SUSTAINED ENHANCEMENT OF REDUCTIVE DECHCLORINATION IN PCB- AND PESTICIDE CONTAMINATED SEDIMENTS

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We investigated electron donors, haloprimers, and bioaugmentation for their potential to enhance reductive dechlorination of polychlorinated biphenyls (PCBs) and chlorinated pesticides in contaminated sediments from the Anacostia River, Washington, DC, and Kearny Marsh, in the New Jersey Meadowlands. The sediments contained 2.1 mg/kg and 1.2 mg/kg total PCBs, respectively. Kearny Marsh also contained significant concentrations of other contaminants including heavy metals and p,p'-DDT. Sediment microcosms (200 mL) were amended with electron acceptors, haloprimers (tetrachlorobenzene or pentachloronitrobenzene), and/or *Dehalococcoides ethenogenes* strain 195. These treatments were evaluated as a means to increase dechlorinator populations and dechlorination activity for *in situ* bioremediation.

We monitored the rate of decrease in the chlorination level of the contaminants to evaluate treatment effectiveness. The persistence of these dechlorination enhancements was tested by taking subcultures at 14 months, spiking with PCB116, and measuring the initial dechlorination rate of the spiked compound. DNA-based markers of dechlorinating bacteria were also tracked over time. Nested polymerase chain reaction targeting *Chloroflexi* coupled to DGGE showed that biostimulation with haloprimers increased the incidence of a native species with 16S rRNA gene sequence identical to *Dehalococcoides* sp. strain CBDB1, while *D. ethenogenes* strain 195 was detected only in microcosms bioaugmented with that strain. Twelve primer sets were also developed from published reductive dehalogenase (*rdh)* gene sequences. Several *rdh* genes were detected in unamended sediment from both sites, and biostimulation increased incidence of a subset of these.

Bioaugmentation with *D. ethenogenes* strain 195 and biostimulation with pentachloronitrobenzene both enhanced PCB dechlorination in Anacostia sediment microcosms, but subcultures made on day 415 revealed that the enhancement was sustained only in the biostimulated (pentachloronitrobenzene or tetrachlorobenzene) microcosms. Tetrachlorobenzene stimulated PCB dechlorination in the Kearny Marsh sediment, but to a lesser extent. We are currently evaluating the effects of biostimulation and bioaugmentation on the chlorinated pesticides in the Kearny Marsh microcosms.