**Carbon stable isotope analysis (CSIA) of sulfamethoxazole during biodegradation by *Microbacterium* sp. strain BR1 and direct photolysis – a new approach to monitor environmental fate of pharmaceuticals**

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Sulfamethoxazole (SMX) is a representative of sulfonamide antibiotics (SAs), widely used in veterinary and human medicine. SMX is incompletely metabolized and enters the environment with wastewater discharge, animal manure and aquaculture. SMX is frequently detected in wastewater treatment plants’ (WWTP), surface water and ground water. Once released to the environment, it may undergo different degradation processes, such as biodegradation, chemical reactions, and photodegradation.

Thorough understanding of SA’s removal routes is crucial for an assessment of their environmental impact and for the evaluation of novel wastewater treatment technologies targeted at these pollutants. Compound specific stable isotope analysis (CSIA) is a tool that has potential to provide additional information on the organic contaminants’ transformation processes in complex environments. In CSIA, the changes in isotope composition of the parent compound are monitored during (bio)transformation processes and the isotope enrichment of the investigated contaminant provides an evidence for its (bio)degradation without a need of metabolite analysis.

Here, we evaluated for the first time the applicability of CSIA for the assessment of SMX transformation pathways. The isotope fractionation of SMX during biotic degradation by *Microbacterium* sp. strain BR1 and abiotic transformation via direct photolysis was determined.

A significant difference in isotope fractionation during biotic and abiotic SMX decomposition was observed, showing that CSIA has a potential for distinguishing these two degradation processes. Isotope fractionation during direct photolysis was variable and it depended on the experimental conditions. Most likely pH has an influence on the reaction mechanism and thus it affects the isotope fractionation. In summary, this work opens a new chapter in CSIA development - the monitoring of sinks, sources and environmental behaviour of water-soluble contaminants, among which pharmaceuticals are of particular concern.