

## A review of emerging micro-pollutants in hospital wastewater: Environmental fate and remediation options

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### ABSTRACT

Hospitals played vital role in the maintenance and sustenance of human health. However, hospital activities generate high volume of toxic solid and liquid containing diverse inorganic, organic and microbial wastes released untreated into the ecosystem. The management of hospital wastewater in particular has been a major source of concern due to the presence of unregulated emerging micro-pollutants at concentrations in the range of ng/L to µg/L. These pollutants at low concentration exert different potential health effects on human and aquatic species. In this review, the formation, composition, properties and ecotoxicology effects of selected emerging micro-pollutants (Norfloxacin, Ofloxacin, Ciprofloxacin, Clofibric acid and Carbamazepine) at different concentrations in hospital wastewater were reviewed. The review also elucidates on detection and quantification of concentration of different emerging micropollutants in hospital wastewater by Spectrophotometry techniques, Gas Chromatography, Ion Chromatography, Gas Chromatography-Mass spectrometry, and High-Performance Liquid Chromatography. Furthermore, treatment of hospital wastewater through physical, biological, chemical, adsorption and advanced oxidation processes such as photocatalysis and photo-Fenton including their operational mechanism were provided. The chemistry and mechanism of degradation of the selected emerging micropollutants into several intermediates were reviewed. It was found that conventional wastewater treatment methods are not designed for effective removal of these unregulated pollutants in hospital wastewater because they exist as mixtures at very high concentrations and exerts different toxicological effects. The review also reveals that no single technology can effectively detoxify the wastewater, instead combination of methods such as (photocatalytic/adsorption or photo-fenton/adsorption) was found most appropriate for hospital wastewater treatment. Finally, regular monitoring and determination of physicochemical and ecotoxicological parameters and treatment of hospital wastewater are recommended.

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