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20813 | Assembly of a bacterial consortium for the biodegradation of PFAS and related subproducts

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Abstract

Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals with wide application in consumer products since the 1950s. A recent revision of the PFAS definition has also introduced several polyfluorinated pharmaceuticals and agrochemicals into this class, further exacerbating the urgency of any PFAS-related pollution scenario. Their many favourable properties, including improved persistence and lipophilicity, has caused PFAS to be considered mobile pollutants with the capacity to accumulate in the environment for various decades. In fact, their increased presence in the aquatic environment has negative effects on the environment and human health, so it is of great importance to develop and improve remediation techniques to remove PFAS and other related subproducts from aquatic matrices.

This work aims to create a synthetic bacterial consortium and study its capacity to degrade different PFAS and/or their subproducts. To achieve this, different fluoroorganic-degrading bacterial strains are currently being screened. Among them, a fluoroaliphatic (*Delftia acidovorans* MFA5) and a fluoroaromatic-degrading strains (*Labrys portucalensis* F11) have already been pre-selected to be included in the consortium. Soon, when a final selection of prospective fluoroorganic-degrading strains is achieved, their co-cultivation compatibility will be investigated through growth inhibition tests (cross-streak and diffusion disc activity assays). Strains with favourable co-cultivation dynamics will then be assembled in a synthetic bacterial consortium and tested for its ability to degrade different PFAS (individually) and related subproducts, based on bacterial growth analysis and on defluorination efficiency.

This work will contribute to the ongoing effort of designing an efficient PFAS bioremediation unit to outfit a novel hybrid water treatment technology that combines nanophotocatalysis and bioremediation for the mitigation of PFAS aquatic pollution.

Keywords: Biodegradation, PFAS, Bacterial Consortium, Defluorination.

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