Special session (2)

OCCURRENCE OF PHARMACEUTICALS AND PERSONAL CARE PRODUCTS IN MUNICIPAL WASTEWATER TREATMENT PLANTS AND RECEIVING WATER BODIES IN BANGKOK, THAILAND

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ABSTRACT

Background: Pharmaceuticals and personal care products (PPCPs) have been frequently detected in aquatic environments worldwide and suspected for potential ecological consequences including adverse health effects on humans. However, occurrences, sources and potential risks of PPCPs residues have rarely been investigated in Bangkok, Thailand, one of the most densely populated cities in the world.

Aims: Two separate studies were carried out to evaluate the levels of some PPCPs in domestic wastewater treatment plants as well as in receiving water bodies in Bangkok, Thailand during 2009 – 2012, including six canals, and Chao Phraya River.

Methods: Solid phase extraction (SPE) followed by liquid chromatography- mass spectrometry- mass spectrometry (LC/MS/MS) technique were used to detect eight and fourteen pharmaceuticals during the two studies including acetaminophen, acetylsalicylic acid, atenolol, caffeine, ciprofloxacin, diclofenac, ibuprofen, mefenamic acid, naproxen, roxithromycin, sulfamethazine, sulfamethoxazole, sulfathiazole and trimethoprim.

Results: Levels of pharmaceutical residues in WWTP influents on average were the highest for acetylsalicylic acid (4,699.4 ng/L), followed by caffeine (2,250.5 ng/L) and ibuprofen (701.9 ng/L). In effluents, the concentration of caffeine was the highest (307.1 ng/L), followed by acetylsalicylic acid (260.5 ng/L) and mefenamic acid (251.4 ng/L). In surface water, acetylsalicylic acid showed the highest levels(on average 1,355 ng/L in canals and 312.6 ng/L in the river).

Conclusion: Removal efficiencies of WWTPs for roxithromycin, sulfamethoxazole and sulfamethazine were determined negligible. For several compounds, the concentrations in ambient water were higher than those detected in the effluents, implying contribution of sources other than WWTPs. While the risks in Chao Phraya River are relatively low, several pharmaceutical residues were detected at high levels in canal waters of Bangkok, clearly indicating that the canals in Bangkok area are at potential ecological risks, warranting appropriate management decisions with efforts to be made to identify the sources and implement effective measures for mitigation.

Keywords: Pharmaceutical, influent, effluent, receiving water, ecological risk