

USE OF MICROPLASTICS AND MICROBEADS IN DIFFERENT MATERIALS AND ENVIRONMENTAL SUSTAINABILITY

¹ANAMIKA SINGH

¹Prof. Zoology Science Department, HLM Group of Institution, Ghaziabad

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ABSTRACT

Present work is a brief survey of microplastics found in different materials and their environmental impact. Microplastics and microbeads are very small pieces of plastics used at larger scale in different areas of everyday life such as packaging of food, surgical instruments, cosmetics, s toothpastes, plastic bags and bottles. In body care face wash scrubs and toothpastes these are used as exfoliating material. These are smaller in size and pass out the normal filtration processes. Polychlorinated biphenyls (PCBS), polycyclic aromatic hydrocarbons (PAHS) of microplastics are free floating and non-biodegradable. Once these are washed off and get mixed with any water body they percolate into soil get mixed with water table and get deposited or adhere to the surface. Plastic wastes in environment have been perceived as environmental problem at least since 1970 (according to New York Times headlines). But microplastics have been emerged as a topic of scientific research about few more than 10 years ago. The topic became highlighted after its confirmation in the cosmetics and body care products. The coastal and oceanic water pollution was matter of concern for all since long. Microplastics are spotlighted as the added problem to this. In sea water these were detected in 1970 but considered and marked as microplastics in 2000. Since then, environmentalists and researchers treat this as a reason for increasing plastic wastes in the environment.

Keywords: *Micro plastics, Exfoliating materials, Polychlorinated Biphenyl, Polycyclic aromatic hydrocarbons, Body care products*

INTRODUCTION

Micro plastics are not any specific kind of plastic rather than any fragment of plastic less than 5 mm in size. Natural weathering of large size plastics convert them into smaller 2 size micro plastics or nanoplastics; small just as they can pass through any normal filtration system. Micro plastics are very small pieces of plastics used at larger scale in different areas of everyday life such as packaging of food, surgical instruments, cosmetics, toothpastes, plastic bags and drinking water bottles. Global demand of micro plastics has been attributed to its low production cost, light weight, portability, versality and structural stability. Mostly these were found to be disposed after only single use. Nevertheless, it has supported the world economy to greater extent. Improper disposal has jeopardised the environmental sustainability. Public awareness regarding the non biodegradable nature of plastic wastes is inconspicuous. Substantial amount of plastic wastes have been added to the environment on regular basis due to consumers' demands for packaging and carrying aids. Bioaccumulation and biomagnifications have spotlighted microplastics as a global issue in this concern. It has been estimated that about 15-51 trillion plastic particles have been accumulated in the worlds ocean. To begin with the micro plastics it was sea water in 1970(2), then considered as fragments, granules, spherules until 2000 subsequently scrutinized as microplastics (3). In our adjoining two major types of microplastics have

been prevailing: primary and secondary microplastics. Any plastic fragments having a size of less than 5 mm before entering into the environment are primary micro plastics Micro beads, microfiber from clothing and plastic pellets were identified as primary micro plastics .Secondary micro plastics were formed due to degradation of larger micro plastics by natural weathering after entering into environment. Fishing nets, bottles, bags of plastics are secondary micro plastics. The micro plastics were highlighted for topic of research for more than 10-12 years. Use of MPs as a indicator of Anthropocene by Scientists has been attributed to its worldwide distribution (4). It is used is in cosmetic and body care also. It has become a matter of concern for their consumers (5).A large proportion of the cosmetic industries voluntary committed to phase out micro beads by 2020(6).Polycyclic aromatic hydrocarbons, Polychlorinated biphenyls were found non biodegradable and free floating. Once they get mixed with water after washing they percolate the layers of soil and enter into the water table. Chemicals like phthalates and biphenyl A of microplastics may be toxic (7). In routine utilization micro plastics have entered in every sphere of life .Plastic packaging in medical sector guarantees aseptic medical products and bags are easy to carry for shopping (8).Plastic wastes has increased exponentially just as mostly these were of one time use. Outcome of Improper disposal has been spotlighted as menace for environmental sustainability. Consuming and throwing plastics material metamorphosed into a normal feature of 3 everyday lives, a practice that is taken for granted (9). For global economy plastics have been identified just as work house materials leading to enormous progress for modern societies(10).People unawareness for non biodegradability, proper disposal and consequence of plastic wastes on biota were the major issue for the use of plastics. Low manufacturing expense, durability, light weight were the points for excessive production and increased amount of plastic wastes in the environment (11,12).Ultimately all these wastes of plastics end in the water bodies.

Consequently the increased concentration of plastic wastes have been reported in different water bodies like rivers, estuaries and open oceans (13).Daily discharge have been estimated from 50,000 up to nearly 15 million particle (14).Existence of microplastics in soil and biotic community may be expected in this condition .Availability of microplastics in soil and fresh water have been measured in different location and possibility for human exposure has been also figured out. Drinking water as a source for microplastics in human exposure may be there, particularly if they pass through the normal filtration process (15, 16).Dermal exposure to these nanoparticles have been also reported through facial and body scrub (17).The world is promoting precautionary strategy to reduce the leakage of microplastics in the environment(18) public awareness and concern is most important.

MICRIPASTICS CONTIGUITY/APPEARANCE/ATTAINABILITY/AVAILABILITY

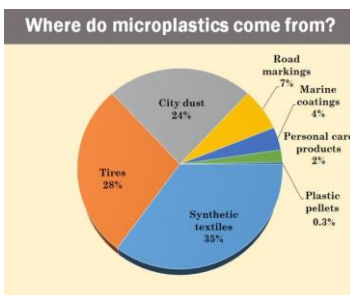


Figure 1: Microplastics from different sources

In Oceans Studies confirmed staggering amount of microplastics in the world's oceans. It has been estimated as much as 93 and 236 thousand metric tons in a study of 2015. Exponential rate of increasing concentration of microplastics in oceans has been revealed in the study of the distribution of Eastern Pacific surface study. Data of 1972-1985 and 2002-2012 having n=60 and n=457 respectively, spotlighted the increase in the mean concentration of plastics. The study also confirmed a 10 fold increase in the pieces of plastics from 18,160-189,800 km⁻²(19). Aquatic flora and fauna experienced detrimental effect of higher concentration of microplastics in their environment. The fishes and other marine animals consume large quantity of microplastics along with their food. Microplastics become available to aquatic fauna like fishes due to its similar size as sediments and planktonic species (20, 21, 22) Accumulation of microplastics in their intestine reduce their appetite gradually. Consequently fading out of the large marine and fresh water fauna due to starvation has been noticed. Through some of these aquatic fauna microplastics entered in food chain at different level in terrestrial biotic community. It has been supported by

In Soil: Like air and water microplastics was reported as potential contaminants for soil also. However numbers of factors are still unexplored like quantification, concentration and percolation in soil. Owing to non biodegradable and hydrophobic nature may interfere chemical composition of soil; altered Ph, salinity, water holding capacity of soil pose menace for sustainability for soil micro organisms, plants and efficacy of plants products. Research confirmed effect of microplastics on micro organisms and plants roots directly and indirectly respectively (23). Additionally inhibitory effect on germination of seeds have been also reported.(24)

In environment: Plastics use for different purposes has been found to be a great challenge for environmental sustainability. The larger size non biodegradable plastic were found to be mostly for one time use and disposed improperly, converts into microplastics and nanoplastics of less than 5 mm and 1 mm in size respectively. It has been reported to have adverse effect on flora and fauna. Loss of Fertility of the soil also adverse effect on wild life has been confirmed by many. About 1,565 wild life have been documented for ingesting microplastics.(25) Presence of microplastics in human stool confirms that microplastics in our plates(26). 5

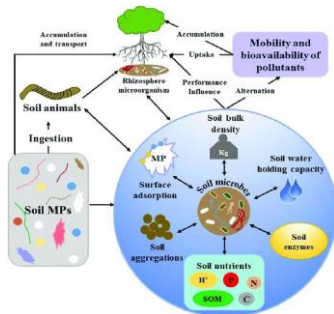


Figure 2: Microplastics in Soil

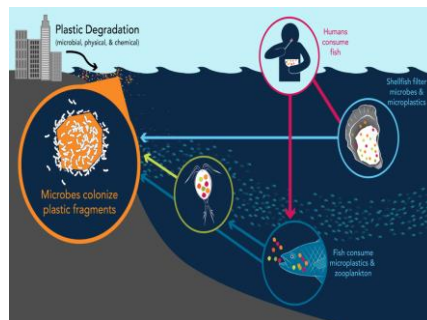


Figure 3: Microplastics in Ocean and Fauna

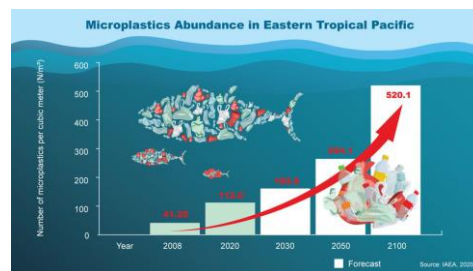


Figure 4: Increasing amount of Plastics in Ocean

Nano particles invade the lung tissues is an established research. The microplastics nano plastics may invade the lung tissues of life forms i.e. wild life, aquatic life and avian fauna; being an ubiquitous. Aside this microplastics mimic human hormones too. Consequently interference in normal physiology may be expected.

In human: Recent researches verified the presence of microplastics in human blood. Exhaustive research on the presence of microplastics revealed that 80% of the human blood sample contains microplastics. Literature confirms the ubiquitous nature of microplastics and their easy intrusion in human body during inhalation, feeding and drinking (Evan Bush 27) According to Damian 2022 health impact of the microplastics on human is still not very clear but owing to existence proven in circulation suspected to be lodged in organ (28) Inadvertently a huge amount of plastics were found to be administered in small children via feeding bottles.

Clinical examination too supported mass detection of microplastics in blood sample of healthy person's i.e. 17 out of 22. Data indicates ½ sample containing PET, 1/2 containing polystyrene and a quarter of the sample contained polyethylene which were generated by drinking water bottles, food packaging and plastic bags respectively (29). First indication of presence of polymer particles in human body, a breakthrough result has been confirmed by Prof. Dick Vethaak (30). The Guardian reports also confirmed the presence of microplastics in breast milk. For chemical contaminants infants were found to be very susceptible and fragile. It has been supposed to be matter of concern for health care centre at global level.

DISCUSSION

Microplastics have reported to be increasing gradually in the environment. The plastic wastes are a serious problem for environmentalist since long. The ubiquitous in nature as has occupied a significant space in packaging of different items globally. Peoples demand is also very high in this respect for easy to carry and durability. The non bio-degradable nature and chemical composition of the microplastics are major issue for environmental sustainability. The indiscriminate use of plastics in everyday life will increase the amount non biodegradable wastes unexpectedly. And a day will come when we have no space for wastes disposal.

CONCLUSION

Micro plastics are not any specific kind of plastic rather than any fragment of plastic less than 5 mm in size. Substantial amount of plastics wastes have been added to the environment on regular basis due to routine utilization. Mostly these were found to be disposed after only single use. Larger size plastics convert into smaller size micro plastics or nanoplastics natural by weathering. They can pass through any filtration system easily introduced in different level ecosystem. Nevertheless it has supported the world economy to greater extent improper disposal has jeopardised the environmental sustainability. Public awareness regarding the non bio degradable nature of plastics and consequences should be highlighted to save environment secure the environmental sustainability.

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