A Novel Approach to the Bioremediation of Concurrent 1,4-Dioxane and Chlorinated Solvent cis-DCE Contamination

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The purpose of experimentation was to determine how the degradation of 1,4-dioxane by Pseudonocardia dioxanivorans (ATCC® 55486) was affected by the presence of cis-DCE as it was degraded by Polaromonas sp. (ATCC® BAA-500), and if Polaromonas sp. (ATCC® BAA-500) could metabolize 1,4-dioxane. 1,4-dioxane is a heterocyclic ether that is a known carcinogen, and its breakdown is inhibited by the chlorinated solvent cis-dichloroethene (cis-DCE) Gas chromatography was used to determine if BAA-500 was capable of breaking down 1,4-dioxane. Vials were bioaugmented with either BAA-500, 55486, or no bacteria at all as an abiotic control, and 1,4-dioxane was evaluated in such vials in 100, 75, 50, 25, and 10 u L volumes. To determine how the breakdown of cis-DCE affected the subsequent degradation of 1,4-dioxane, various 100, 75, 50, 25, and 10 uL combinations of the contaminants were evaluated with the presence of both BAA-500 and 55486. When compared to a standard abiotic degradation curve, it was found that lower volumes of cis-DCE relative to 1,4-dioxane are more conducive to the breakdown of 1,4-dioxane. It was also determined that BAA-500 may have limited abilities to degrade 1,4-dioxane, thereby aiding in the degradation pathway in the presence of both compounds. This study has many applications in the field of contaminant hydrology.