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Isolation and Characterization of Bacteria from e-waste

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Structured Abstract

Background: The rapid proliferation of electronic devices has led to an increase in electronic waste (e-waste), posing significant environmental and health challenges. Efficient management of e-waste is crucial to mitigate these issues, reduce costs, and recover valuable materials. Recycling e-waste decreases hazardous materials and supports material recovery. However, biofouling caused by bacteria forming biofilms in e-waste recycling processes can reduce efficiency. Understanding the role of microorganisms in biofouling and their antibiotic resistance profiles is essential for improving recycling processes and addressing potential health risks. The purpose of this study is to identify and characterize bacteria in local e-waste samples via biochemical characterisation, to quantify the biofilm ability, and to analyze antibiotic resistance profiles of bacteria isolated from local e-waste.

Methods: Bacteria were isolated from locally sourced e-waste samples. Morphological characteristics of these bacteria were determined through Gram staining and various biochemical tests. For molecular identification, DNA extraction was performed, followed by Polymerase Chain Reaction (PCR) and gel electrophoresis. The potential for biofilm formation by the isolated bacteria was assessed to understand their role in biofouling. Additionally, antibiotic susceptibility testing was conducted to evaluate the resistance profiles of the isolated bacteria.

Results: This study successfully identified specific bacteria present in local e-waste samples through biochemical characterization and molecular techniques. The quantification of biofilm production by these bacteria indicated their potential impact on the efficiency of e-waste recycling processes. Antibiotic susceptibility testing revealed varying levels of resistance and susceptibility among the isolated bacteria, underscoring potential health risks associated with these organisms. The findings highlight the significant role of microorganisms in biofouling and their contribution to the challenges faced in e-waste management.

Conclusion: In conclusion, the PCR that was conducted is successful. Based on characterization and biochemical test, the isolated bacteria from e-waste is most likely to be Staphylococcus spp. Furthermore, *S. epidermidis* ATCC35984, *S. epidermidis* ATCC12228, and bacteria isolated from e-waste have been demonstrated to possess the capability to form biofilms. Based on antibiotic susceptibility testing results, isolated bacteria from local e-waste, which is S1, S2, and S3 were susceptible to gentamicin and chloramphenicol but resistant to penicillin.

Keywords: e-waste management, Biofouling, Biofilm, Antibiotic resistance, Biochemical characterization.

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