Bioremediation potential of immobilized aerobic consortia dechlorinating 1,2-DCA

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1,2-dichloroethane (1,2-DCA) is a persistent and probably carcinogenic groundwater contaminant. Under suitable conditions, 1,2-DCA can be biodegraded by specialized microorganisms by anaerobic and aerobic pathways that can be exploited in bioremediation. Although anaerobic pathways are usually more studied, hydrolytic aerobic biodegradation seems a promising alternative. Currently, the only known hydrolytic pathway is mediated by the key enzyme haloalkane dehalogenase DhlA, encoded by the *dhlA* gene, carried by a few isolates within the Xanthobacteriaceae family[1]. In this work, the dechlorinating potential of newly isolated aerobic 1,2-DCA degrading consortia was evaluated to be exploited in bioremediation strategies based on bioaugmentation with immobilized degrading bacteria.

Six 1,2-DCA dechlorinating consortia were isolated from 1,2-DCA contaminated groundwater through enrichment cultures on mineral salt medium amended with 1,2-DCA as sole carbon source and subsequent transfer on solid medium. Chemical monitoring performed over time (on four of the six consortia) by Cl^- release assay and Gas Chromatography-Mass Spectrometry (GC-MS) revealed stable 1,2-DCA removal capacity by all consortia. The Whole Genome Sequencing revealed the presence of genera including known aerobic 1,2-DCA degraders (*Ancylobacter, Starkeya, Xanthobacter*) and other genera whose role in the consortia is yet unclear. All consortia carried a *dhlA* gene fragment 100% identical to that of other known aerobic 1,2-DCA degraders, and other genes involved in the hydrolytic 1,2-DCA degradative pathway. The consortia were tested for the ability to form 1,2-DCA-degrading biofilms on biodegradable biopolymeric polylactic acid (PLA) scaffolds made by electrospinning[2]. Scanning Electron Microscopy observations and GC-MS monitoring revealed the consortia can form a biodegrading biofilm on biopolymeric scaffolds that maintains its properties after being transferred to a new system.

Successful immobilization on biopolymeric supports suggests the potential application of the dechlorinating consortia-scaffold system as a bioremediation device.

[1]Munro et al., (2016). Appl. Environ. Microbiol. 82(17), 5298-5308.
[2]Catania et al., (2020) New Biotechnology 58, 25-31;