Dual C-Br isotope fractionation during anaerobic biodegradation of ethylene dibromide by *Dehalococcoides*- and *Dehalogenimonas*-containing cultures

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Subsurface contamination by organohalogen compounds such as 1,2-dibromoethane, popularly known as ethylene dibromide (EBD), is an issue of environmental concern due to its high toxicity. In groundwater, EDB can be biodegraded under both oxic and anoxic conditions. Therefore, knowledge about the fate of EDB in contaminated sites is crucial to design adequate remediation strategies. Compound-specific isotope analysis (CSIA) is increasingly used to investigate the fate of organohalogen compounds in the environment and to quantify the extent of degradation. However, isotopic fractionation values (ε) are still lacking for several compounds, the organohalogen-degrading bacteria involved, and the degradation pathways utilized.

In this study laboratory experiments were conducted (i) to evaluate the ε_C and ε_{Br} during anaerobic biodegradation of EDB by *Dehalococcoides*- and *Dehalogenimonas*-containing cultures and (ii) to characterize the dual C-Br isotope patterns in view of its potential use to distinguish degradation pathways of EDB in the field.

Degradation of EBD via dihaloelimination was observed for both cultures. Very different ε_C values were obtained for *Dehalococcoides*- and *Dehalogenimonas*-containing cultures, whereas ε_{Br} values were lower and similar to each other, leading to different trends in a dual C-Br isotope plot (i.e., $\Lambda_{C\text{-}Br} = \Delta\delta^{81}Br / \Delta\delta^{13}C \approx \varepsilon_{Br} / \varepsilon_C$). This result provides a valuable information for future application of CSIA to investigate EDB biodegration in the field.