Executive **Summary**

WATER ENVIRONMENT & REUSE FOUNDATION

Towards a better understanding of trace organic compound containment and removal strategies

Identification of the "Active" Fraction and Metabolic Pathways in Trace Organic Compounds Removal Using Stable Isotope Probing (U2R12)

The Central Issue

The widespread presence of trace organic compounds (TOrC) such as the endocrine disrupting compound bisphenol-A (BPA) has caused growing concern due to persistence in the environment and potential ecological impacts. Wastewater treatment could become a critical barrier for the discharge of TOrCs into the environment. Inexpensive and easy-to-retrofit TOrC containment strategies are needed.

Context and Background

Despite the progress that has been made in understanding the removal of TOrCs in wastewater treatment, there is still a lack of consensus regarding the identity of active species and the exact removal options. By studying and understanding the microbial active fraction in activated sludge which is responsible for the transformation and removal of TOrCs, the researchers sought to clarify the TOrC pathways.

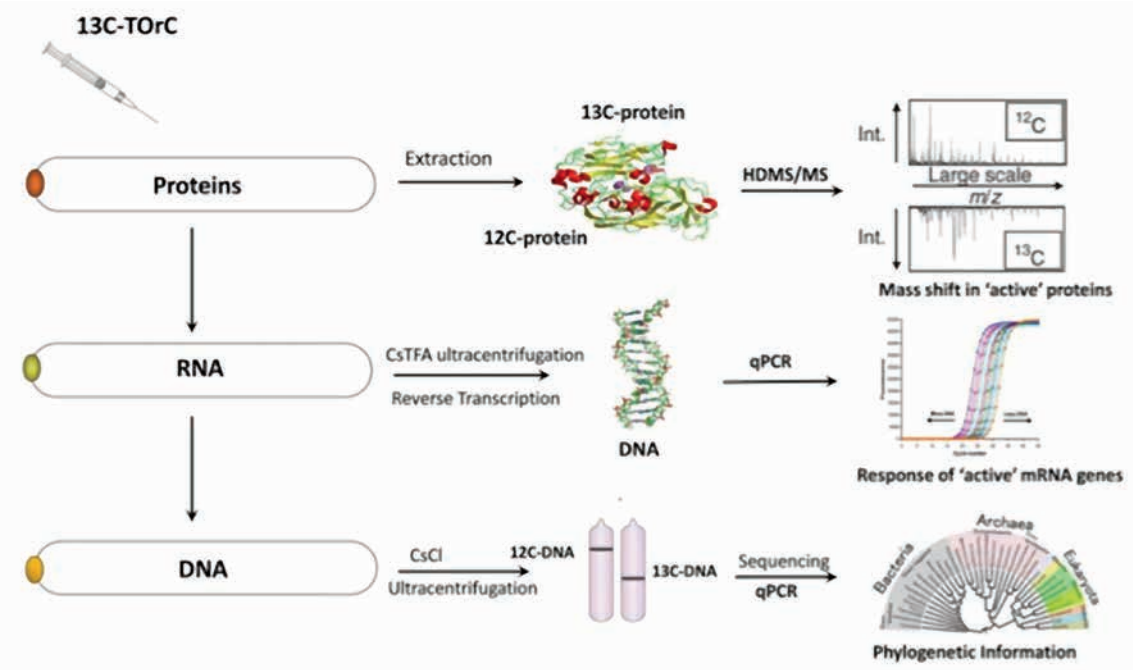
The research team evaluated BPA assimilation and bidegradation by a variety of microbial communities. They evaluated BPA biodegradation and microbial community structure using molecular biology techniques for microbial communities originating from biomass sources including lab-scale and two full-scale treatment plants. BPA was selected for this research due to its known endocrine disrupting capability, recent inclusion on the list of chemicals for assessment under the Toxic Substances and Control Act, and its highly variable removal rates in wastewater treatment.

Findings and Conclusions

The researchers found that some water resource recovery facilities (WRRFs) are capable of BPA assimilation. However, further investigation of its impact and the pathways involved is needed. Other organics subtracted and the bioreactor process conditions affect the BPA assimilation and bacteria degradation. The findings provide insight into the fate and biotransformation of BPA in activated sludge. They also will lead to a better understanding of TOrC removal mechanisms and a more accurate estimation of BPA removal kinetics.

Management and Policy Implications

This research enables a better understanding of the BPA removal mechanisms, a more accurate estimate of the TOrC removal kinetics, and enables development of models and tools to design TOrC removal systems in isolation or integrated into activated sludge processes.



The research team used stable isotope probing (rarely used for TOrC biodegradation studies) to obtain a panoramic view of the active fraction and metabolic function involved in bidegradation of TOrCs.

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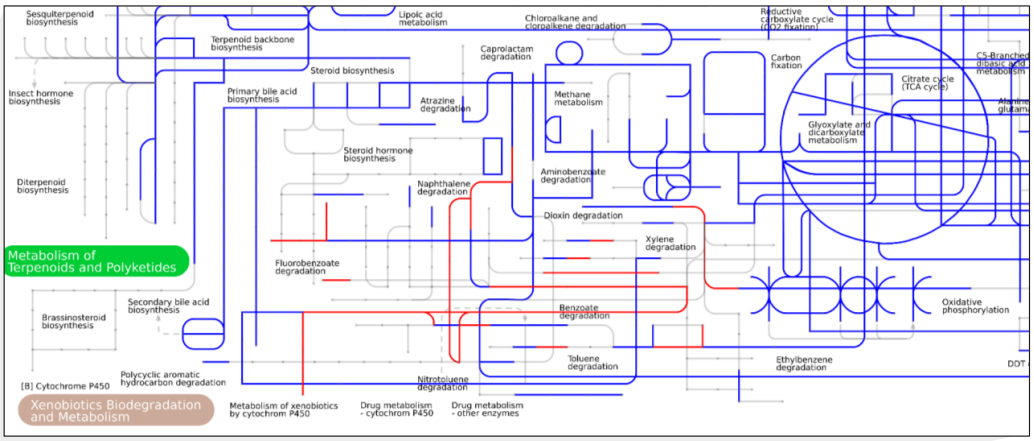

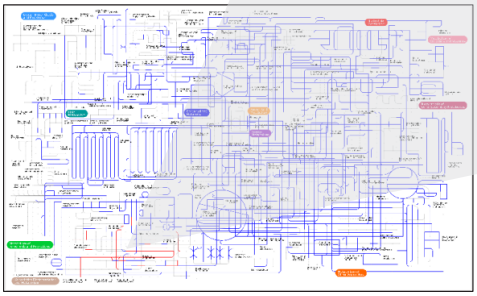

Pathways identified from one microbial community exposed to BPA.

Related WERF Research

Project Title	Research Focus
Trace Organic Compound Indicator Removal During Conventional Wastewater Treatment (CEC4R08)	Identifies a small number of suitable indicators that allow for a rapid characterization of performance efficiency of conventional wastewater treatment facilities and focuses on investigating the performance of activated sludge treatment processes.
Development of Indicators and Surrogates for Chemical Contaminant Removal During Wastewater Treatment and Reclamation (04HHE1CO)	Provides guidance to the water reuse industry on how to assure proper removal of wastewater-derived chemical contaminants in indirect potable reuse applications using a combination of tailored surrogate parameters and a select list of indicator compounds.
Developing a Standardized Protocol for Assessing the Biodegradability of Trace Organic Compounds (U3R10)	Provides insight into prioritizing future trace organic compounds efforts and provides an analytical technique that allows for the simultaneous detection of five trace organic compounds under positive and negative mode ionization.
Holistic Assessment of Trace Organic Compounds in Wastewater Treatment (U3R11)	Summarizes the performance characteristics of common biological treatment processes, filtration technologies, and disinfection technologies in reducing 12 trace organic indicator compounds.

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