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Isolation and Characterization of Dibenzofuran-Degrading Bacteria from Contaminated Sediments and their Ability to Transform Lightly Chlorinated Dioxins

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Background/Objectives. Chlorinated dioxins may be reductively dechlorinated in aquatic sediments. The resulting lightly chlorinated dioxin congeners are amenable to aerobic degradation. Identification and characterization of aerobic bacteria that degrade dibenzofuran and selected dioxin congers was performed for aquatic sediments from a heavily contaminated river.

Approach/Activities. Sediment samples from a river heavily contaminated with environmental polychlorinated dibenzo-*p*-dioxins (PCDDs) and another contaminated site were incubated aerobically in minimal medium with dibenzofuran as the sole carbon and energy source. Sediment enrichments that exhibited active degradation were transferred several times to produce sediment-free cultures and then were plated to obtain colonies growing on dibenzofuran. Partial 16S rRNA gene sequences were obtained to identify isolates. Isolates were further characterized for ability to transform non-chlorinated and lightly chlorinated dioxins in liquid culture.

Results/Lessons Learned. Aerobic dibenzofuran-degrading bacteria were readily enriched from river sediments from a dioxin-contaminated site. Isolates from the genera *Paenibacillus (*known polynuclear aromatic hydrocarbon degrading bacteria), *Janibacter* and *Acidovorax* were identified. These isolates are being further characterized to determine whether non-chlorinated or lightly chlorinated dioxins can also be biotransformed by these organisms. Highly reduced river sediments harbor organohalide-respiring bacteria that may dechlorinate polychlorinated dioxins to lightly or non-chlorinated congeners. The presence of aerobic bacteria that can biodegrade these daughter products could lead to complete removal of these problematic pollutants from the environment.