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The Role of Hospital Effluent for Occurrence and Distribution of Ecologically Important Antibiotics in Sri Lanka

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Abstract

Antibiotics are among the emerging micro contaminants in the aquatic environment due to their potential adverse effects on the ecosystem and possibly on human health. Four important antibiotic classes, sulfanomides [sulfadiazine (SDI), sulfamethoxazol (SMX)], penicillin [amoxicillin (AMX), ampicilline (AMP)], tetracycline [oxytetracycline (OTC), tetracycline (TET)] and macrolids [erythromycin (ERM)] used for human and veterinary medicine, were studied. Triplicate samples of hospital effluents water and sediment were collected from 50 sampling sites in different area of the country. Solid-Phase Extraction (SPE) was employed to concentrate antibiotics and quantification was done by High Performance Liquid Chromatography (HPLC). Recoveries for each antibiotic were remained between $83\% \pm 0.021$ to $95\% \pm 0.034$. Among the selected antibiotics tested; the highest concentrations of AMX and AMP were recorded in hospital effluent water while OTC was not detected. AMX and AMP were ranged between 0.001-0.023 ppm and 0.001-0.024 ppm respectively. The other antibiotics concentrations were; TET (water: 0-0.001 ppm, sediments: N.D); SDI (water: 0.001-0.003 ppm, sediments: 0.001-0.003 ppm); SMX (water: 0.001-0.018 ppm, sediments: 0.001-0.002 ppm); ERM (water: 0.001-0.008 ppm, sediments: 0.001-0.003 ppm) respectively. A relatively high removal efficiency was detected for TET (50-100%) where descending order was followed by SDI (63-72%), SMX (52-72%), ERM (48-100%), AMP (40-54%) and AMX (35-58%) respectively. The results of the study can be incorporated into environmental risk assessments of the particular contaminants as the published information regarding antibiotic contamination status in water and sediment are limited in Sri Lanka.

Keywords: Ampicillin (AMP), Amoxicillin (AMX), Sulfadiazine (SDI), Sulfamethoxazol (SMX), Oxytetracycline (OTC), Tetracycline (TET), High Performance Liquid Chromatography (HPLC)