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Screening and Quantification of Selected Penicillin Group Antibiotics (AMX, AMP, CLOX) and Resistant Bacteria in Solid Waste Dump Leachates

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Abstract

The escalating generation of solid waste due to rapid industrialization and urbanization necessitates effective waste management strategies to mitigate environmental pollution, notably through containing landfill leachate (LFL) contamination. This study reports the presence of penicillin group antibiotics Amoxicillin (AMX), Ampicillin (AMP), Cloxacillin (CLOX) and antibiotic-resistant bacteria in LFL. Leachate samples collected from Kegalle, Mathugama and Kegalle and subjected to identification, quantification of AMX, AMP and CLOX residues and screening of resistance bacteria against AMX, AMP and CLOX. Antibiotic residues were quantified using High-Performance Liquid Chromatography (HPLC). None of the samples detected AMX, AMP, and CLOX antibiotic residues. Antibiotic Resistance Bacteria (ARB) and Minimum Inhibitory Concentration (MIC) were determined against the antibiotics following the standard methods. Antibiotics using CLSI guidelines. In the collected leachate samples, resistance to AMX ranged from 2.2% to 13.7%, resistance to CLOX ranged from 3.3% to 5.1%, and resistance to AMP ranged from 1.6% to 10.3%. Over 50% of antibiotic-resistant bacteria (ARB) were found, with a minimum inhibitory concentration (MIC) greater than 360 µg/ml for both AMX and AMP. Multiple antibiotic resistance indices ranged from 0.1 to 0.6, underscoring the intricate interplay of environmental factors and selective pressures. These findings underscore the imperative for continuous monitoring and management strategies to curb the proliferation of antibiotic resistance in landfill leachates. By safeguarding environmental integrity and public health, such initiatives are essential for sustainable development and the preservation of ecosystems. Integrated approaches, informed by robust scientific investigations, are vital for addressing the multifaceted challenges of antibiotic contamination in landfill leachates.

Keywords: *Leachate, Amoxicillin, Ampicillin, Cloxacillin, Antibiotic resistance*