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TITLE: Occurrence of pharmaceuticals and personal care products in effluent-dominated Saudi Arabian coastal waters of the Red Sea

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ABSTRACT:

The occurrence of selected pharmaceuticals and personal care products (PPCPs) and the pesticide atrazine were investigated in seawater samples collected from stations located at effluent dominated sites in the Saudi Arabian coastal waters of the Red Sea. PPCPs were analysed using solid phase extraction (SPE) followed by high performance liquid chromatography ? tandem mass spectrometry (HPLC-MS/MS). A multi component method for the ultra-trace level quantification of 13 target PPCPs in Seawater was developed and validated for the here performed study. The method procedure is described in detail in the supplementary material section. 26 samples from 7 distinct locations (2 directly influenced by continuous sewage release) were chosen for the sampling of surface seawater. Based upon local sales information, 25 target substances (20 PPCPs, 4 pesticides and 1 stimulant) were chosen for the here reported method development. Thirteen PPCPs were detected and quantified in a total of 26 seawater samples. Metformin, diclofenac, acetaminophen, and caffeine were identified as the most abundant PPCPs, detected in maximum concentration higher than 3 ?g/L (upper quantification limit for the here developed method). Concentrations were in the range of 7? >3000 (metformin), <LOQ ? 2379 ng/L (acetaminophen) and 62? >3000 ng/L (caffeine). The contribution of direct sewage release on the PPCP levels detected was obvious, the target PPCPs were detected in the Al-Arbaeen and Al-Shabab coastal lagoons in high concentrations due to the low water exchange with the open sea and still ongoing sewage releases in the lagoons. Also, substantial amounts of antibiotics were detected in all samples. Levels and distribution profile of the detected PPCPs revealed high level release rates and give raise to concern on potential environmental risks associated with the here document long term exposure on the fragile coastal marine environment of the region but particularly in the nearby protected coral reef environment outside the harbour region of Jeddah.

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