meets all the requirements to apply to this funding, presenting an excellent and highly competitive CV. The candidate will work under the supervision of CESAM researchers, prof Rosa Freitas and prof Amadeu Soares, whose complementary expertise covers the project's core topics. He/She will integrate a dynamic transdisciplinary research team, providing additional support and specific know-how. The team has various ongoing national/international research projects and an extensive collaboration network with other research institutions. Thus, collaboration with researchers from different institutions (within or not the proponents' network) will be encouraged and fundamental to accomplish the aims proposed.

Supervisor team

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CESAM description

The Centre for Environmental and Marine Studies (CESAM) is a Research Unit of the University of Aveiro (UA) with the status of Associated Laboratory since 2005, evaluated with the highest grade of Excellent since 2014. The mission of CESAM is to develop leading international research on environmental and marine sciences, following a multi-actor and multisectoral approach, framed into 4 multidisciplinary thematic lines, promoting scientific knowledge and the connection between science and policies.

Additional information

Website of CESAM: www.cesam-la.pt

Website of the University of Aveiro, Portugal: <https://www.ua.pt/en/>