

*Title*

Characterization of the Anaerobic Dechlorinating Microorganisms in Two PCB Contaminated River Sediments

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*Abstract*

Persistent chemical wastes, such as polychlorinated biphenyls (PCBs) that accumulate in the environment and in food webs, result in long-term threats to public health and ecosystem stability. Prior research has demonstrated the microbial activities in the degradation of PCBs, especially the anaerobic dechlorination of the highly chlorinated congeners. There is also evidence from previous research indicating that the diverse microbial activities lead to a wide variety of dechlorination patterns. Our study aims to characterize the anaerobic dechlorinating microorganisms from the sediments of two different PCB contaminated rivers, the Grasse River (New York) and the Upper Hudson River (NY), while comparing their dechlorination patterns of selected spiked PCB congeners. The results of our 2,4,5-trichlorobiphenyl (BZ29) congener specific analysis showed the dechlorination of this selected congener in sediment microcosms of the two different river sediments. The Hudson River sediment microcosms showed a rapid dechlorination of BZ29 to BZ1 (2-chlorobiphenyl) within 7 weeks with a minimal gas production, while those of the Grasse River performed dechlorination with a longer lag period, accompanied by an extensive methane and CO<sub>2</sub> production. The addition of nutrients or fatty acids increased the dechlorination of BZ29 and favored *para* over *meta* dechlorination in Grasse River microcosms, while there was no such effect on the Hudson populations. The results of PCR and denaturing gradient gel electrophoresis of 16S rRNA gene fragments provided a phylogenetic analysis and a comparison of these two microcosms at the molecular level. Our work demonstrated the effects of particular geochemical conditions on the transformation and the fate of PCBs in river sediments. The characterization of different PCB dechlorinating microbial populations will result in a better understanding of the biological processes that affect the degradation of PCBs in river sediments, which will improve our ability to predict PCB biotransformation in river sediments.

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