FACT SHEET

Food for Thought: Microplastics Are a Macroproblem

The "invisible" presence of microplastics throughout our food chain has become a growing concern. While their extremely small size makes the full extent of their reach hard to quantify, these particles are abundantly found in marine environments and in agricultural soils. Here they are easily ingested by many sea creatures and adsorbed by plant life — essentially compromising the environment, the food chain, and our bodies with microplastics and their chemical additives. Microplastics also enter the food chain through plastic food and beverage packaging, which has become prolific thanks to the boom in fracking and the oil and gas industry's thirst for new markets for petroleum products. Solving the issue of microplastics involves macro efforts like banning fracking and single-use plastics.

What Are Microplastics (MPs)?

MPs are plastic particles smaller than 5 millimeters in size and formed through the breakdown of plastics via physical or chemical processes.[1] Primary MPs are produced to be their original size (for example, microbeads), while secondary MPs are generally broken down from larger items.[2] Due to their size, proliferation, and ability to stick to biological components, MPs can act as persistent carriers for pollutants and toxins[3] and are easily ingested by both plant and animal life. It is estimated that MPs make up nearly 95 percent of global annual waste output.[4]

In The Environment

Agricultural soils

The microscopic size and diverse chemical composition of MPs make them difficult to quantify and track in the environment, although they are found in virtually everything. They enter the environment and atmosphere through various stages of plastic production and handling, plastic use, and plastic degradation.[5] Some studies have estimated that more than 50 percent of all MPs remain on land, which leaves agricultural soils especially contaminated — and potentially an even larger reservoir for MPs than the ocean.[6]

MPs have deeply contaminated agricultural soils through the application of contaminated compost, the use of sewage sludge as fertilizers, deposition via weather patterns and the atmosphere, the use of plastic mulch, and even irrigation.[7] Contaminated composting products and livestock feed also contribute to MPs in soils,[8] alongside general plastic litter. Plants can uptake and internalize these MPs[9] and produce a variety of negative physiological and developmental effects in crops and yield.[10]

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The damaging effects of accumulated MPs in soil systems are unquantifiable. In addition to leaching their own adsorbed toxic pollutants and altering the physiochemical properties of soil, MPs interact with other potentially harmful contaminants, severely affecting soil organisms such as earthworms.[11] They can also have a negative effect on soil-root feedback mechanisms, reduce soil fertility and integrity, and impact greenhouse gas emissions from soil.[12]

Water systems

Microplastics, primarily in the form of microfibers, are ubiquitous in aquatic environments as well. [13] As a result of general plastic land pollution from solid waste, more than 300 million metric tons of plastic waste enter water bodies annually; even unsuspecting sources such as tire particles from wear play a large role. Commercial fishing nets alone contribute to roughly 20 percent of marine plastic. MPs are also found in influent and effluent streams of wastewater treatment plants from the plastic industry or domestic households; MP is generated from just doing laundry or using a body scrub.[14] Weather also plays a role in releasing MPs trapped in soils into water bodies through storms, typhoons, and snowfall, and through distribution via ocean currents and wind.[15] Once in the water, MPs are exposed to ultraviolet (UV) radiation, wave actions, and microorganisms that aid in their transformation, degradation, and redistribution.[16]

MPs are found in the Arctic,[17] in every ocean basin on the planet, in freshwater,[18] in drinking water,[19] and in rainwater.[20] They are very harmful to marine life because they resemble food and adsorb toxic pollutants. As a result, both small marine organisms (such as crucial filter feeders that interact often with MPs), as well as large top predators, directly ingest MPs. MPs can bio-magnify, meaning that they can increase in concentration moving up the food chain, and affect species' behavior, fitness, abundance, and mortality.[21] MPs can also bioaccumulate, meaning that they increase in concentration within the body and tissues.[22]

In Our Bodies

Direct food chains

MPs pose a persistent threat to the food chain, readily transferring from soils and water to plants and animals.[23] MPs have been found in more than 690 species of marine life and in commercially sold marine species, with some instances of seafood accumulating more MPs and toxins upon entering the seafood markets as a result of food processing such as de-shelling, packaging, and freezing.[24]

Vegetables and fruits are not exempt from MP contamination[25] and, alongside seafood consumption, can be a direct pathway toward the accumulation of MPs in our bodies.[26] MPs are found in various vegetables and fruits such as apples, pears, broccoli, carrots, [27] wheat, lettuce, rice, and corn.[28] They have also been detected in pantry staples like salt, sugar, and even honey.[29] Recent studies have detected MPs in fresh, raw, powdered, and processed milk as well as in the blood of livestock and in a majority of raw beef and pork meats.[30]

Food packaging

Even if meats or vegetables are miraculously harvested without any MP contamination, the plastic food packaging that they are sold in can be a significant source of MP pollution. In addition to environmental contamination from plastic production and disposal,[31] packaging generates MPs through mundane tasks such as opening a bag of chips or cutting through plastic wrap to access what was bought.[32] MPs even leach from teabags, and it is estimated that people who order takeout 5 to 10 times a month consume an additional 145 to 5,520 MPs.[33]

Drinking water and water bottles

Water treatment plants are not able to filter out 100 percent of MPs from drinking water,[34] and the particles have been detected in our tap water.[35] However, using bottled water will not help you avoid MPs; not only does most bottled water contain tap water anyway, but the plastic bottles further increase MP ingestion.[36] Studies suggest that drinking from plastic water bottles, both single-use and reusable, may add anywhere from 680 percent more MPs in your system than from just tap water.[37] MPs are also found in other beverages, including beer and milk.[38]

MPs are even found in indoor air.[39] However, quantifying MP ingestion from our food, water, and air is difficult, in part because studies asking human subjects to consume plastic would be unethical, and also because the issue is so widespread.[40] One study that grabbed headlines estimated that we ingest about a credit card's worth of plastic every week.[41] Another found that diets that are heavy in fish and seafood result in the consumption of more than 12 million MPs annually.[42] However, other studies acknowledge that age, sex, and diet play a role in MP ingestion; this, on top of insufficient data, means that we could be significantly underestimating MP consumption.[43]

Microplastics Are Still Mega-Harmful

Impacts on our bodies

Just because MPs are small does not mean they are not harmful when ingested. Similar to larger plastics, many MPs contain toxic additives, which can be released upon degradation, and can adsorb additional toxins that have well-documented combined toxicity effects with MPs.[44] Negative impacts related to MPs in animals are documented throughout the liver, kidney, and spleen.[45] Among many other effects, the particles can accumulate in cells, tissues, and organs, where they effectively turn into toxic substances and can cause damage to cell walls, allergic responses, and early cell death.[46]

MPs have recently been found in human blood, semen and testes, breast milk, and placentas.[47] MPs have also been proven to have adverse effects on the immune system, carry pathogens, and cause developmental and reproductive harm.[48] MPs have recently been linked to cancer[49] and have been found to exacerbate the spreading of breast cancer to other parts of the body.[50] In addition, the chemical additives in MPs are linked to a longer list of similar toxic health and cancer-related effects[51]; because MPs bioaccumulate, people who consume top marine predators are likely to experience the greatest pollutant load.[52]

Mega-impacts on environmental justice communities

The United Nations Environment Programme (UNEP) recently declared that plastic pollution affects marginalized groups to a much more significant extent than it does other populations. This extends to microplastics. Rural and low-income communities, along with Indigenous groups whose diets are centered around seafood, are disproportionately impacted by MP pollution — a concern that these groups are actively voicing out.[53] Island and coastal communities may also be heavily exposed to microplastics through fish-centered diets and from ocean currents and wind patterns that redistribute plastics back onto shorelines.[54]

In addition, plastic's toxic lifecycle places many low-income, historically marginalized communities at risk, even if these communities could avoid MP exposure. From the extractive Los Angeles urban oil fields to the fenceline communities and "cancer alleys" alongside production and incineration facilities, residents are constantly exposed to toxic pollution through their air, water, and soil.[55]

Addressing the Mountain of Microplastics

Efforts to address microplastics will not stem from simple detection and capture methods. Rather, they will come from confronting the larger fossil-fueled plastic industry and should aim to target the increase in plastic production and its subsequent lifecycle. This includes banning fracking — the industry's life source — and assisting the vulnerable communities that are priced out of greener alternatives and safe living spaces.

Food & Water Watch Recommends:

Microplastics are an issue that has touched almost every living being on the planet. While these tiny particles may seem inconspicuous, their impact forms part of a larger plastics pollution problem that has been enabled by major plastics and fracking corporations. The current administration should cut off the plastic industry at its source by first passing the Break Free from Plastic Pollution Act and banning fracking on public lands and waters — ultimately working to ban fracking everywhere.

Endnotes

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