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Contaminants of emerging concern in municipal wastewater effluents and marine receiving water

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ABSTRACT

The occurrence and concentrations of contaminants of emerging concern (CECs) were investigated in municipal effluents and in marine receiving water. Final effluent from four large publicly owned treatment works (POTWs) and seawater collected near the respective POTW outfall discharges and a reference station were collected quarterly over one year and analyzed for 56 CECs. Several CECs were detected in effluents; naproxen, gemfibrozil, atenolol, and tris(1-chloro-2-propyl)phosphate were the compounds most frequently found and with the highest concentrations (>1 mg/L). Gemfibrozil and naproxen had the highest seawater concentrations (0.0009 and 0.0007 mg/L) and also were among the most frequently detected compounds. Effluent dilution factors ranged from >400 to approximately 1,000. Fewer CECs were detected and at lower concentrations in seawater collected from the reference station than at the outfall sites. Effluent concentrations for some CECs (e.g., pharmaceuticals) were inversely related to the degree of wastewater treatment. This trend was not found in seawater samples. Few temporal differences were observed in effluent or seawater samples. Effluent CEC concentrations were lower than those currently known for chronic toxicity thresholds. Nevertheless, the evaluation of potential chronic effects for CECs is uncertain because aquatic life toxicity thresholds have been developed for only a few CECs, and the effluent and seawater samples had compounds, such as nonylphenol, known to bioaccumulate in local fish. Additional data are needed to better understand the significance of CEC presence and concentrations in marine environments.

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