



Organic pollutants in Tai Lake, China – Occurrences, toxicity and implications for drinking water production

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Taihu (Tai lake) is located east of Shanghai in one of the most economically prospering areas of China with high urbanization rates. It serves as drinking water source for more than 10 million people but is also used for seafood production. Due to the rapid urban development in the last decades, Taihu suffered massive pollution with nutrients, organic contaminants and heavy metals. This pollution and the consecutive eutrophication of large parts of the lake threaten the production of safe drinking water.

This study presents and discusses the results of the Sino-German SIGN (BMBF) project with respect to occurrences of organic pollutants, their toxicity and impacts on drinking water.

Between 2015 and 2017 multiple sampling campaigns in the Northern Taihu, artificial wetlands, drinking water and wastewater treatment plants have been conducted. More than 80 samples have been collected and analysed for about 200 pesticides, industrial chemicals, pharmaceuticals, PAHs, VOCs and THMs. Here, 70 different organic pollutants have been detected, whereas spatial patterns indicate multiple sources within the various catchment areas of the major inflowing rivers. The results further show, that the artificial wetlands, which are used as pollution control for water fluxes entering Taihu, are able to substantially lower pollution loads. Also, several pollutants have been detected in the drinking water.

In addition, toxicity tests with eukaryotic cell lines have been conducted with most of the samples. The general cell damage was checked with the MTT assay. The test also served to exclude false negative results in the specific test systems ER-CALUX, AR-CALUX and p53-CALUX. If cytotoxicity was proven, the samples could only be tested further in dilution. Estrogenic activity up to 0.3 ng EEQ / L could be determined in 12 raw samples while no androgenic effect and no genotoxic potential were observed. Furthermore, an environmental and human risk assessment has been conducted for most of the organic pollutants, whereas six pollutants have been identified with a high risk quotient.

Based on the results of the study, several recommendations for drinking water treatment facilities have been derived. For example, the dosage of ozone for water purification should be adjusted according to online measured chemical-physical parameters in order to avoid the generation of transformation products.