MICROBIOME TECHNOLOGY FACT SHEET

Sediment-filled flow path tubes activities

Leibniz-Institut für Gewässerökologie und Binnenfischerei (IGB) Berlin
developed under the EU-funded NYMPHE project

PROBLEM

TRACE ORGANIC CONTAMINANTS OF ANTHROPOGENIC ORIGIN (E.G., PHARMACEUTICALS, INDUSTRIAL CHEMICALS, ARTIFICIAL SWEETENERS) OFTEN PERSIST IN RIVERS. THEIR FATE IN THE HYPORHEIC ZONE—THE SEDIMENT LAYER WHERE SURFACE WATER AND GROUNDWATER INTERACT—REMAINS POORLY UNDERSTOOD, MAKING IT DIFFICULT TO PREDICT OR OPTIMIZE NATURAL IN-SITU DEGRADATION PROCESSES ALONG SPECIFIC FLOW PATHS.

Target pollutants:

Anthropogenic trace organics such as pharmaceuticals, X-ray contrast media, industrial chemicals, artificial sweeteners, specifically metformin, guanylurea, and ibuprofen.

TECHNOLOGY

System setup:

- Sediment-filled tubes with sampling ports and conductivity loggers.
- Sediment types: natural, artificially enriched with microbes, or synthetic.

Operation:

- Monitoring water retention times via conductivity loggers.
- Tracking redox conditions along the subsurface flow path.

Function:

- Assess how different sediments and redox states influence the attenuation and degradation of trace organic contaminants.

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INNOVATION

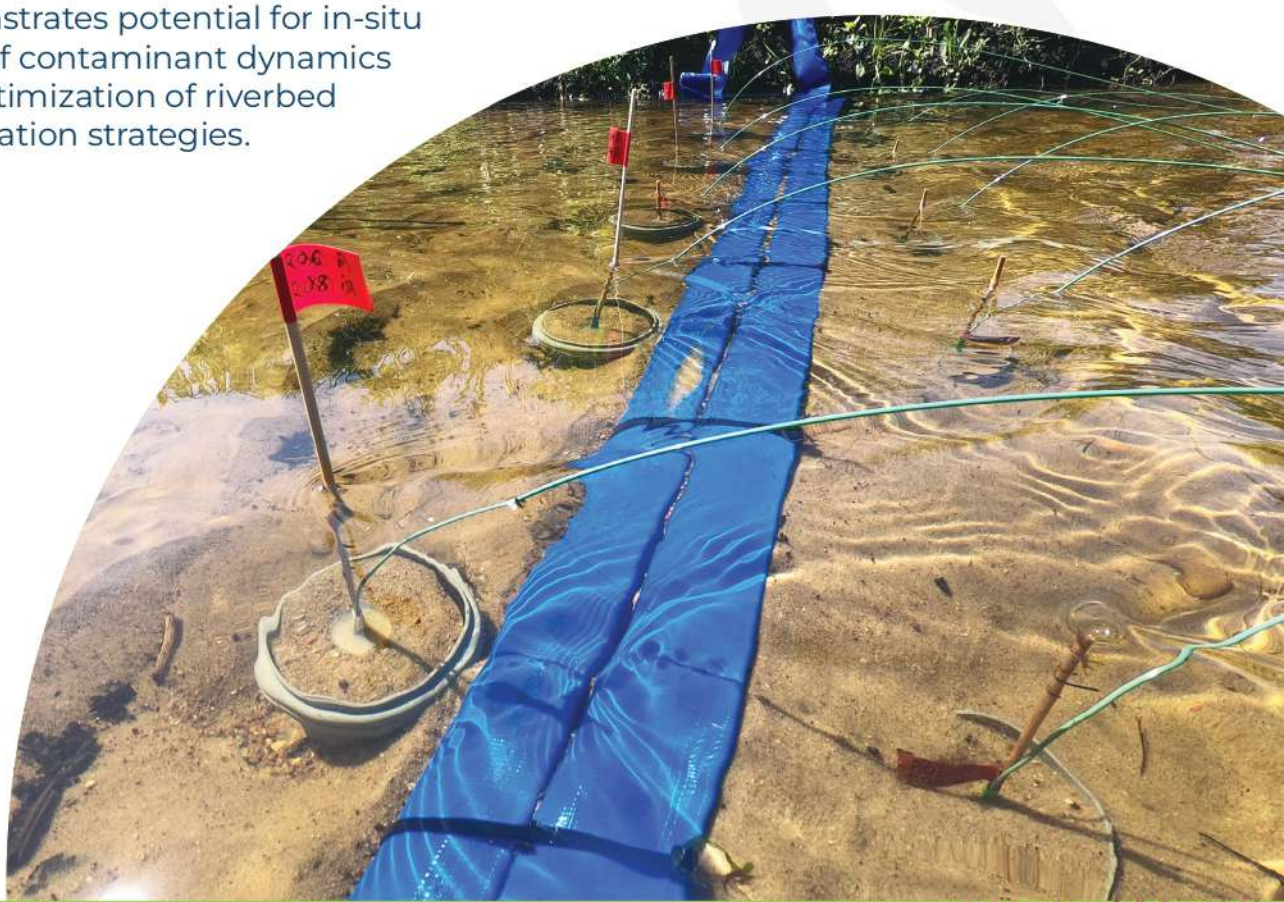
Ambition:
Provide a system to track contaminant fate along specific flow paths in natural rivers.

TRL:
6 (system demonstration in relevant environment).

Novelty:
No other system currently allows in-situ sampling along defined subsurface flow paths; enables manipulation of sediments and microbiomes to study degradation processes.

RESULTS

- Natural microbial communities can attenuate trace organic contaminants.
- Best attenuation observed in **extensive oxic zones** with **intermediate residence times.**
- Demonstrates potential for in-situ study of contaminant dynamics and optimization of riverbed remediation strategies.



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