Newsletter 1

December 2023

Biodiversity restoration and conservation of inland water ecosystems for environmental and human well-being

Pollution is threatening the **biodiversity** of inland waters that are vital to society and the future of the Earth. A **major source** of this pollution are **effluent discharges** from wastewater treatment plants. The treatment processes used in these plants do not efficiently remove **emerging contaminants**, such as pharmaceuticals and microplastics, which lead to **health hazards** to non-target species, including **humans**.

This polluting source also limits the **conservation and restoration of freshwater systems**. There is a need for strategies to up-scale **restoration solutions** and for fast and simple methodologies to assess conservation and restoration progress.

BioReset promotes **ecosystem recovery and conservation** through a combined approach including cutting-edge advances in existing **wastewater treatment processes** and development of **methodologies to assess ecosystem conservation and restoration** provided by these treatments based on investigating **diatom communities**, laying the foundation for a global quality index for ecological status and ecosystem assessment.

This **multidisciplinary** and **international** collaboration project involves **7 partners** from **academia** and **businesses** from **4 different countries**: Norway, Portugal, Spain, and Sweden.

The main source of water pollution are the effluent discharges from wastewater treatment plants.

The objectives of BioReset are focused on boosting ecosystem recovery and conservation

Activities

Analysis of emerging contaminants in waters

- Pharmaceuticals and microplastics monitoring
- Screening of pharmaceuticals and plastic-related chemicals with innovative analytical devices

Improving the effectiveness of wastewater treatments

- Advanced oxidation processes
- Green bioremediation with white-rot fungi
- New approaches for the removal of microplastics
- Environmental, Economic and Biodiversity Life Cycle Assessments

Evaluation of ecosystem conservation and restoration: diatom biofilms

- Development and stabilization of diatom biofilms
- System degradation by emerging contaminants
- System conservation and restoration
- Field studies for ecosystem restoration

2020 – 2021 Joint COFUND Call on "Conservation and restoration of degraded ecosystems and their biodiversity, including a focus on aquatic systems"

biodiversa+ European Biodiversity Partnership
Water JPI

BIORESET

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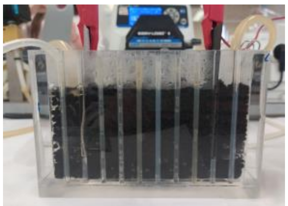
INNOVATIVE ANALYTICAL DEVICES FOR PHARMACEUTICAL SCREENING

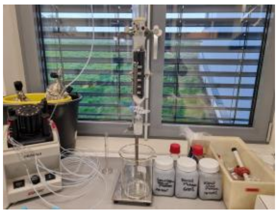
Electrochemical sensors based on molecularly imprinted polymers, a kind of artificial receptors, were developed for the analysis of several pharmaceuticals (atorvastatin, atenolol, venlafaxine, and carbamazepine). A cheap and easy-to-construct analysis device was developed with pencil lead electrodes and a microtube cell. This opens the way for on-site monitoring of pharmaceuticals in a practical and expeditious way, making it easy to implement for wastewater treatment plant operators.

IMPROVED WASTEWATER TREATMENTS



To achieve the removal of pharmaceuticals and improvement of water quality, a concentration-degradation-purification strategy was developed by combining adsorption and advanced oxidation processes. Biosorbents with high adsorption capability and selectivity for the target contaminants were produced from agro-industrial wastes (e.g. waste from olive oil production).

In another approach, commercial mushroom spawn of white-rot fungi (*Pleurotus ostreatus*) was used to develop fungal pellets for the degradation of pharmaceuticals. These laccase-producing pellets can easily be harvested by coarse filtration. In addition, the grain spawn, lignin, and the produced mycelium can be considered less harmful from an environmental standpoint.



Several experiments for the removal of microplastics were also performed. These experiments were based on chemical coagulation with mild reagents (i.e., carragenats, alginates, starch) combined with posterior filtration columns filled with different biocarbon materials obtained from the pyrolisation of several wastes (coffee waste, bricket waste, and sewage sludge).

DIATOM SAMPLING AND CHARACTERISATION

Diatoms are unicellular algae that are found all over the world in aquatic environments. They show high levels of biodiversity and can be used to provide a better understanding of their capacity to provide early-warning ecosystem degradation and recovery in experimental laboratory simulations. Diatoms were collected close to the discharge point of a wastewater treatment plant in the Lis river (Portugal) and the diatom diversity and abundance was characterised.

BioReset

A Biodiversity Project

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