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HIPPOCRATEs: A Holistic Approach Towards Onsite Hospital Wastewater Treatment – Luxembourg Pilot

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Abstract

(CECs) are not only persistent but can also be taken up by crops and accumulate in aquatic ecosystems, posing substantial risks to both human health and the integrity of natural environments.

Tackling this complex challenge demands innovative and sustainable solutions. Two main strategies are being explored: (a) the integration of advanced treatment processes at centralized wastewater treatment plants, which must manage low concentrations of CECs across large daily flows; or (b) the deployment of on-site treatment systems at point sources such as hospitals, where CECs are discharged at significantly higher concentrations.

The primary objective of the HIPPOCRATEs project is to evaluate whether on-site treatment of hospital wastewater can achieve high removal efficiency and cost-effectiveness at a large demonstration scale, operating continuously throughout the year across diverse European regions—specifically comparing the operational performance in southern and northern climates. The treatment technology under investigation is a combined anoxic/aerobic membrane biological reactor (MBR), designed to degrade organic matter, followed by an advanced oxidation process using UV/H2O2 to further break down persistent pollutants.

A key aspect of this initiative is ensuring that the treated water is safe and suitable for agricultural applications. By reusing treated wastewater for irrigation, the project not only reduces the environmental burden of freshwater extraction but also helps alleviate water stress in regions where water scarcity is a pressing issue. This approach supports the circular economy by turning wastewater from a liability into a valuable resource, while simultaneously minimizing the risk of contaminating natural water bodies and agricultural land with CECs.

As part of the LIFE program, this project also aims to inform and support the development of new EU policies and regulations. The outcomes will directly contribute to the implementation of the Water Framework Directive (WFD), the Urban Wastewater Treatment Directive (UWWTD), and the new EU Regulation 2020/741 on minimum requirements for water reuse. Notably, Annex 2 of Regulation 2020/741 emphasizes the need for additional monitoring of micropollutants—such as pharmaceuticals, antimicrobial resistance, and other emerging contaminants—where necessary to ensure adequate protection of human, animal, and

environmental health. The results from the HIPPOCRATES project will provide essential data and practical guidance for the development and enforcement of national legislation on wastewater treatment and reuse. By advancing both technological innovation and policy frameworks, the project will play a pivotal role in promoting safe, sustainable water reuse and protecting ecosystems and public health across Europe.

Keywords: Pharmaceutic, hospital wastewater, antibiotic resistance gene, policy support

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