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Occurrence and potential hazard posed by pharmaceutically active compounds in coastal waters in Cape Town, South Africa

Newman, Brent K; Velayudan, Anisha; Petrović, M; Álvarez-Muñoz, D; Čelić, M; Oelofse, G; Colenbrander, D; Le Roux, M; Ndungu, K; Madikizela, LM

Abstract:
The occurrence of 58 pharmaceutically active compounds (PhACs) in surface water at 28 coastal and five river sites, and in two stormwater flows in Cape Town, South Africa, was investigated in winter and summer. After accounting for quality assurance and control data, 33 PhACs were considered in detail. In winter, 25 PhACs were found at one or more sites and 27 in summer. Salicylic acid was the most widespread PhAC in each season. At least one PhAC was found at each site in each survey. The largest number found at a site was 22 at Lifebox23 Beach in winter and 23 at Macassar Beach and in the Black and Diep Rivers in summer. These sites are strongly directly or indirectly affected by wastewater treatment plant discharges. The range in ΣPhAC concentrations was 41 ng L−1 to 9.3 μg L−1 in winter and 109 ng L−1 to 18.9 μg L−1 in summer. The hazard posed by PhACs was estimated using Predicted No Effect Concentrations (PNEC) from several sources. Hazard Quotients (HQs) for numerous PhACs were >1, and for several even >10, including azithromycin, cimetidine, clarithromycin, erythromycin, and ibuprofen. The highest hazards were at coastal sites strongly indirectly affected by wastewater treatment plant discharges. Azithromycin, trimethoprim, and sulfamethoxazole at some sites may have promoted antibiotic resistance in bacteria, while irbesartan at some sites might have posed a hazard to fish according to the fish plasma model. The concentrations of several PhACs at some coastal sites are higher than concentrations reported in estuarine, coastal, and marine waters in other parts of the world.