MICROPLASTICS

THE MOST WIDESPREAD AND PERSISTENT HAZARDS OF PLASTIC

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A QUICK LOOK INTO THE MICROPLASTICS

- Microplastics are synthetic or semi-synthetic, solid, water insoluble, high polymer plastic particles of a size range below 5 mm.
- They are both used as a raw material for a number of products and produced from degradation of any plastic product.
- Their small size allows them to pass through wastewater treatment plants and reach the oceans through surface waterbodies and rivers.
- Microplastics are non-biodegradable and persistent in marine and freshwater.

Nanoplastics: Plastic particles generally of size below 1μm are called nanoplastics. They pose higher risk to the environment because of their reduced size which is 1000 times smaller than an algal cell.

TYPES OF MICROPLASTICS

Depending on the origin, we can differentiate between primary and secondary microplastic.

Primary microplastics are manufactured as microbeads, capsules, fibers or pellets. Examples include microbeads used in cosmetics and personal care products, industrial scrubbers used for abrasive blast cleaning and microfibers used in textiles. Primary microplastic can also come from the run-off/effluent of plastic product fabrication or manufacturing facilities.

Secondary microplastics are the result of larger pieces of plastic breaking down into smaller pieces. This occurs when plastic debris is exposed to sunlight and the plastic begins to weather and fragment. It is generated by the fragmentation of larger plastic items by UV radiation, physical abrasion (waves, rocks), and microbial processes.

There are some microplastics which fall in between, for examples dust from car and truck tires, synthetic textiles, ropes, paint etc. for example, plastic dust is created by the friction between the car wheels and the road and is blown into waterways by the wind. Car tires shed 20 grams of plastic dust every 100 kilometers! These are in most cases classified as primary owing to the fact that their emissions are inherently a result of human material and product use and not secondary defragmentation in nature.

ARE MICROBEADS DIFFERENT FROM MICROPLASTICS?

Microplastics used as abrasives in personal care and cosmetic products (PCCP) are commonly known as microbeads. Mostly of spherical shape, these, are used in both leave-on lotions and rinse-off products.

WHY IS OF RISK?

- Microplastics undergo various processes of physical, enzymatic and microbial degradation in nature, but do not get completely broken down.
- About 5 to 14 million tons of plastic waste enter into the ocean every year. Average annual global release of primary microplastics into the ocean is estimated to be around 1.5 million tons.
- Microplastics can absorb extremely harmful hydrophobic organic pollutants.
- Removal of microplastics from aquatic environment is extremely difficult as that could lead to the elimination of all plankton size organisms.
- Microplastics exist in air as airborne pollutants originating from the plastic textile fiber production.

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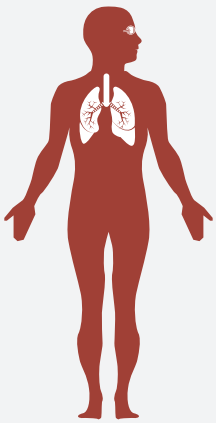

Occurrence of microplastic across food-chain ensures their presence in human food increasing the possibiliy of exposure of associated toxic chemicals to humans. In direct impact, microbead can lead to bacterial infections in the gum, skin or injure the cornea by sticking in the eye. In facial products, it can cause tiny skin rips.

IMPACTS OF MICROPLASTICS

Environment: Considered as global pollutants, microplastics pollute the water environment; change the ecosystem, affects biodiversity by reducing species diversity and act as vectors for spreading toxic chemical additives.

Wildlife: Microplastics are ingested by zooplanktons, like, daphnia, as well as several other higher aquatic species and bio-accumulates in the food chain. Ingestion of microplastics causes digestive tract blockage and stomach lining damage leading to starvation of the organism, digestion impairment and reduced and delayed reproductive ability, resulting into a lifespan reduction. In addition, the toxins, including endocrine disrupting chemicals (EDCs), persistent organic pollutants (POPs), organochlorine pesticides, carried by these microscopic plastic particles are carried over long distances by water systems and released inside the organisms, impacting further. From the fishes these harmful toxins and particles spread across the food-chain.

Socio-economic: severely affected by marine plastic pollution owing to the reduced fish population, loss of income from tourism, damage to coastal agriculture, etc. Direct socio-economic impacts of microplastics need to be researched in depth.

Human health: Humans can be exposed to microplastics either directly through contaminated water and cosmetics or indirectly from seafood consumption. It can lead to bacterial infections in the gum, skin or injure the cornea by sticking in the eye. Microbeads in facial products can cause tiny skin rips and further infection. Suspended microplastics in the air can be directly inhaled and affect the lungs. Occurrence of microplastic across food-chain ensures their presence in human food increasing the direct exposure of associated toxic chemicals to humans which again come with their own sets of fateful impacts.

A tap water survey analysis conducted with in samples from 5 continents (USA, Lebanon, Europe, Indonesia Uganda, India & Ecuador) found microplastics in 83% of sample from across the continents. India ranks 3rd with in 82.4% sample contaminated with microplatics

BIO-DEGRADABLE PLASTICS ALSO PRODUCE MICROPLASTICS

Microplastic and plastic concerns have lead to the development of bio-degradable plastics. However, none of these plastics are completely degradable and their degradation also is subject to high temperature which is not possible in marine environment.

THE INDIAN CONTEXT

Sadly, microplastics are less studied in India despite the country being among the major plastic consumers and producer of 5.6 million tons of plastic waste annually. Studies have found microplastics in Gujarat and Chennai coast, Mumbai beaches and Kerala lake. International studies have also found microplastics in drinking water (tap) samples from Delhi and bottled water from Mumbai, Delhi and Chennai. A National Institute of Oceanographic study (running) has found microplastics absorbed in fish tissues.

MICROPLASTIC IN DRINKING WATER

Analysis of 259 bottled drinking water of 11 different brands, from 19 locations in nine countries found an average of 325 plastic particles for every litre of water being sold. In one bottle, concentrations were as high as 10,000 plastic pieces per litre of water. Of the 259 bottles tested, only 17 were free of plastics, according to the study. There are no regulatory limits on the levels of microplastics in bottled water.

The consumption of plastics and microplastics by marine animals can lead to false satiation , starvation and death.

An estimated 5 trillion pieces of plastic currently float in the world's oceans

MICROPLASTIC in OCEAN

1 Plastic Particles from Vehicle Tyres

5 Fibers from washing synthetic textile

6 Microbeads in Personal Care & Cosmetics Products

3 Loss from plastic manufacturing Industry

4 Painting Construction and Road marking

2 Fishing gear, rope, painting & maintenance of ships & boats

Passes through the municipal filtration system

Reaches drinking water & food

Intake by Human

7 Breakdown of plastic products

Contaminantes surface water

Adsorbs and leaches out chemicals and harmful pollutants

Reaches the ocean

Ingested by aquatic Species

1 to 6 : Primary Microplastic

7 : Secondary Microplastic

REGULATIONS ON MICROPLASTICS

Legal restrictions on the use of microbeads in cosmetic products are either posed or under process in a number of countries. In the US the Microbead Free Water Act was introduced in 2015, which prohibits the manufacturing, packaging, and distribution of rinse-off cosmetics containing plastic microbead. Legislations on banning microbeads in cosmetics are to come in force in 2018 in the European Union and Canada. Legislations are also under process in South Korea and New Zealand while Australia has initiated a voluntary phasing out. No legal framework is in place for restrictive use of microplastics or microbeads in India. However, microbeads are notified as 'not recognized as safe' for use in cosmetic products by the Bureau of Indian Standards (BIS) in India.

A tube of face wash can contain over 330000 micro beads!

Plastic straws, drink stirrers and cotton swabs could be banned in England under plans proposed by the UK government to reduce plastic waste and protect the world's oceans.

CONCLUSION

Microplastic is a global environmental problem which has the power to threaten marine life as well as freshwater

organisms for decades and centuries, and the potential to poison the entire food chain.

Though it needs global research, policy and technological change to decontaminate the environment from microplastic pollution, however, we can always take action to minimize the contribution.

Meanwhile, consumers can limit their personal contributions to microplastic pollution by avoiding products that contain microbeads, choosing clothing made from natural fibers, avoid single use plastic products and taking care not to litter or flush plastic materials down the drain

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