

Investigations of occurrence and elimination of hazardous compounds in waste water treatment plants

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The focus of environmental research has recently been widened to endocrine disrupting compounds (EDCs), pharmaceuticals and personal care products. These trace organic contaminants enter the environment through regular domestic use. Thus, loads of bioactive compounds are entering the wastewater, and if not completely removed through sewage treatment also reach the receiving water bodies. Number of effect studies in the aquatic environment is limited, but some reported effects in the range of environmental concentrations (e.g. ethinylestradiol). Thus, the removal efficiency of sewage treatment plants (STPs) should be more precisely monitored and enhanced wherever applicable.

Main task of the presented project is the monitoring and assessment of the concentration of several trace organics in all process steps (water and sludge samples) of different STPs. This will help to identify the removal performances of the plants in view of sorption to sludge or biodegradation. Among others, the EDCs Bisphenol A, Nonylphenol, Octylphenol, and derivatives of phthalic acid were determined, as well as flame retardants and pharmaceutical residues. All investigated substances are of great environmental and/or ecotoxicological relevance caused by persistence, toxicity or its potential of bioaccumulation (EU-waterframework).

Samples were prepared by solid-phase-extraction, liquid-liquid-extraction and/or accelerated-solvent-extraction. Additionally, some substances need to be derivatized, to enable sensitive gas chromatography. Identification and quantification is performed by gas or liquid chromatographic separation and detection by mass spectrometry (LC-MS, GC-MS). Focus was on a reliable methodology for sensitive and selective detection of all trace contaminants in difficult environmental matrices. The results show the different behavior of single substances or groups of compounds. As an example the removal of bisphenol A is assumed to be mainly based on degradation. On the other hand the musk fragrance Tonalid is adsorbed to a great extent to the primary and secondary sludge.