



## **Xenobiotics in the aquatic environment of Leipzig, Germany**

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Surface and groundwater in urban areas is increasingly polluted by anthropogenic activity. Recently xenobiotics as pharmaceuticals and personal care products are matter of concern in numerous studies. On the one hand xenobiotics are pollutants which may have negative effects on human health. On the other hand they are marker substances for anthropogenic pollution as untreated and treated wastewater. The Helmholtz Centre for Environmental Research has just started the survey “WASSER Leipzig - Water-And Sewershed Study of Environmental Risk”. Aim of the study is to understand the impact of urban land use on groundwater and water balance within a water- and sewer-shed. Transport of water and contaminants will be quantified, related processes will be investigated. To assess xenobiotic contents in the study area a monitoring programme was started. Monitoring covers the observation of groundwater (17 wells) and surface water (6 sampling points) including effluent of a sewage treatment plant (STP). Based on preceding studies we choose 8 xenobiotics: t-nonylphenol, bisphenol a, caffeine, galaxolide, tonalide, carbamazepine, phenazone and ethinylestradiol. Here first results of the monitoring are presented. Xenobiotics are ubiquitous in ground and surface water of the study area with concentration ranges from 0,7 ng/l up to 8075,0 ng/l. T-nonylphenol is characterised by average concentration of 238 ng/l. No differences in content between ground and surface water can be recognised. Bisphenol a is high in groundwater (Ø 2883 ng/l) and lower in surface water (Ø 749 ng/l). In contrast caffeine concentration is high in surface water (Ø 91 ng/l) but low in groundwater (Ø

7 ng/l). Lowest concentration of t-nonylphenol, bisphenol a and caffeine in surface water can be observed in the STP effluent, indicating good removal rates. Galaxolide and tonalide are characterised by low contents in groundwater (Ø 6 ng/l and 9 ng/l) and higher concentrations in surface water (Ø 175 ng/l and 24 ng/l). Carbamazepine is also low in groundwater (Ø 23 ng/l) and high in surface water (Ø 179 ng/l). In contrast to the xenobiotics mentioned above, STP effluent concentrations for galaxolide, tonalide and carbamazepine are high. Phenazone and ethinylestradiol were not found at all. The observed xenobiotics are characterised by high spatiotemporal heterogeneity. Contents may vary in groundwater up to a magnitude within a few meters. On the other hand same variations are observed on a sampling point within 1 month. This variability reflects the complexity of urban water pathways as well as probable different transport and degradation processes. Further research in the study area will face these problems. Integrating as well as high resolving investigation methods have to be used. Using integral pumping tests, mass fluxes of contaminants through a control plane will be determined. Passive sampling is a possibility to deal with temporal variability of pollutants. To assess 3-D high resolving spatial distribution of contaminants direct-push techniques and multilevel packer are used.