**Happy end: microbial degradation of the recalcitrant**

**artificial sweetener acesulfame**

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Artificial sweeteners are amongst the most frequently detected emerging organic contaminants in the aquatic environment. One prominent example for these additives to food, pharmaceuticals and personal care products is acesulfame (ACE). Its high consumption rates cause vast amounts being released into waste water. Resulting concentrations of up to several µg/L along with the reported persistence of ACE during waste water treatment qualified this compound as a potential marker substance for tracing anthropogenic input into the environment (Jekel *et al.* 2015).

To date, ACE is considered to be largely persistent. Only partial removal of ACE through biotransformation with an enriched nitrifier culture (Tran *et al.* 2014) and enhanced removal rates by photolysis under presence of microorganisms (Gan *et al.* 2014) have been observed in this field. However, while monitoring the performance of constructed wetlands in Langenreichenbach (Germany) we noticed complete ACE removal in a couple of systems, exclusively during summer time.

For investigating biotransformation of ACE laboratory column experiments were carried out. Sludge from the best performing wetland was transferred into a fixed bed bioreactor under aerobic conditions. Partly treated waste water spiked with ACE was recirculated through the column. ACE concentrations were increased successively.

Within eight weeks 30 mg/L of ACE (potassium salt) were removed to >99 %. In this experiment a lag phase of four to five weeks was noticeable, which strongly indicates biotransformation processes causing declining ACE concentration. Control experiments showed that sorption was negligible.

Tran *et al.* (2014) assumed that ACE degradation is a cometabolic process during nitrification. Since no measureable amount of ammonia was detected in our column experiment samples, this cometabolism could not be the exclusive pathway in biotransformation of ACE.

Due to a high background level of dissolved organic carbon in the matrix it is not clear yet, whether ACE was mineralized or transformed.

In contrast to previous findings our data already show that ACE is not resistant to biodegradation. Temperature and residence time appear to be crucial factors for ACE removal. We are presently studying the biodegradation pathway by liquid-chromatography-high resolution mass spectrometry (LC-QTOF-MS) and investigate whether full mineralisation occurs. Results of this work will be reported. In cooperation with microbiologists we aim at identifying the microbial species involved in ACE transformation. On this basis it may become possible to understand under which conditions ACE can be degraded and why these conditions are only seldomly fulfilled.

Nevertheless, the use of ACE as an anthropogenic marker may remain meaningful. The residence time needed for ACE elimination could far exceed what is feasible for waste water treatment plants. Moreover a low number or absence of the microorganisms capable of degrading ACE or an inactive metabolic pathway could be reasons for reported persistence in the environment.

This study outlines that polar pollutants, which have previously been considered as persistent, may actually be degraded under suitable environmental conditions. The behaviour of recalcitrant compounds under varying natural and technical conditions should be studied closely to identify possible degradation pathways.

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