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CHARACTERIZATION OF A MIXED CULTURE THAT REDUCTIVELY DECHLORINATES MIXED CHLORINATED ETHENES AND ETHANES

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Abstract

Looking for a valid bioaugmenting agent for applications in real sites, an anaerobic mixed culture able to reductively dechlorinate a mixture of C_2 chlorinated aliphatic hydrocarbons (CAHs), has been enriched over a period of several years from a groundwater historically contaminated with 1,2-dichloroethane (1,2-DCA) and other C_2 CAHs, such as tetrachloroethene (PCE).
The culture, named Multidechlorobac, has been analysed for its microbial composition, and the effects of inoculum amount on its dechlorination capabilities have been tested on subcultures prepared in non-sterile conditions, using 1,2-DCA and PCE as final electron acceptors. Lactate, yeast extract and molasses have been used as both carbon and electron sources.
Multidechlorobac consisted of both dechlorinators, such as *Dehalococcoides ethenogenes* strain 195 and *Desulfitobacterium* sp., and non-dechlorinators belonging to Bacteroidetes, Proteobacteria and Firmicutes. While the former ones are directly involved in the degradation of the pollutants, the latter support the process by providing hydrogen, which acts as electron donor in the dechlorination. The initial bacterial concentration was about 10^8 cells mL^{-1}, and subcultures were able to degrade the pollutants at 10 % inoculum. Higher dilutions resulted in a loss of dechlorinating capacity, leading to a slower or unsuccessful treatment, even though dechlorination was still observed for 1,2-DCA.
Multidechlorobac was effective in the degradation of pollutants, and it was found to be robust and easy to grow, in comparison with pure cultures. The culture might be successfully used as bioaugmenting agent in the clean-up of sites polluted with C_2 chlorinated aliphatic hydrocarbons.