

Targeted profiling of chlorinated transformation products and the parent micropollutants in the aquatic environment: A comparison between two coastal cities

ABSTRACT

This study investigated chlorinated transformation products (TPs) and their parent micropollutants, aromatic pharmaceuticals and personal care products (PPCPs) in the urban water bodies of two metropolitan cities. Nine PPCPs and 16 TPs were quantitatively or semi-quantitatively determined using isotope dilution techniques and liquid chromatography-tandem mass spectrometry. TPs and most PPCPs were effectively removed by conventional wastewater treatments in a wastewater treatment plant (WWTP). Chlorinated parabens and all PPCPs (at concentrations below 1000 ng/L) were present in the waters receiving treated wastewater. By contrast, the waters receiving untreated wastewater contained higher levels of PPCPs (up to 9400 ng/L) and more species of chlorinated TPs including chlorinated parabens, triclosan, diclofenac, and bisphenol A. The very different chemical profiles between the water bodies of the two cities of similar geographical and climatic properties may be attributed to their respective uses of chemicals and policies of wastewater management. No apparent increase in the number of species or abundances of TPs was observed in either the chlorinated wastewater or the seawater rich in halogens. This is the first study to elucidate and compare the profiles of multiple TPs and their parent PPCPs in the water bodies of coastal cities from tropical islands. Our findings suggest that chlorinated derivatives of bisphenol A, diclofenac, triclosan, and parabens in the surface water originate from sources other than wastewater disinfection or marine chlorination. Although further studies are needed to identify the origins, conventional wastewater treatments may protect natural water bodies against contamination by those chlorinated substances.