



the MICROPLASTIC *in* ENVIRONMENT

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THE global use of plastic has quadrupled in the last three decades, reaching 353.3 million tonnes per annum in 2019. About 80% of the roughly 8.5 to 9 billion tonnes of it produced between 1950 and 2015 had gone to landfills or had become entrenched in soil, water and food system — only 9% was recycled.

Plastics are not biodegradable and continuously break down into smaller and smaller particles called micro-plastic under the influence of various elements of nature like the sun, heat, air and water. According to the National Oceanic and Atmospheric Administration (NOAA) of USA and the European Chemical Agency plastic particles with diameter less than 5 mm come under this category.

Microplastics are present almost everywhere — air, water and soil — and have become detrimental to life as well as health of all living organisms beginning from the microscopic zooplanktons to elephants and whales, and even humans.

Microplastic particles and their constituents are mostly released when artificial fibres are washed and dried

(particularly in machines) or materials made up of plastics are exposed to sunlight, heat, air or rain. The other major sources of microplastics are wet pipes, tea bags, cigarette butts, laundry/dish washer pods, tyres, weathering household plastic wastes, etc. Most of these mix with water bodies, air, food, soil and drinking water. While the oceans contain uncountable quantity of microplastics, even a litre of bottled water has 400 to 700 and tap water 30 to 40 of such particles. In the US 94%, in Europe 72% and in New Delhi 82% tap water has been found to be contaminated with it.

A study carried out by researchers of the Yantai Institute of Coastal Zone Research, China and the Leiden University, the Netherlands has suggested that many of our food items such as salt, beer, tea, wine, sugar, apple, carrot, rice, peanut, broccoli, honey, lychee, radish, rice, spinach, chicken, prawn & crab as well as various other seafoods and packed meat and fish contain dangerously high levels of microplastic.

In 2020, Margherita Ferante and her co-workers at the University of Cantania, Italy extensively investigated fruits

and vegetables to determine the presence of micro-plastic and toxic chemicals. They found the maximum number of these particles in apples, which on an average was 1,95,500 per gram. Similarly, peanuts had 1,89,500 and broccoli and carrot each had 1,00,000 particles, while it was 114 to 17200 mg/kg in various samples of salt. So, depending upon our food habits and other factors on an average 5 to 10 gm of microplastic enters our body every week.

According to another survey conducted by Heather A Leslie of the Netherlands and reported in the *Environment International* in March 2022, more than 77% people he and his co-workers tested had high levels of microplastics in their bodies. It was about 1.6 micrograms per ml of their blood. Nearly 50% of this was polythene terephthalate, 36% polystyrene and 5% polymethyl acrylate. Another report published in *Environmental Science and Technology* in the year 2014 had suggested that about 40,000 to 50,000 microplastic particles enter into the human body on an average.

These microparticles also serve as carriers of bacteria like *E. coli* and a number of toxic organic chemicals called persistent organic pollutants or POPs, which are dangerous to many living organisms including humans and animals. These particles undergo biomagnification after entering the food chain and pose a threat to larger sea animals like sharks and whales as well as to human beings. Again, as microplastics are not soluble in water, they settle down at the bottoms of the seas and other water bodies creating highly toxic environments, detrimental to living organisms and ecology and environment. Even the land-based ecology is affected leading to the death of many animals. As a result, the numbers of eco-friendly organisms residing in soil, such as earthworms, are decreasing fast leading to the depletion of soil quality.

According to a study conducted in 2014, about 51 trillion pieces of microplastics had entered the oceans that year. This number is more than 500 times the number of stars in our milky way. Now, the number must have gone up substantially, owing to the fact that the use of plastic has been constantly increasing. A combined study by the researchers of the Royal Melbourne Institute of Technology and the Hainan University, China in 2016 had revealed that most of the sea fishes had high levels of microplastic in their bodies along with toxic chemicals produced by them, including polybromide di-phenyl ether that interferes with the functioning of a number of enzymes and damages DNA.

Another survey conducted by researchers of Finland, Italy, Japan, Russia and England in 2018 found on an average 20 pieces of microplastics in 100 g of human faeces. A similar study by Rolf Halden and his co-workers of the Arizona State University had detected high levels of microplastics in dead human bodies.

Depending on the sources, the composition of microplastics varies. However, some of the main components are polystyrene butadiene, biphenyl-A, polybromide diphenyl ethers, polyethylene, polypropylene, polyamide, polyester, acrylene, rayon, polyethylene terephthalate, etc. Experiments on animals have proved that they can have adverse effects



on our brain, kidney, liver and intestinal ecology and can cause infertility in both men and women, cause hormonal imbalance, type-2 diabetes, heart diseases, cancer, etc. They can also lead to oxidative stress, DNA damage, inflammation and improper growth of various organs in foetuses.

It is now almost impossible for us to free ourselves completely from the grips of the demon called microplastic as our dependence on plastics is growing day by day. However, we can reduce the impact by using it judiciously and obeying the 3-R rule (Reduce, Reuse and Recycle). Some tips include:

1. Buy organic clothes (not synthetic).
2. Change how you do laundry (use of mechanical washers and dryers generates 40 times more microplastic from synthetic fibres than washing by hand air drying).
3. Avoid single use plastic materials.
4. Buy microplastic free cosmetics.
5. Reduce seafood consumption of shellfishes and other seafoods.
6. Use public or alternative means of transportation.
7. Do not microwave your food in plastic utensils.
8. Regularly dust and vacuum clean the surroundings of your home.
9. Do not preserve drinking water in plastic bottles.

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