ANAEROBIC MTBE AND TBA METABOLISM: MICROBIAL ECOLOGY, BIOGEOCHEMISTRY, AND NOVEL ANAEROBIC CULTURES

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Methyl tert-butyl ether (MTBE) and tert-butyl alcohol (TBA) are prevalent groundwater contaminants. In situ conditions within source areas are typically anoxic, and thus source area bioremediation strategies must encompass anaerobic metabolisms. The purpose of our research was to investigate the kinetics of MTBE and TBA biodegradation under shifting anoxic geochemical conditions, and to understand microbial ecology, mechanisms and the affecting factors.

Three distinct novel cultures that degrade MTBE anaerobically have been enriched. The electron acceptors used are AQDS, sulfate or fumarate. 2mM MTBE is continuously degraded within 20 days. Amplified ribosomal DNA restriction analysis (ARDRA) was applied to analyze the microbial community composition in the cultures. Unidentified dominant clones represent completely novel microorganisms, as a result of the unique selective pressure of MTBE biodegradation.

Microcosm studies with radiolabeled (14C) MTBE/TBA have shown that the aquifer sediment evaluated has intrinsic potential for anaerobic oxidization of TBA. Amending Fe (III) or sulfate can stimulate [14C]-TBA mineralization. Fe(III) + electron shuttling compound (i.e. AQDS) incubations had the shortest lag period (110d) and up to 65% was oxidized to CO2. We are currently utilizing 16S rDNA based molecular techniques to investigate in situ microbial communities and will compare the data to the cultures to identify dominant organisms involved.

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