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EBNet Environmental Biotechnology

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Enhancing PFAS Attenuation in Coastal Brownfield Soils (EPACS): Enhancing natural system attenuation capacity for a key emerging contaminant

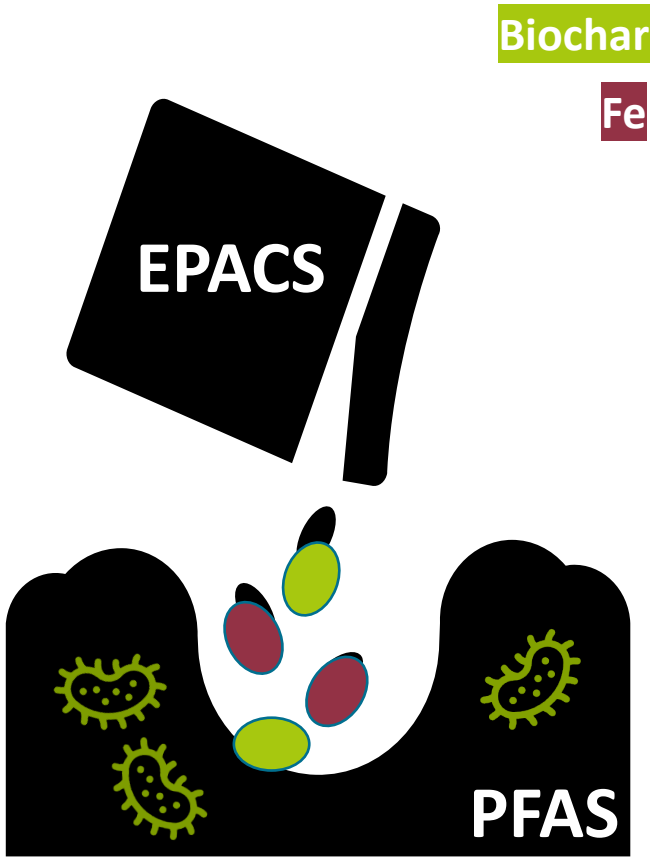
"*EBNet support has allowed the generation of key data which we can use to assess the natural capacity of coastal soils to adsorb and degrade PFAS, and how we can enhance this natural capacity to design more effective PFAS removal and management processes.*" **Prof. Andy Cundy, University of Southampton**

The Problem

Perfluoroalkyl substances (PFASs) are key emerging contaminants which have been used for over 60 years in a wide range of industrial applications. They are now ubiquitous in environmental matrices. Several bioaccumulate in marine food webs, and so their presence in coastal brownfield soils is of significant concern, particularly given their recalcitrant and mobile nature. Current remediation technologies involve highly invasive interventions such as soil removal and off-site landfilling or incineration, sorption/stabilization through ex-situ soil mixing, and ex-situ thermal desorption with off-gas destruction.

Our Approach

We assessed the capability of zero-valent iron (ZVI) combined with highly sorptive biochar to enhance PFASs attenuation, improve soil functionality and stimulate local microbial communities to enhance breakdown of PFASs.



Results

Hypotheses were tested via a series of controlled microcosm experiments (carried out over 20- and 60-day periods), using artificially spiked and natural or control soils and intertidal sediments collected from the Hamble estuary, followed by materials characterization (including surface area measurements, N%, C%, and C and N isotopes), and PFAS and targeted DNA analysis. Results were used to assess the validity of enhanced natural attenuation approaches for PFAS management and trapping/degradation in these and similar coastal settings (including the impact of PFAS contamination on local microbial populations). These form the focus of subsequent larger proposals to UKRI examining enhanced "treatment train" approaches for PFAS management.

FURTHER REFERENCES:
Assessing the role of the "estuarine filter" for emerging contaminants: pharmaceuticals, perfluoroalkyl compounds and plasticisers in sediment cores from two contrasting systems in the southern U.K. ***By: Omar Celis-Hernandez, Andrew B. Cundy, Ian W. Croudace, Raymond D. Ward, Rosa Busquets, John L. Wilkinson. In: Water Research Volume 189, 1 February 2021, 116610***