Aerobic Cometabolism of cis-DCE by Rhodococcus rhodochrous ATCC® 21198 with Isobutane Growth Substrate

Waldman, Lauren

The purpose of experimentation was to determine the inhibitory effects of the cis form of 1,2-Dichloroethene (cis-DCE), a widespread toxic chlorinated solvent contaminant, on the growth of the aerobic bacteria Rhodococcus rhodochrous ATCC® 21198, as well as to determine the rate of Rhodococcus rhodochrous cometabolic degradation of cis-DCE with and without the presence of the primary growth substrate isobutane. R. rhodochrous' unique metabolic capabilities presented a promising alternative to current decontamination methodology. Growth Reactors were designed to determine if cis-DCE induced any inhibitory effects on the growth of Rhodococcus rhodochrous. Growth reactors were prepared with 270 mL of nanopure water and bioaugmented with 21198 before cis-DCE was added to one to assess the inhibitory effects of cis-DCE on 21198 growth. The Substrate Inhibition Test sought to determine how the rate of cis-DCE cometabolism is affected with and without the presence of the primary growth substrate isobutane. A rate test was conducted with three 27 mL vials prepared with MV media and injected with cis-DCE with 21198 in vials 1 and 2 and isobutane in vials 2 and 3. When compared to standard curves of isobutane and cis-DCE, it was found that the growth reactors performed similarly both with and without cis-DCE. It was also determined that the cometabolism of cis-DCE by 21198 was more efficient without the presence of isobutane, since the cometabolism of cis-DCE in the vials without isobutane occurred more rapidly. This study has numerous implications in the field of contaminant hydrology.

Awards Won:
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Intel ISEF Category