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Marine ecology is harmed by polymer breakdown in biological systems and interactions with other contaminants

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ABSTRACT

The production and disposal of plastics has become a major concern for the sustainability of our planet. Over the past 75 years, approximately 80% of plastic waste has been sent to landfills or released into the environment. Plastic waste released into the environment is broken down into smaller particles through fragmentation, weathering and other decomposition processes, producing microplastics (plastic particles less than 5 mm in size). Although the focus of research on microplastic pollution has been on marine and aquatic ecosystems, there is growing evidence that terrestrial ecosystems are also at risk. Microplastic pollution has been reported in a variety of terrestrial environments from a variety of sources, including plastic mulch, pharmaceuticals and cosmetics, tire debris (tire debris), the textile industry (microfibers), sewage sludge and plastic landfills. Recent studies have shown that marine s are a major sink for pollutants released into terrestrial ecosystems and are often contaminated with a mixture of organic and inorganic pollutants. This has a gradual negative impact on marine health and fertility as it affects marine pH, porosity, water holding capacity and enzymatic activity of marine microorganisms. Microplastics coexist by adsorbing contaminants on their surfaces through various intermolecular forces such as electrostatic forces, hydrophobic forces, non-covalent forces, distribution effects, van der Waals forces and microporous packing mechanisms. Can interact with environmental pollutants. This delays the decomposition process of existing pollutants and affects various ecological activities in marine s and ecosystems. The detrimental effects of microplastics and their interactions with other pollutants in terrestrial ecosystems. The review also looks at the impact of microplastics on the sustainability of the earth.

Keywords: Marine sustainability; Terrestrial ecosystems; Co-contamination; Heavy metals; Pestcides

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INTRODUCTION

The ocean is an integral part of the planet because it provides various services for ecosystem functioning. However, approximately 25% and 44% of the world's marine life is reported to be severely and slightly affected, mainly by pesticides, persistent organic pollutants, metals and metalloids, respectively [1]. In addition, there has been a significant increase in the last decade of new pollutants caused by the mass production of synthetic organic polymers and plastics, which pose serious environmental threats to marine systems [2]. Therefore, interactions between pollutants need to be studied to reduce pollution and ensure ocean sustainability. Pollutants affect ocean homeostasis by altering ocean properties such as: B. They affect water content, water holding capacity, sea structure, pH, porosity and everything else that depends on them [3]. Major common types of plastics in terrestrial ecosystems include polypropylene, polyethylene, polystyrene, polyvinyl chloride and polyethylene terephthalate. In recent years, promising alternatives to conventional non-degradable plastics, such as polyhydroxyalkanoates, polylactic acid, polybutylene adipate terephthalate and polyhydroxybutyric acid, called biodegradable plastics (bioplastics), have been introduced. Although the recycling rate of plastic products is increasing, high levels of plastic are still released into the environment. For example, millions of tons of plastic are made each year to facilitate different aspects of humanity. According to EPRO, global plastic production in 2016 was 335 million tonnes, an average annual increase of 8.6% since the 1950's. As a result, past trends such as overproduction of plastics, waste disposal patterns, low renewal rates, and demographics have driven the accumulation of plastic waste in the environment [4].

For decades, plastics have become a potential new pollutant, posing a serious threat to the environment. The decomposition process of plastic waste is a serious environmental problem, as the fragile plastic on the surface will develop microcracks due to weathering mechanisms such as microorganisms, light and hydrolysis, and will gradually decompose into finer fragments, so-called Microplastics (MPs). Microplastics are small particles of plastic with a size of about 5 mm to 1 mm. Due to their low density, small size, and resistance to environmental biodegradation, these MPs readily disintegrate in water, oceans and air currents. Once in the ocean, MPs can persist for decades, even centuries, slowly breaking down into tiny particles known as nanoplastics. Microplastic pollution in marine ecosystems can have a variety of negative impacts on marine health and ecosystem functioning [5]. In addition to their effects on the physical and chemical properties of marine organisms, MPs can also adversely affect marine organisms such as plants, invertebrates and microorganisms. For

example, MPs can affect plant germination and growth and alter the physiology and metabolism of marine microbes [6].

Potential sources of microplastic pollution in marine

Microplastics are the most versatile, cheap and non-biodegradable materials that are widely used in our daily life. SMGs have emerged as a significant ecological problem despite their enormous potential for exploitation. According to one study, MPs are broadly divided into primary MPs and secondary MPs. Major SMGs are intentionally made for specific uses. B. For the production of plastic mulch, pharmaceutical carriers, cosmetics, industrial (textiles, wastewater treatment) and technical products [7]. This type of MP is generally difficult to mitigate with wastewater treatment technology and eventually accumulates in the environment after entering sewage. In addition, secondary MPs arise from fragmentation of larger plastic waste under complex environmental conditions such as temperature, wind, waves and exposure to UV light. Marine plastic litter can also be fragmented into MPs by marine animal biological processes such as feeding habits and digestive and excretion processes. Its sources are mainly related to human use. B. Mulching, cosmetics, washing and care, textile industry (microfibers), automotive manufacturing (tire debris/tire debris), plastic products [8]. All of these include agricultural, industrial and manufacturing features. Therefore, the inevitable occurrence of MPs in biomes and everyday products makes it safe for humans to be exposed to MPs. Sewage sludge, plastic film mulching, improper disposal of plastic waste and agricultural alteration are reported to be major sources of MPs in marine ecosystems, posing serious environmental hazards to the planet's diverse ecosystems [9]. It has been. The ocean is a reservoir for a wide variety of trace pollutants from multiple potential sources [10].

CONCLUSION

Globally, research on MPs is a persistently progressing field and while researchers emphasize separation, identification and quantification of MPs in marine, there are still some system-level research gaps that must be addressed. There is a dearth of in-depth studies on the combined effect of different potential sources of MPs with existing co-contaminants in the marine ecosystem and how this can modify the properties and efficacies of MPs by altering their fate in the environment. Despite the rapid growth in MPs, prevailing scientific research might not have comprehensively related the combined interactions between MPs, co-pollutants and the marine microbial community of the environment the rapid production, emission and outflow of plastics into the ecosystem could lead to a further increase in the concentration of MPs in the near future. Hence, the participation of all citizens would be essential to enhance resource efficacies and develop a new economic circle by reducing waste and pollution from the ecosystem. In addition, further quantitative and qualitative assessments in the terrestrial environment may be required to mitigate the impact of MP pollution on MP pollution and changes in marine biodiversity. Reducing marine pollution also reduces water pollution.

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