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Microbiological characterization of healthcarre wastewater: what are the potential consequences for public health?

M. Fabio (1), M. Barbera (1), C. Sindoni (1), A. Laganà (1), G. Visalli (1), A. Facciolà (1)

Department of Biomedical and Dental Sciences and Morphological and Functional Imaging (BIOMORF), University of Messina.

Introduction. Healthcare wastewater represents a complex matrix characterized by a high concentration of pathogenic microorganisms. Unlike urban wastewater, these effluents act as actual reservoirs for "superbugs," whose release into the environment without specific treatments poses critical challenges for public health.

Methods. Post-treatment wastewater samples were collected from the 8 main hospitals in the province of Messina. An aliquot of each sample was inoculated onto standard culture media. Following incubation, the microbial strains were identified, and their antibiotic resistance/sensitivity profiles were evaluated.

Results. A total of 77 microbial strains were isolated, including 55 (71.4%) Gram-negative bacteria, 9 (11.7%) Gram-positive bacteria, and 13 (16.9%) yeasts. The most represented genus was Pseudomonas spp. (20.8%), followed by Aeromonas spp. (18.2%) and Candida spp. (13.0%). An average resistance rate of 27% was detected. Among the antibiotics tested on Gram-negative strains, ciprofloxacin showed the highest levels of resistance (53.2%), followed by amoxicillin-clavulanic acid (45.5%) and piperacillin-tazobactam (42.9%). Furthermore, an average resistance to carbapenems of 20% was observed. Among the antibiotics tested on Gram-positive strains, vancomycin resistance was found to be 11.1%. Finally, significant resistance was also detected for antifungals, with resistance levels of 28.6%, 22.2%, and 14.3% for fluconazole, caspofungin, and voriconazole, respectively.

Conclusions. This microbiological characterization highlights that hospital wastewater is not merely waste, but a critical vector for resistant pathogens. Without targeted monitoring protocols and disinfection systems, the risk of a "silent spread" into the environment directly threatens public health, accelerating the global emergency of antimicrobial resistance.