Issue At A Glance:

Plastics and Microplastics

Plastics and microplastics have become ubiquitous in everyday life. Plastic Free July is a month-long sustainability initiative with the goal of reducing plastic use in daily routines to decrease plastic waste. This brief provides an overview of various sources of microplastics in the environment, the Microbead-Free Waters Act of 2015, and the negative health effects of plastics and microplastics.

Introduction

The world is facing a crisis of plastic pollution, as over 430 million tons of plastic are created each year.[1] Microplastics, which are plastic particles smaller than five millimeters (or 0.2 inches), originate from different sources including commercial product development and the breakdown of larger plastics.[2,3] As a pollutant, microplastics pose risks to both the environment and the health of both humans and animals.[4]

Research has shown that only 10% of plastic produced has been recycled, while the remaining 90% remains in landfills.[5] Therefore, worldwide efforts, such as Plastic Free July, aim to raise awareness about the prevalence of plastic in daily life and urge individuals to decrease their use of single-use plastic items, mitigate plastic pollution, and advocate for lasting solutions to the plastic pollution crisis.[6,7]

This brief provides an overview of the various sources of microplastics in the environment, the Microbead-Free Waters Act of 2015, and the adverse health effects of plastics and microplastics.

Key Statistics

80% Of all marine pollution is made up of plastic waste.[8]

34.8% Of microplastic pollution are generated from synthetic fabrics.[9]

28.3% Of microplastic pollution are generated by the friction of tires.[9]

10% Of plastic produced is currently being recycled. The rest is either incinerated or ends up in the oceans and environment, creating more pollution.[8]

Sources of Microplastics in the Environment

Microplastics, or plastics that are less than five millimeters (or 0.2 inches) in diameter, are often categorized into two groups: primary and secondary. Primary microplastics are miniscule particles made for commercial purposes, such as those found in cosmetics and fibers that come off clothing and textiles. On the other hand, secondary microplastics are formed when larger plastic items, such as single-use water bottles, break down due to exposure to environmental elements, mainly sunlight and ocean waves.[4] Common sources of microplastics include:[10]

- **Microfibers**: Small particles released from textiles are the primary source of micro-pollution. While only synthetic microfibers are officially labeled as microplastics, small fragments from all types of fibers, including natural ones like cotton and wool, also add to pollution.
- **Vehicle tires**: Approximately 28.3% of microplastics in the environment originate from tire wear. Tire wear and brake pads contribute to microplastic pollution, with tires containing significant amounts of synthetic materials.[9]
- **City dust**: Another 10-20% of microplastics in the environment originate from city dust, which encompasses various microplastic sources from urban environments with artificial turf, building paints, and industrial abrasives being primary contributors.
- **Personal care products and cosmetics:** Contributing to 1-2% of microplastics in the environment, personal care products, such as exfoliants that contain microbeads, contribute a small but well recognized facet of microplastic pollution.

Microbead-Free Waters Act of 2015

Microbeads are defined as small plastic pieces found in many beauty and health products, including soaps and body scrubs.[11] On December 18, 2015, President Obama signed into law the Microbead-Free Waters Act of 2015 (H.R. 1321).[11,12] The Act bans the production and sale of over-the-counter drugs that double as cosmetics and contain plastic microbeads for exfoliation or cleansing of any part of the body. This can include rinse-off over-the-counter drugs, including fluoride toothpaste, acne scrubs, antibacterial soaps, and anti-dandruff shampoos.[13]

Effects of Plastics and Microplastics on Human Health

Throughout the lifecycle of plastic, individuals are exposed to a wide array of harmful chemicals and microplastics through inhalation, ingestion, and direct skin contact. Research has suggested that the average adult ingests nearly five grams of plastic per week.[14] Moreover, microplastics have been found in tap water, bottled water, and commonly consumed foods, such as beer and salt.[15] Studies estimate that an average adult consumes around 2,000 microplastics annually through salt alone.[15,16] Although the study of the health effects of plastics is relatively new, recent studies have suggested that plastics and microplastics contribute to diseases, disabilities, and premature deaths.[14]

Exposure to BPA

Bisphenol A, or more commonly known as BPA, is an industrial chemical that has been used to make certain plastic containers for food storage, such as water bottles and other consumer goods. Although the Food and Drug Administration has noted that BPA is safe at low levels, the Environmental Protection Agency has noted that BPA can mimic the hormones in our body and disrupt the production, response to, and function of natural hormones.[17,18]

Cardiovascular Health

A recent study in the *New England Journal of Medicine* suggests patients with heart disease are twice as prone to experiencing heart attacks or strokes when microplastics were detected in their carotid arteries. Additionally, these patients faced a higher risk of mortality over the subsequent three years that the study was conducted compared to individuals without microplastics in their carotid arteries.[19]

Respiratory Health

Research shows that breathing in plastic and their chemicals may harm the lungs, with ongoing research continuing to investigate the long-term effects. Recent studies have consistently shown a correlation between plastic particles in the lungs of patients with cancer and chronic lung diseases.[20] Furthermore, workers exposed to plastic fibers may experience lung issues and reduced lung capacities likely due to inflammation and damage.[20,21]

Gastrointestinal Health

A research study conducted in 2020 highlighted that exposure to microplastics can trigger gastrointestinal (GI) inflammation, impacting gut health and consequently weakening the immune system.[22,23] Since 70-80% of the body's immune cells reside in the GI tract, any disruption to GI health can affect immune function.[23,24] Persistent exposure to microplastics can be toxic to immune cells, causing dysbiosis, a disruption to the gut microbiota, and promoting the growth of harmful bacteria.[23,24,25]

Reducing Plastic Waste This July

Although the presence of plastics in our daily lives is constant, there are many ways we can reduce our plastic use and tackle the plastic crisis.

- **Water bottles:** Reusable water bottles reduce marine debris, protect wildlife from the dangers of plastic water bottles and caps, and reduce litter on beaches.[26]
- **Reusable shopping bags:** Using reusable bags rather than plastic grocery bags helps reduce single-use plastic that is fatal for animals who mistake it for food or become entangled in it.[27]
- **Plastic straws:** Single-use straws that are thrown away can become stuck in the airways of animals or, if mistaken for food, be fatal if ingested.[28]
- **Bulk food shopping:** Purchasing bulk food items help reduce waste and pollution by decreasing plastic packaging.[29]

Did you know?

Approximately 2.5 million plastic bottles are thrown away every hour in the U.S. and take nearly 450 years to degrade in landfills.[30]

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