

Abstract

The occurrence of Pharmaceutical and Personal Care products (PPCPs) in the environment is a global issue due to uncontrolled use of these products by human and animals. The impacts of these products are complex and must be considered a major importance to global problems.

The results from this research found the occurrence of 3 of antibiotics which were Ciprofloxacin with a concentrations of 0.32-12.44 µg/l, Norfloxacin 1.79-20.75 µg/l and Tetracycline 0.60-2.31 µg/l. DEET as an insect repellent showed concentrations at 0.08-0.78 µg/l and Caffeine as a stimulant was 0.75-0.81 µg/l. PPCPS contaminants were detected in all the 11 stations along Bang Pa Kong river.

Fifteen PPCPs were also found in wastewater of a big hospital, although the activated sludge treatment plant was in operation. This WWTP can treat 8 of PPCPs, however, 7 PPCPs were still detected in effluent which were: Ciprofloxacin with a concentrations of 1.56 µg/l, Norfloxacin 5.04 µg/l, Sulfamethoxazole 0.91 µg/l, Tetracycline 0.72 µg/l, Theophylline 0.39 µg/l, Atenolol 0.47 µg/l and Caffeine 0.34 µg/l.

Fifteen PPCPs were also found in wastewater of a small hospital. The stabilization pond treatment plant was in operation. Seven PPCPs were detected in effluents which were Norfloxacin with concentrations of 2.53 µg/l, Sulfamethoxazole 0.93 µg/l, Tetracycline 0.62 µg/l, Erythromycin 1.09 µg/l, Theophylline 0.37 µg/l, Atenolol 0.47 µg/l and Caffeine 0.36 µg/l.

Eleven PPCPs were detected in a municipal wastewater. The activated sludge treatment plant in this municipality was in operation. Eleven PPCPs were detected in the effluent, specifically antibiotics such as Amoxicillin with concentrations of 0.64 µg/l, Sulfamethoxazole 0.42 µg/l and Tetracycline 0.91 µg/l.

Eight PPCPs were detected in the wastewater of a pig farm. The wastewater discharged to the water environment contained 5 antibiotics which were Amoxicillin with concentrations of 0.04 µg/l, Ciprofloxacin 34.3 µg/l, Norfloxacin 39.2 µg/l, Sulfamethoxazole 0.35 µg/l and Tetracycline 30.6 µg/l. Acetaminophen which is an analgesic and anti-inflammatory was also detected with a concentration of 0.99 µg/l, DEET 0.76 µg/l and Caffeine 0.74 µg/l. Two antibiotics were detected in the wastewater of a fish farm which were Sulfamethoxazole with concentrations of 0.34 µg/l and Tetracycline 1.09 µg/l. Caffeine was detected at 0.77 µg/l.

Treatment efficiency of advanced constructed wetlands (ACW) treating PPCPs are varies by type of it. The experimental results show that ACW which contain of stone and reeds have treatment efficiency for most of PPCPs, CIP, NOR, TC, ERY, SMX ranging from 94-98 % except ERY which is 57%. Furthermore the ACW have high efficiency to treat ACT 73 % and ATN 81 %

The plants in the ACW show higher efficiency than without plant especially CIP. The results also show that stone and laterite have treating efficiency for ACT 89 % and 92 %

PPCPs detected in this research are sources of PPCPs contamination in the environment and it is expected that PCPPs contamination in other areas may exist. High performances of treatment plants are required for treating PPCPs to protect Bang Pa Kong river and other water sources. PPCPs treatment technology and performance evaluation were studied as well as promote water reuse for some activities in hospitals to protect water bodies and aquatic life from this emerging pollutants.

Keyword Pharmaceutical and personal care products, Contamination, treatment and reuse