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The unseen ingredients: a systematic review of the prevalence of microplastics and nanoplastics in our food

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Abstract

Background: Plastics have revolutionized every aspect of modern life [1, 2], offering convenience but also bringing forth environmental and health hazards. Their exponential production and improper disposal have led to the global burden of microplastics (MPs) and nanoplastics (NPs) in the environment [3, 4]. These tiny particles possess the alarming ability to infiltrate the food chain, thereby posing a potential threat to human health [1-3, 5]. **Objective:** This study aims to evaluate the prevalence of MPs/NPs contamination in food and beverages, emphasizing the urgency of addressing this invisible threat and providing future directions. **Methods:** Employing a PRISMA methodology, a comprehensive literature review was conducted on PubMed, Scopus, and Web of Science until August 15, 2023. From an initial pool of 4078 potentially relevant studies, duplicates and unrelated works were removed, and 229 articles focusing on edible products were selected for analysis, resulting in 1630 data points. Systematic categorization included food types, detection techniques, particle characteristics, and polymer compositions. **Results:** Our investigation unveiled that over 95% of the examined food items were found to be contaminated with MPs/NPs. Predominant detection methods included FTIR spectroscopy and microscopy, uncovering fragments and fibers in a spectrum of colors such as blue, black, red, transparent, and white. Polypropylene, polyethylene, and PET emerged as the primary polymers present across diverse food categories. Notably, fruits and vegetables exhibited the highest contamination rates (126150 items/g), followed by sauces, beverages, and dairy products (45 to 8 items/L). Conversely, seafood, sweeteners, canned foods, salts, meats (0.7 up to 0.014 items/g), rice (56 µg/g), and soy-based products (0 µg/g) displayed comparatively lower contamination levels. **Conclusions:** This study highlights significant gaps in our knowledge regarding the extent of MPs/NPs contamination in our diet. Future research is imperative to expand our understanding of their presence, particularly in under- or unexplored foods categories such as fruits and vegetables, dairy products, meat, bakery products, baby foods, and beverages other than water. This issue cannot be underestimated, as it pertains directly to safeguarding human health in the face of an unseen but potentially pervasive threat.

Keywords: microplastics; nanoplastics; prevalence; food chain contamination

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