Assessing microbial dehalogenation of brominated organics using compound specific stable isotope analysis

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Over the last decades, concepts involving compound specific stable isotope analysis (CSIA) have been developed allowing the qualification and quantification of biotransformation *in situ* and evaluation of the related reaction mechanisms of microbial biotransformation of common groundwater contaminants such as the chlorinated ethenes but also pesticides such as γ-hexachlorocyclohexane (Lindane). Brominated subtances are present in the environment as well either from natural or anthropogenic sources and have applications e.g. as flame retardants or biocides. Compared to their chlorinated analogues, however, the biotransformation pathways of these brominated substances are largely unknown and concepts to assess their fate *in situ* are absent.

As several microorganisms were observed capable of dehalogenation of both brominated and chlorinated analogues, it was assumed similar pathways may be involved in the removal of chlorinated and brominated analogues. Therefore, carbon and bromine stable isotope fractionation was tested during biotransformation using model microorganisms and substances and the extent in observed carbon and chlorine stable isotope composition was compared. Main questions addressed were: can CSIA be used to monitor the fate of brominated organics in the environment? Can the knowledge of dechlorination be directly transferred for evaluation of debromination processes? Are debromination and dechlorination reactions the same, taking place at the same enzyme? And, are the same or different microbial communities in the *in situ* dehalogenation of brominated vs. chlorinated organics?