



Recent Progress and Research Trends in Microplastic Pollution and the Potential Health Risks

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It has been almost a century since the revolutionary invention of the first fully synthetic plastic, Bakelite, and now there are over 350,000 commercially available plastic materials worldwide. As these alternatives preserve scarce natural resources and could be molded to cater to our every whim, the Great Depression and WWII further necessitated a great expansion of the plastics industry. Nonetheless, the unblemished fantasy about plastics became disenchanted as awareness about environmental issues spread in the late 1960s. Plastic litter has been documented since the 1960s (Bergmann et al. 2015) and early 1970s (Carpenter and Smith 1972); the increasing generation of plastic waste worldwide has posed a significant threat to ecosystems and has raised global concern. In 2018, global annual plastics production reached almost 360 million tonnes and 62 million tonnes in Europe, but only 9.4 million tonnes of plastic post-consumer waste were collected in Europe to be recycled (Plastic Europe 2020).

Pieces of plastics smaller than 5 mm are defined as microplastics (MPs) with various shapes, colors, densities, chemical compositions, and dimensions. Ever since the introduction of the concept of MPs in 2004 by Thompson et al., where microplastic debris was quantified in beach sand and ocean sediments for the first time, research over the past couple of decades has shown that MPs are present in the natural world, including marine, terrestrial, atmospheric environments. MPs are small in size but exist in vast numbers and are persistent in the environment but resistant to natural degradation. MPs can also be easily broken up into smaller pieces, which may also absorb or leach chemicals/pollutants such as metals, endocrine disrupting chemicals

(EDCs) persistent organic pollutants from or to these debris. Extensive studies and reports have been executed to help improve our understanding of the characteristics, environmental distribution, behaviors of MPs, and risks to humans, ecosystems, and society.

The 1st and 2nd International Symposium on Marine Microplastic Pollution and Control provided the opportunity to launch this special issue in Bulletin of Environmental Contamination and Toxicology (BECT) on MPs pollution. In this special issue, 30 articles, including this editorial, eight reviews, and 21 research papers, have been selected for publication. The special issue highlights the ecotoxic interaction of MPs and diverse model species, such as the thick shell mussel, *Daphnia magna*, zebrafish, and microbes, and the influence of MPs on the structural and functional dynamics of biofilms during the microbial community succession in marine, freshwater and soil ecosystems. In this issue, the characteristics and distribution of MPs debris were reported in the nearshore sediment from the Bohai Sea coastline, in the surface water of the southwest coast of the Caspian Sea (Guilan province, Iran), in seafood (feed made from seafood and molluscs) and in a municipal wastewater treatment plant (influent, effluent and excess sludge). Research in this issue also illustrates the potential risk of MPs transportation mechanism in marine ecosystems and the absorption–desorption processes of toxic substances (e.g., steroid hormones, Pb) during weathering/aging and degradation. Cutting edge methods have also been proposed for MPs identification, such as micro-hyperspectral imaging (MHSI) and accelerated solvent extraction (ASE). In addition, the semi-systematic literature review statistically analyzing the relationship between plastic consumption and socioeconomic levels and investigation focusing on the MPs pollution caused by food delivery services provides a new perspective for understanding the risks to our societies.

This special issue aims to reveal state-of-the-art studies on broad topics of microplastic pollution, analytical methodology, characterization (visualization, identification), and

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environmental fate in the water environment. The guest editors of this special issue (Rong Ji, Daoji Li, Haibo Zhang, Lihui An, Qiqing Chen, Yuelu Jiang, Yini Ma, Chen Tu, Philippe Corvini, Bodo Philipp, Nicolas Kalogerakis) would like to thank all authors and reviewers for contributing to this special issue and also would like to express their appreciation to Erin Bennett, the Editor-in-Chief, Huan Zhong, the senior editor, and all the editorial staffs of BECT for their enthusiasm and support.

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