

Temporal trends of select pharmaceutical compounds entering an estuary from a small, urban river

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The fate and effects of pharmaceutical compounds have been widely studied in freshwater systems; however, less is known about their behavior in marine ecosystems. In many coastal watersheds, there are river systems that are receiving waters for domestic wastewater treatment effluents. Depending on the size of the human populations served by these treatment plants, the effluents will contain a range of emerging contaminants including pharmaceutical compounds. Ultimately, these rivers discharge to coastal waters or estuaries, resulting in the release and distribution of pharmaceutical compounds to marine waters. In this study we measured the dissolved and particulate phases of select pharmaceuticals entering Narragansett Bay from the Pawtuxet River in Cranston, RI, USA over a one year period. Of the 16 pharmaceutical compounds measured, 14 were consistently present in the dissolved phase throughout the study. Concentrations ranged from below detection to more than 310 ng/L. Sediment traps were deployed to collect suspended particulate matter exiting the mouth of the river. Seven of the 16 measured pharmaceuticals were present in the suspended sediment samples, ranging from below detection to more than 18 ng/g. Distribution coefficients (K_d s) were calculated and remained relatively constant during the study for most compounds. River flow from a USGS gaging station was used to generate estimates of flux for each compound during the study. Overall, these results indicate that the majority of pharmaceuticals measured in this study exiting the Pawtuxet River reside primarily in the dissolved fraction and are likely still bioactive and bioavailable upon entering the waters of Narragansett Bay.