

RESEARCH CONTRACT TO DEVELOP A PHD

EXPLORING ANAEROBIC DIGESTION PROCESSES TO MAXIMIZE PHARMACEUTICALS AND ANTIBIOTIC RESISTANCE GENES REMOVAL FOR SEWAGE SLUDGE SAFE DISPOSAL - SAFESLUDGE

Position's characteristics

An opportunity to develop a PhD with financial support for a 4-years period is offered by the Group of Environmental Biotechnology (Biogroup) of the University of Santiago de Compostela (<https://biogroup.usc.es/>).

The contract is associated to the SAFESLUDGE project described below and financed by the Spanish Research Agency (former FPI fellowships). The contract includes a monthly salary of around 1,260 € (year 1 and 2), 1,350 € (year 3) and 1,680 € (year 4).

In addition, the grant will pay the university doctorate taxes, as well as a fellowship for a 3-month research stay abroad during the PhD period.

The contract starting date would be approximately **December 2024 – January 2025**.

Project description

The main objective of the SAFESLUDGE project is to minimise emerging contaminants, such as pharmaceutical residues (PhACs) and antibiotic resistance genes (ARGs), in treated sludge. For that purpose, the effect of three strategies (thermal pretreatment, thermophilic vs. mesophilic, and co-digestion with other substrates) on the operation of anaerobic digesters will be explored. Two relevant objectives of the project are to understand PhAC biotransformation pathways and ARG transfer mechanisms to gain additional knowledge to maximise their elimination from sludge.

An interdisciplinary approach, combining technological, analytical chemistry and up-to-date omic tools (metaproteomics and metagenomics), is applied to tackle the project from a holistic perspective. The first workpackage (WP1) focuses on monitoring the fate of selected PhACs and ARGs in full-scale mesophilic anaerobic digesters, with and without thermal pretreatment. With this information as a reference, WP2 comprises the study at lab-scale level of thermophilic conditions, once again with and without thermal pretreatment, and of using co-substrates of different characteristics (protein-, carbohydrate- and lipid-rich) on the fate of PhACs and ARGs during sewage sludge anaerobic (co-) digestion. A more detailed analysis of the results obtained in WP2 is considered in WP3 and WP4. The influence of temperature and co-substrate on

selected PhAC biotransformation pathways will be investigated by combining the determination of tentative transformation products (WP3) and the identification of the enzymes involved in the biotransformation pathways using metaproteomics (WP4). Moreover, WP4 includes the identification of ARG transfer mechanisms among microorganisms during sewage sludge anaerobic digestion as function of the temperature and the co-substrates applied through a multi-omic approach.

The candidate will be incorporated into a research team with expertise in environmental and chemical engineering and microbiology applied to wastewater. He/she will be part of the Group of Environmental Biotechnology (Biogroup - <https://biogroup.usc.es/>) from the University of Santiago de Compostela. The group has access to high-quality resources and a solid network of collaborations at international level. So, the candidate will work at state-of-the-art lab facilities with the support of experienced researchers and technicians. Biogroup staff is composed by 14 full/assoc. professors, 7 postdocs and ~25 PhD students providing a stimulating and multidisciplinary work environment to conduct your research.

SAFESLUDGE researchers belong to the **singular research centre CRETUS** (<https://cretus.usc.es/en/home-cretus/>) composed of 39 main researchers working in the field of Environmental Technologies that bring to the centre around 70 PhD students and 25 postdocs. They form a multidisciplinary team comprising chemists, biologists, physicists, engineers, economists and psychologists. CRETUS aims to develop and assess innovative environmental technologies with an interdisciplinary and holistic perspective, to ensure safe water, healthy soils, and sustainable cities and industries. Through CRETUS, the candidate has access to a **mentoring programme**, that looks for a continuous accompaniment of PhD students during their research, ensuring that their training adapts to their future professional perspectives. Among the courses offered are “Information Design Lab” for improving the visual presentation of data and information, “Development of scientific leadership”, “Writing and presentation skills to improve the impact of research”, “Tools to better plan their agendas”, etc.

Research area

Developing technologies for innovative sewage sludge treatment to remove contaminants of emerging concern, promoting safe sewage sludge disposal.

Research team

Marta Carballa ([marta-carballa](#)) and Lorena González ([lorena-gonzalez](#)).

Brief work description

- Set-up and operation of lab-scale bioreactors under different operational conditions to study the removal of CECs.
- Monitoring of pharmaceuticals during the different treatment options.
- Use of microbiological and genetic tools to follow selected ARGs, in close collaboration with the microbiologists that participate in the project.

Requirements

- Bachelor in Chemical Engineering, Biotechnology or similar areas.
- Master's degree in chemical or environmental engineering.
- Adequate training in solid waste treatment.
- Good level in English and ability to travel abroad to attend project meetings or conferences.
- Commitment to perform a PhD Thesis.

Selection process

Applications must be sent to marta.carballa@usc.es (including in the subject: "SAFESLUDGE position") before 12th October 2024.

Applications must contain the following documents:

- Motivation letter (not more than 1 page), indicating the contact details of the candidate and a brief description of the reasons why he/she should be selected.
- Academic record (Bachelor and Master)
- Curriculum Vitae

The selection process will include a personal interview to those candidates that based on the previous information fulfil the position requirements.