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Critical Review

Are we eating plastic? Science mapping of microplastic pollution in the aquatic food chain

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Abstract

This study evaluates the knowledge structure of microplastic pollution and its effects on the aquatic food chain. The presence of microplastics has seriously harmed the ecosystem. Through bibliometric analysis, 216 journal publications were retrieved from the Web of Science (WoS) from 2008 to 2023 (April), with no restriction in the time frame. Applying bibliographic coupling and co-word analysis, the emerging, current, and future themes of microplastic pollution are presented. Three research streams are derived from bibliographic coupling, centralized on the source of microplastic pollution and its impact. At the same time, research streams from co-word analysis are associated with overcoming the issue of microplastics in the ecosystem. This study's implications suggest three main principles to mitigate microplastic issues: (1) educating the public on the impact of microplastic pollution, (2) implementing holistic regulations and policies, and (3) developing treatment strategies through conventional, innovative, and hybrid approaches. Microplastic pollution is a global concern, requiring a holistic and comprehensive approach to overcome it. This review is the first to present a scientific mapping of the microplastics literature, which is a fundamental basis for future research on microplastic pollution and its impact on the ecosystem. *Integr Environ Assess Manag* 2024;00:1–12. © 2024 SETAC

KEYWORDS: Bibliometric analysis; Food chain; Microplastics; Nanoplastics; Pollution

INTRODUCTION

Since the 1950s, the problem of environmental pollution caused by plastic has continued to increase (Rebelein et al., 2021). Plastic products are dispersed into the ecosystem from many sources, such as household littering, losses from landfill sites, illegal dumping, agricultural waste, textile products, and recycling facilities (Mishra et al., 2019). Most of these nonbiodegradable materials reach the environment, producing plastic debris and accumulating in terrestrial and aquatic systems around the globe (Ivleva et al., 2017). Over time, plastic fragments into microplastic particles, accumulating in the environment (Bajt, 2021). The secondary process can also produce it because microplastics degrade from larger plastic items into smaller debris caused by chemical, physical, and biological processes (Wang, Guo, et al., 2021). Secondary microplastics are the most common microplastics in the ecosystem (Meng et al., 2020). Plastic pollution results from insufficient waste management and the rapid growth of waste accumulation, leading to the uncontrolled release of plastics into the environment (Shruti et al., 2021).

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In the past 70 years, the global use of plastic has increased from 1.5 million tons to 357 million tons in 2018 (Bui et al., 2020) and is expected to reach 500 million tons in 2025 (Osman et al., 2023). Plastics have become universal materials due to their strength, durability, and light weight, as well as low electrical and thermal conductivity and corrosion resistance (Meng et al., 2020). Microplastic refers to plastic items smaller than 5 mm in diameter (Jung et al., 2022). There are two sources of microplastic: primary and secondary. Primary microplastics are raw polymer materials found in domestic and industrial applications (Wang, Zhao, et al., 2021). They are commonly found in cosmetics, personal care products, toothpaste, clothing, textiles, and plastic industries (Kasmuri et al., 2022). Most of these products are purged into the aquatic system through industrial activities, water treatment plants, sewage discharge, and human activities.

Organisms in the marine ecosystem ingest these tiny plastic particles through the food chain, potentially ending in human bodies (Borriello & Rose, 2022). Microplastics are a serious concern to human health because they have been detected in water, food, air, and humans, including tissue, lungs, placentas, blood, and stools (Jung et al., 2022; Nicole, 2021). Microplastics are ubiquitous because of their small size and ability to penetrate cells and tissue (Jung et al., 2022). Their infiltration into the food supply chain

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