The Diversity and Role of Microbes in Degradation of Pharmaceuticals and Personal Care Products

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Research Purpose

Purpose: To analyze the degradation role of microbes present when wastewater sludge samples are amended with pharmaceuticals and personal care products: methylparaben, nonylphenol, octylphenol, and triclosan.

Research Questions:
Can the specific microbes responsible for the degradation of certain pharmaceuticals and personal care products (PPCPs) be identified?

Research Rationale

- There is little information focusing on the specific microbes responsible for the degradation process of various PPCPs and their specific role in the process.

Methodology: Experimental

Experimental research design was the best approach to use in order to most accurately acquire quantitative data when working with samples in a laboratory setting.

Procedure

- Wastewater Sludge Collection
- Anaerobic Toxicity Assay (ATA)
- Enrichment Cultures
- MiSeq Amplicon Sequencing
- DNA Sequence Data Analysis
  - Organization
  - Visualization
  - Basic Local Alignment Search Tool (BLAST)

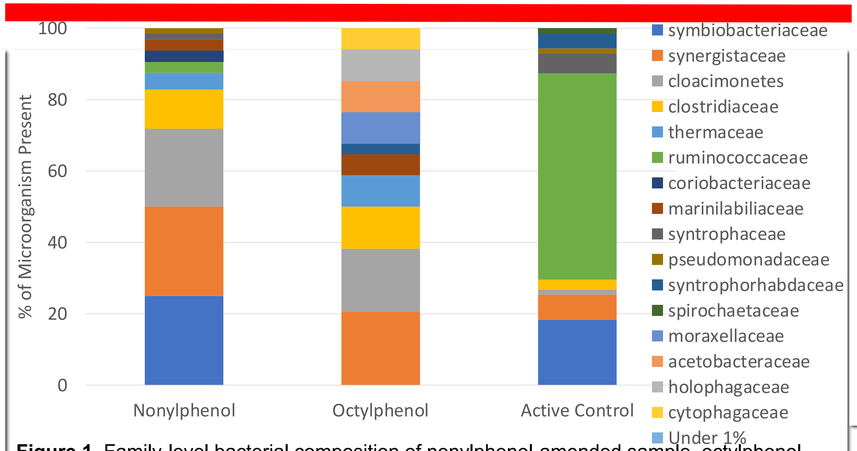

Figure 1. Family-level bacterial composition of nonylphenol-amended sample, octylphenol-amended sample, and the active control.

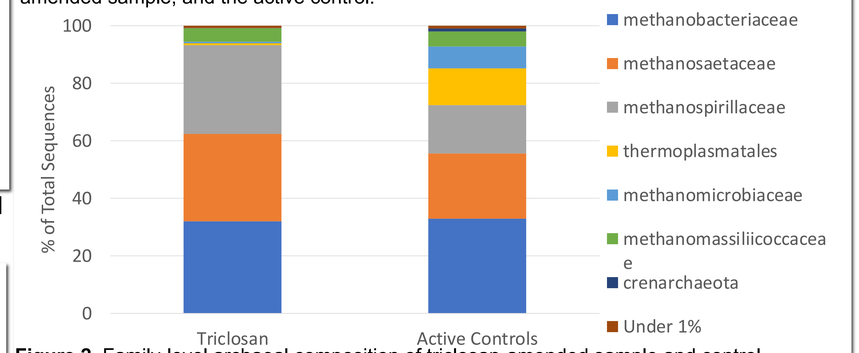

Figure 2. Family-level archaeal composition of triclosan-amended sample and control.

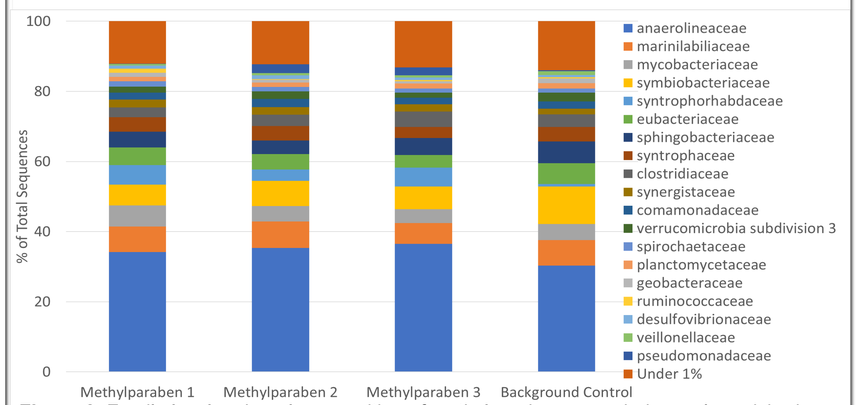

Figure 3. Family-level archaeal composition of methylparaben-amended sample enriched once and the corresponding active control.

Discussion

- Bacterial families that observed to have been in less abundance in the PPCP-amended samples may indicate that these families may not be tolerant to the PPCPs applied.
- Key take away: diversity of bacteria changes depending on what has been added. With microbes that potentially play a role in degradation becoming more abundant in PPCP samples.

The Next Steps

- Develop a project in which to identify microbes that have the genes, that allow them to degrade PPCPs, such as the O-demethylase gene.
- Only four out of a copious amount of PPCPs that are used everyday were investigated in this study.

References

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