Differing Carbon Isotope Fractionation during Anaerobic Biodegradation of Ethylene Dibromide by *Dehalococcoides*- and *Dehalogenimonas*-Containing Cultures

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Background/Objectives. Subsurface contamination by organohalogen compounds such as ethylene dibromide (EBD) is widespread due to its common use for different applications. As a result, groundwater contamination by EDB 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 for site remediation and long-term predictions. 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 (e) for several compounds and organohalogen-degrading bacteria are still lacking. The aim of this study is (i) to evaluate the carbon and bromine isotopic fractionation 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.

Approach/Activities. Laboratory degradation experiments of EDB were conducted using *Dehalococcoides*- and *Dehalogenimonas*-containing cultures and samples were collected for concentration and isotopic analyses. For CSIA of EDB, a gas chromatograph coupled to an isotope ratio mass spectrometer (GC-IRMS) was used.

Results/Lessons Learned. Degradation of EBD via dihaloelimination was observed for both cultures. For carbon, very different bulk e^c values were obtained for the experiments with *Dehalococcoides*- and *Dehalogenimonas*-containing cultures. This result contrasts with the relatively more similar e^c values determined for 1,2-dichloroethane degradation by the same cultures in a previous study by Palau et al (2017). The new e^c values obtained in this study may be used to quantify degradation at sites polluted with EDB. However, due to the large difference of e^c values, identification of the bacteria responsible of EDB degradation in the field will be necessary for choosing the appropriate e^c value. This information might be obtained using a dual-element (C-Br) isotope approach, provided that different slopes (i.e., $\Lambda_{C\text{-}Br} = Dd^{81}Br / Dd^{13}C \approx e^{Br} / e^c$) are obtained for the different cultures in a dual isotope plot.