

Antimicrobial Resistance in Urban Wastewater: Insights from Operating Conditions and Bacterial Community Dynamics

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ABSTRACT

The new European Urban Wastewater Treatment directive (1) addresses concerns regarding the emission of contaminants of emerging concern (CEC), such as pharmaceutical compounds and antimicrobial resistance (AMR), challenging Urban Wastewater Treatment Plants (UWWTP) goals. This work aimed to investigate how different key operating conditions (Food/Microorganism ratio, coagulant and ozone doses) affect the final effluent, regarding total bacteria and AMR removal, as well as the composition of the bacterial communities. Water samples were collected from three UWWTPs with different activated-sludge (AS) systems and six lines operated under different F/M and coagulant doses, and one UWWTP with different ozone doses. The samples were collected at the plants' inlet, after AS, after ozonation when applicable, and at the receiving waterbodies, upstream and downstream the UWWTP discharge. Microbiological analyses included total coliforms and *E. coli* enumeration, quantitative PCR of selected genes (e.g. 16S rRNA, *int1*, *ermB*), bacterial community analysis by 16S rRNA gene metabarcoding, and isolates identification by MALDI-TOF.

Keywords: Antimicrobial resistance, Urban wastewater treatment plants, Activated sludge operating conditions, Bacterial community structure, Antibiotic resistance genes