DOCTORAL INPhINIT FELLOWSHIPS PROGRAMME – INCOMING FRAME INFORMATION CALL 2020
PhD POSITION OFFER FORM Position

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Limit Date: 04/02/2020

Project Title/ Job Position title:

How can we restrict Antibiotic Resistance Gens transport during Artificial Recharge of Aquifers?. Researcher: Benjamin Piña and Cristina Valhondo

Candidate: Biologist, Chemist, Environmental Engineering, Hydrogeologist

Area of Knowledge:· LIFE SCIENCES
Group of disciplines: LIFE SCIENCES
Human Biology, Microbiology, Molecular Biology, Genetics, Cellular Biology, Genomics and
Proteomics, Biochemistry

Research project/ Research Group description (max. 2.000 characters)

The so-called circular economy is an emerging concept based on the principle of "closing the life cycle" and seeks, through reuse and revaluation, to extend the value of water and energy, minimizing generation of waste. Regarding the use of water, it is a common practice to use effluents collected from WWTP for irrigation or aquifer replenishment. Its limitation are the possible adverse effects on the environment and on agricultural production since there are many biologically active compounds present in wastewater, including antibiotics (ABs), other micropollutants and endocrine disruptors (EDs). Managed aquifer recharge (MAR) is a technology capable of increasing the water quality in an efficient and economical way. Water recharge, coupled to the purification processes taking place in the soil and subsoil, can act as a tertiary treatment by increasing the groundwater resources with good quality water. RESTORA project aims at developing a MAR technology, enhanced by reactive layers to renaturalize aquifer water to an optimal quality. To this end, we will work in a pilot MAR system at the WWTPs (Palamós). Wastewater is an important source of bacteria and viruses, which are not always fully removed by treatment. The simultaneous presence of antibiotics and bacterial strains reinforce the selective pressure of antibiotics on bacterial communities and the horizontal transfer of ARGs among bacteria. As a consequence, the generation and propagation of new form of antibiòtic resistance in the environment (resistome) is facilitated. Our research team is a multidisciplinary group made up of engineers, hydrogeologists, chemists and biologists working in four consolidated research groups: the Hydrogeology Group
of the UPC – CSIC, the Unit of Water Quality and Subsoil of the IDAEA-CSIC, the Environmental Toxicology Group of the IDAEA-CSIC, and the Group of Sanitary

Hydrology, Economy and Cooperation. All required facilities and equipment is available at the Institute.

Job position description (max. 2.000 characters)

Field work will consist on managing the six pilot MAR systems located at Palamós. The Systems provide an ideal frame for study recharge water quality evolution under different operational conditions. The student will evaluate the effectiveness of the reactive barriers installed in the recharge areas of the system to improve the performance of MAR removing EOCs, pathogens, and ARGs. Since one of the goals of the reactive barriers is to promote the development and diversity of the microbial community, the student will investigate the interrelation between EOCs and ARGs with these parameters. The systems are equipped with sensors for the continuous monitoring of oxygen, heads, conductivity, temperature, water content of the unsaturated zone, and flow into and out of each system. The characterization of the flow and transport parameters will be done using numerical models. In addition, the performance of MAR systems in the removal of infectious viruses and antibiotic resistant bacteria, involves the application and optimization of sampling and concentration methods, followed by several molecular techniques, which will allow the detection, quantification and classification of these biological elements (nucleic acid extraction of field samples, quantitative real time PCR, 16S sequencing).