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# Detection of Diverse Microplastic Polymers in Human Breast Milk

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## ABSTRACT

**Introduction:** The detection of microplastics (MPs) in human breast milk (HBM) has raised urgent concerns about infant exposure to environmental contaminants at a critical stage of development. Breastfeeding, long regarded as the gold standard for infant nutrition, may inadvertently serve as a pathway for MPs to reach newborns. **Methods:** Breast milk samples collected from the Halimatussaadia Mother's Milk Centre (HMMC) were processed to isolate MPs, which were subsequently characterised using Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy. **Results:** A range of polymer types was identified in HBM. The most frequently detected MPs included polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET)—materials widely used in packaging, food containers, and textiles. In addition, polyvinylidene fluoride (PVDF), typically associated with industrial and household applications, was also present. The diversity of polymers suggests multiple contamination pathways, including consumer products, packaging, and broader environmental exposure. **Conclusion:** This study provides direct evidence of diverse MP polymers in human breast milk, confirming that infants may be exposed to synthetic particles during breastfeeding. The detection of PE, PP, PET, and PVDF highlights the ubiquity of MPs in daily life and the urgent need for further research to quantify exposure levels and assess potential health effects. Expanding investigations with larger cohorts and advanced analytical methods will be crucial to understanding the risks of MPs in early life nutrition. Microplastic (MPs) are current rising concerns with recent research confirming their presence in human breast milk (HBM). Early-life exposure is particularly concerning due to infant vulnerability, yet Isolation remains challenging due to the complex lipid–protein matrix, and no standard method currently exists.

**Keywords:** ATR-FTIR spectroscopy; human breast milk; infant exposure; microplastics; polymer identification