Background

Microplastics, or MPs, are tiny plastic particles less than five millimeters long. The term was coined in 2004 by researchers who identified the particles on UK beaches.

Like synthetic plastics, MPs are mostly made of long chains of hydrogen and carbon atoms, formed by linking byproducts of refining crude oil and natural gas (watch explainer). Other chemical additives (e.g., pigments) may be incorporated to modify the final product's properties.

MPs are widespread pollutants and have been found everywhere, from the deepest point on Earth, the Mariana Trench, to the highest, Mount Everest. A 2023 study estimated that over 171 trillion particles weighing 2.5 million tons float on the ocean's surface alone.

Where Microplastics Come From

Most MPs found in the environment are classified as secondary, resulting from the breakdown of larger plastic items through weathering, physical wear, and UV radiation, despite not being biodegradable (learn why).

Synthetic textiles are the largest source of secondary MPs. They are commonly produced during the abrasive process of washing laundry, which releases plastic microfibers, including polyester, nylon, and acrylic, into sewage water.

Despite wastewater treatment plants' ability to remove up to 98% of these fibers, the massive amounts of water processed from more than 2,000 pounds of laundry by the average American family annually leave enormous numbers of MPs in the water these plants discharge. Removed microfibers are added to sewage sludge, which is often used as fertilizer and creates MP-contaminated soil (learn more here).

Tires and city dust, which includes pieces of degraded building coatings and synthetic footwear, are the next largest secondary MP sources and the leading pollutants of MPs in the air (see more sources here).

Primary MPs are not formed by breakdown and are intentionally manufactured to be small. These include microbeads used for exfoliation in cosmetics and small plastic pellets called nurdles (or mermaid tears), designed to be melted down for molding into other products. Many are easily lost to the environment during transport and processing.

Risks of Microplastics

The FDA provides guidelines on which types of plastic are food-grade—those safe for direct contact with food—and, as of 2024, claims insufficient evidence exists to show that those types produce MP contamination in food or that MPs pose any human health concern.

However, non-food-grade primary and secondary MPs have been detected across food chains, including particles containing additives known to harm humans. These MPs have been found in over 1,300 marine species and throughout the human body (see infographic).

Although research on MPs' biochemical risks is in its infancy, initial studies have linked them to inflammation, immune system impairments, and hormone disruption. MPs can obstruct photosynthesis, limit growth, and create microbiome imbalances within plants.

Since the late 1960s, plastic has been known to cause physical harm upon ingestion (e.g., digestive obstruction, choking hazard). MPs can similarly block nutrient and water pathways in plants, and their accumulation in arterial plaque has been associated with a higher risk of stroke and heart attack in humans.

What Can Be Done

Decreasing the number of MPs in the environment will require reducing the 500 million tons of new plastic produced annually, likely through broader use of reusable plastics, creating financial incentives to increase the rate of successfully recycled plastic (currently 9%), and instituting plastic bans (see worldwide examples).

As of 2025, the United Nations is negotiating a global plastics treaty similar to the Montreal Protocol, which phased out the production of ozone-depleting chemicals.

Scientists must also develop methods to decompose existing plastic, such as bioengineering plastic-eating microbes (watch explainer), and create eco-friendly alternative materials, including plastic that dissolves in seawater within hours.

Referenced Resources

1. Microplastics are everywhere and pose growing risks to wildlife and ecosystems
2. Plastic production starts with crude oil and ends with molded products via pellets
3. Microplastic pollution extends from Earth’s deepest oceans to its highest peak
4. Plastics don’t biodegrade because their chemical bonds are unnatural to microbes
5. Washing clothes is a significant source of global microfiber pollution
6. Microplastics from sewage sludge persist in farmland soil for decades
7. Synthetic textiles and tires are the top sources of secondary ocean microplastics
8. Mermaid tears are a lasting and hazardous form of ocean plastic pollution
9. The FDA claims microplastics have not yet been shown to pose a health risk

10. Microplastics are entering human food chains through fertilized farmland
11. See where and how many microplastics are in the average human body
12. Microplastics are infiltrating the human body with unclear but concerning effects
13. Microplastics may cut crop yields and worsen global hunger
14. Arteries with microplastic deposits linked to higher risk of cardiovascular events
15. More than 130 nations have enacted bans or restrictions on plastic items
16. A UN-led treaty may establish rules to phase out plastic globally
17. Plastivores are plastic-eating microbes that may provide a solution to plastic waste
18. Japanese scientists develop an eco-friendly plastic that dissolves in saltwater