Integrating microbiota profiling in biomonitoring of occupational exposure to micro- and nanoplastics

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The widespread generation of micro- and nanoplastics (MNPLs) during industrial and manufacturing processes has raised concerns about their potential impact on human health, particularly regarding chronic occupational exposure. While research has primarily focused on the toxicological effects of MNPLs on respiratory and systemic health, their influence on the human microbiota remains largely unexplored. Therefore, this study aims to assess the gut microbiota composition of workers potentially exposed to MNPLs in occupational environments, using high-throughput sequencing techniques.

A cohort of exposed workers from various industrial sectors was recruited, alongside a matched control group with no known occupational MNPL exposure. Fecal samples were collected to evaluate microbial diversity and community composition through 16S rRNA nanopore sequencing, followed by bioinformatics analyses to identify potential dysbiosis. Preliminary data suggests that alpha and beta diversity metrics might significantly shift in microbial diversity between control and exposed group. The observed microbial imbalances suggest that chronic MNPL exposure may contribute to microbiome dysregulation, potentially influencing immune responses, metabolic health, and systemic inflammation. These findings highlight the importance of including microbiome analysis in occupational health risk assessments.

This study underscores the need for further research on MNPL-microbiota interactions and the development of preventive measures for workers in high-risk environments. Future investigations should explore the mechanistic pathways linking MNPL exposure to microbiome-associated health outcomes, as well as the potential for microbiota-based biomarkers in biomonitoring strategies.

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