FIRST COMPREHENSIVE ASSESMENT OF MICROPLASTICS IN URBAN STREET DUST OF EASTERN SAUDI ARABIA: ABUNDANCE, TRAITS, AND HEALTH RISKS

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Urban street dust has emerged as an important reservoir and secondary emission source of microplastics (MPs), yet evidence from arid regions remains scarce. This study provides a comprehensive assessment of MP contamination in street dust from two major cities in eastern Saudi Arabia, Alkhobar and Al-Dammam, integrating occurrence, physicochemical characteristics, and human health risk evaluation. Street dust samples were collected from 58 sites representing diverse land-use categories and analyzed using density separation, chemical digestion, stereomicroscopy, and ATR-FTIR spectroscopy. Microplastics were detected in all samples, with a mean abundance of 12.6 ± 13.8 items per 5 g of dust and pronounced spatial heterogeneity. Fragments were the dominant morphotype, followed by fibers and films, while medium-sized particles (300–999 µm) prevailed. Polymer analysis identified polyethylene (PE), polyethylene terephthalate (PET), and polypropylene (PP) as the most abundant polymers, alongside consistent contributions from high-toxicity polymers such as polyvinyl chloride (PVC) and polystyrene (PS). Diversity index (MDI) analysis revealed high heterogeneity in MP size and color across both cities. Human exposure assessment demonstrated that children experience substantially higher estimated daily and annual intake of MPs via both ingestion and inhalation compared with adults, particularly in residential and recreational areas. Polymer hazard index (H) classified several sites as high to very high risk, driven primarily by PVC and PS contributions. Overall, the findings identify urban street dust as a significant exposure pathway for hazardous microplastics in arid cities and provide critical baseline data for the Arabian Gulf region. These results highlight the need to integrate microplastic monitoring and polymer-specific risk control into urban dust management and public health frameworks in rapidly urbanizing arid environments.

Keywords: Microplastics (MPs) Street dust Human exposure risk Urban environment, Saudi Arabia

[1] H. A. Alharbi, A. Y. Bazeyad, Y. Al Naggar, B. K. Youssef, and A. Ashry, “First comprehensive assessment of microplastics in urban street dust of Eastern Saudi Arabia: abundance, traits, and health risks,” Journal of Hazardous Materials, 2026, Art. no. 141047.