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Transport behaviour of xenobiotic micropollutants in surface waters – an experimental assessment

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Xenobiotics are substances that do not exist in natural systems but are increasingly produced by industrial processes and introduced into the environment. While many of these compounds are eliminated in waste water treatment plants, some are only barely degraded and are discharged into receiving water bodies. Often little is known about their acute or chronic toxicity and even less about their persistence or transport behaviour in aquatic systems.

In the present study, the stability and turnover of selected micropollutants along a 7.5 km long segment of the River Ammer in Southwest Germany was investigated (catchment area 134 km^2). This stream carries a proportion of treated wastewater which is clearly above the average in German rivers, mainly supplied by a major waste water treatment plant at the upstream end of the studied stream segment. An experimental mass balance approach was chosen where in- and outflow of water and target compounds into and out of the balanced stream segment was measured during base flow conditions. To cover a complete diurnal cycle of wastewater input, pooled samples were collected every 2 h over a sampling period of 24 h. A comparison of bulk mass fluxes showed that carbamazepine, a pharmaceutical, and phosphorous flame retardants, such as TCPP, behave conservative under the given conditions. Some retention was observed for the disinfectant product Triclosan and some polycyclic musk fragrances (e.g., HHCB). TAED, a bleaching activator used in detergents, was completely eliminated along the stream segment. The outcome of the experiment demonstrates the very different persistence of some widely-used micropollutants in aquatic systems. However, the mechanisms involved in their attenuation as well as the fate of the most persistent compounds still remain subject to further research.