Polychlorinated Biphenyl (PCB) Degradation by Sulfate Reducing Microorganisms under Microaerophilic Condition

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Polychlorinated biphenyls (PCBs) have been identified as one of the most persistent chemical contaminants that can be found in our environment. Numerous studies on PCB-degradation have been conducted under aerobic and anaerobic conditions. In this study, the main objective was to determine if microaerophilic conditions would support the oxidative degradation of PCB1 (2-chlorobiphenyl) and 2-chlorobenzoate using sulfate-reducing bacteria. PCB-impacted freshwater sediment collected from a Superfund Site in the Fox River, WI was used as the inoculum. This sediment had been previously subjected to a weak electric field in a laboratory environment, which created an oxygen gradient and microaerophilic conditions. During the 3-month experiment, degradation of PCBs was observed. For the new study, anaerobic and aerobic growth conditions will be compared with microaerophilic conditions (5 to 8% O₂). A minimal liquid medium was prepared anaerobically under N₂/CO₂ (80:20), aerobically under air, or microaerophilically in Remel incubators. Each test was done in triplicate with 250μM PCB1 with and without 5 mM sodium sulfate versus no inoculum controls. GC-ECD and HPLC were used to analyze PCB degradation and chlorobenzoate formation. Growth on agar plates with PCB1 was also examined. After two transfers, individual colonies were transferred into liquid medium, and cultivated under microaerophilic condition. PCB-degrading activity was seen in microaerophilic samples containing inoculum, sulfate, and PCB1, which suggest that sulfate-reducing bacteria play an important role in microaerophilic PCB degradation in contaminated sediment.

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