



THE EFFECT OF MICROPLASTICS IN HUMAN BLOOD EFFECTING PREGNANT WOMEN AND CHILD DEVELOPMENT

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Abstract: In the living environment and food chain, plastic particles are ubiquitous pollutants. A public health risk is associated with such exposure to determine if plastic particles and their exposure is the reason or not. Many scientists make them an important indicator of the period to tell the abundance and distribution of Microplastics in the world defining a new concept: Plasticine. The implications of these microplastics are not completely understood. Due to different physical-chemical properties which are complexly involved in understanding their impact. In the ecosystems, microplastics carry toxic chemicals in which they are vectors of transport, a mixture of hazardous chemicals to prolong their life in production as additives which eventually increase polymer properties. There is a lack of knowledge of their fate once microplastics dispose of into the environment which is used in plastic industries and their consequent effects on human health when associated with micro and Nano plastics. The studies highlight the most toxic and dangerous chemicals which are present in all plastic products to narrate the effects of these hazardous chemicals on human health. Microplastics in pregnant women, fetus effects and Potential Carcinogenic Effects of Micro/ Nano plastics and their Derivatives.

Keywords– Microplastics (MP), additives, Nano plastics, pollutants, Plasticine, Carcinogens, ecosystem, Hazards, Polypropylene (PP), Polystyrene (PS) or Polyethylene (PE), causation, microdermabrasion.

Introduction:

Plasma, Red blood cells, white blood cells, and platelets are blood's main components. Blood has different functions which include oxygen transportation and nutrients to the lungs and tissues.

Plastics: A class of materials that are molded when soft and hardened to maintain the required shape. There materials are two types manmade or naturally occurring. Plastics are polymers. A polymer is a substance consisting of several repeating units.

Microplastics: A word for plastic particles without a well-accepted definition is "microplastic." In the literature, microplastic is often defined as plastic particles up to 5 mm in dimensions with no defined lower size limit. A study conducted by a team of researchers in the Netherlands found the first evidence of tiny plastic particles, known as Microplastics, in human blood. The researchers modified already-in-use methods to identify and examine particles as small as 700 nanometers. They targeted five popular plastics, including polyethylene and PET (polyethylene terephthalate).

Nano plastic: Nano plastics as particles unintentionally produced (i.e. from. the creation and decay of plastic items) and exhibiting colloidal behavior, between 1 and 1000 nm in size.

Classification:

Primary microplastics: These microscopic fibers shed from garments and other fabrics and tiny particles made for commercial purpose. For instance, plastic fibers, pellets, and microbeads found in personal care products.

Secondary microplastics: These are created when bigger plastics, including water bottles, break down.

Etiology:

Microplastics may have been swallowed by humans accidentally through personal care items like toothpaste or lip gloss, as well as through the air, water, and food supply, polymers, parts of implants, or tattoo ink residues. Your air may contain microplastics in 4-77 percent of it. 4 to 77% of the air you regularly breathe may include microplastics. Negative effects of microplastics on species, ranging from disruption of biological processes to extinction. Depending on the type of the MPs after consumption, MPs poisoning is divided into the following categories:

- 1) accumulation in the digestive tract, which causes physical injury including obstruction and damage;
- 2) release as pseudo feces, disrupting organisms' energy transfer;
- 3) go into the body, exposing internal organs and tissues to MPs.

To provide the groundwork for long-term MPs toxicological studies and to assess the potential for significant ecological disturbance, the harmful effects of MPs on species were highlighted. The danger to human health posed by MPs in seafood is significant. A vital component of the human diet is seafood. There is a significant possibility that intestinal MPs infection may spread to other parts of the body. There are several potential origins for these microplastics, including:

- 1) synthetic materials like polyester and polypropylene that are removed from clothing during washing cycles.
- 2) abrasions to common plastic or synthetic things, such as shoe soles and kitchenware
- 3) discharge from plastic elements used in the construction and marking of roadways
- 4) coatings applied to maritime infrastructure and machinery, such as cargo ships
- 5) plastic microdermabrasion beads used in face washes are an example of a plastic component utilized in personal care products.
- 6) plastic pellets used in manufacturing

Concerns related to Microplastics:

The ability to carry oxygen can be affected by the microplastic attachment to the red blood cells to their outer membranes. The particles have also been discovered in the placentas of pregnant women, and in pregnant rats, they quickly enter the lungs and go to the fetuses' hearts, brains, and other organs. Air pollution particles are already known to penetrate the body and cause millions of preventable deaths every year, and microplastics have been shown to harm human cells in the lab.

A. Microplastic contamination of drinking water:

Other sources of microplastics in freshwater ecosystems include combined sewage overflows, industrial effluent, degraded plastic debris, and air deposition, in addition to surface runoff and wastewater effluent (both treated and untreated). The most prevalent plastic polymer was polyethylene terephthalate (PET), which is often used in disposable water bottles and was present in almost 50% of the donors. According to the study, polystyrene (PS), the second most prevalent material and the material used to make polystyrene foam, was discovered in roughly 36% of samples.

Toxic Compounds from Plastic used:

1. Polyethylene terephthalate (PET): The most popular thermoplastic polymer resin of the polyester family is polyethylene terephthalate, also known as poly (ethylene terephthalate), PET, PETE, or the defunct PETP or PET-P. In addition to being combined with glass fibre, it is utilised in textile fibres, food and drink containers, thermoforming, and manufacturing. Polyester fabric, bottles of juice, mouthwash, jam, beer, water, and other household supplies including microwaveable meal plates and detergent containers
2. High density polyethylene (HDPE): Some items include cereal boxes, shampoo and detergent bottles, polyethene bottles, opaque milk, juice, and water containers, and some medicine bottles.
3. Polyvinyl chloride (V or Vinyl or PVC): PVC is used in a variety of items, including toys, packaging, oil jars, shower curtains, flooring, carpet backing, loose leaf binders, wire insulation, window frames and other building supplies. It is also used in medical tubes and blood bags.
4. LDPE Low-density Polyethylene: Due to its flexibility, barrier qualities, good impact strength, and stress crack resistance, low-density polyethylene (LDPE) is a high clarity and chemically inert polymer that is widely used. It is also one of the more economic polymers available meal plates and detergent containers.
5. Polypropylene: A synthetic resin that was created by polymerizing propylene. When toughness, flexibility, light weight, and heat resistance are required, polypropylene, a prominent member of the polyolefin resin family, is molded or extruded into a broad range of plastic items.

B. Microplastic contamination in food:

Despite the growing number of scientific investigations into the occurrence, transport, and distribution of microplastics in the marine environment and their adverse effects on marine life, researchers have only recently started to think about how it may affect human health. Research has shown that shellfish (including crustaceans and bivalves), and a high variety of commercially important fish species are often contaminated with microplastics, being a potential route through which human consumers become exposed to these particles and the chemicals they contain. For instance, 11 of the 25 species that are most responsible for worldwide marine fishing were discovered

to possess microplastics. In seafood and other food microplastic occurrence: Microplastics have been discovered in honey, beer, table salt, and other foods as well as seafood (including fish, prawns, and bivalves).

C. Microplastic pollution in Air:

Microplastics can become airborne and be breathed in by anyone who breathes air containing those microplastics. Microplastics may also travel hundreds of kilometers through the atmosphere of the globe once they become airborne. Numerous polyester-based clothing items have little plastic parts inserted during the manufacturing process. When the surface of polyester clothing is rubbed, millions of tiny fibers are released into air. When water contaminated microplastics evaporated, then also microplastics get into air. When any plastic object gets damaged, abraded, scraped, and so on, microplastics can also get into the air.

The Effects of Microplastics and Nano plastic On Pregnancy:

Pregnancy is a sensitive timeframe for environmental exposure. Pregnant women all around the world have recently been exposed to a shockingly high level of plastics in their surroundings. Recently, microplastics were found in the meconium, newborn feces, and human placenta. During pregnancy and breastfeeding, a mother's unborn child may be exposed to toxicants from plastics that she has been exposed to throughout her life and while she is pregnant. It is still mostly unknown how this will affect humans in the long term and at this early and fragile age.

Research into the role of these Nano and microplastics in the beginnings of development of health and illness is crucial going ahead. Nano and microplastics are always present in our lives. From single-use plastics in the ocean that degrade and end up in the seafood we eat to plastic cooking utensils that encourage us to ingest them in our meals. The particles, which were around 0.01 mm in size, were found in the membrane where the fetus grows as well as on both the maternal and fetal sides of the placenta.

Pregnancy and parenthood plastic reduction and sustainability tips:

1. Plastic-free periods: It's important to consider the most environmentally friendly ways to experience the monthly menses. These include plastic-free tampons made of silicon, washable pads to replace single-use ones and even fashionable 'period pants'.
2. Maternity clothing: Consider buying used maternity clothing; there are plenty of maternity-specific items on pre-loved websites and apps. Finally, consider upcycling bulky clothing (like the dad-to-be's old shirts?) into belly-embracing, stylish items. Consider loose-fitting silhouettes if you decide to buy brand-new clothing so you can wear them from being pregnant to becoming a stylish mother.
3. Nappies and wipes: There are washable, reusable cloth options as well as biodegradable alternatives that can be used in place of plastic, disposable diapers, and wet wipes. However, they may also be costly, inefficient, and impractical. Washable cloth inserts within a leak-proof outer diaper and washable cloths are examples of clever combo solutions. Even so, it might not be feasible to wash hundreds of diapers, wipes, or liners each week. Try your best while being gentle with yourself.
4. Bottles and dummies: Even reusable plastic bottles have a terrible image. Glass infant bottles that are as precisely constructed and stress resistant as you'd think are now being produced by a number of firms. There are other alternatives made of bamboo and stainless steel if you or your child aren't quite ready for glass. There is now just one environmentally friendly substance that can successfully replace silicon. Hevea has a large assortment of bottle teats and pacifiers made of natural rubber.
5. Toys and wheels: Toys often seem to be made of plastic, but there are alternatives. Try Bella Luna Toys for handcrafted wooden toys, and choose plastic-free toy innovators Le Toy Van, Eco-Tots, etc. And even previously beloved plastic-heavy products like Lego have begun to consider alternative materials, so hopefully they will become more sustainable in the future.
6. Crafts, gifts and parties: Avoid using plastic for present wrapping, children's parties, and arts and crafts. Choose biodegradable glitter and more environmentally friendly craft supplies, and teach your children early on that not all glitter needs to be made of plastic. Teach your kids to appreciate pencils and paint, and teach them how to properly maintain (high-quality) plastic pens so they may be used less frequently and last longer.

Microplastics found in placenta and newborns:

Plastic degrades into microplastics and even smaller Nano plastics, which are now being identified in newborns all over the world. Due to the limits of present technology for studying very tiny particles, Nano- and microplastics. It's nearly hard to stop kids from consuming plastic. Nano- and microplastics are so tiny that they can penetrate the placenta and deep into the lungs. Additionally, they bring potentially harmful chemicals on their journey. This makes them particularly vulnerable.

It's nearly hard to stop kids from consuming plastic. Nano- and microplastics are so tiny that they can penetrate the placenta and deep into the lungs. Additionally, they bring potentially harmful chemicals on their journey. We think that kids' health may be at danger from Nano- and microplastics because of this.

Sources and Modes of Microplastic Transmission:

Small plastic pellets or microbeads made for commercial use, such as those found in cosmetic items and microfibers from clothes and other textiles, are the main sources of MPs. In an ecosystem, the majority of living creatures mistakenly absorb MPs along with their food sources. Similar to how MPs may get into people through the food chain. MPs are bioaccumulated across a

food chain from creatures at lower trophic levels to those at higher trophic levels. Due to MPs' bioavailability and ubiquity in aquatic and terrestrial environments, they are also likely to be present in a variety of foods.

Exposure to microplastics (MP) during the early stages of development may pose the following risks:

Digestive System: Numerous studies on animals have shown that ingested MPs build up in the stomachs of several species. Smaller particles can pass through the mucus barrier and cause intestinal inflammation and local immune system effects while MPs with a maximum size of 150 m are not absorbed; Instead, they are connected to the intestinal mucus layer and directly in contact with the intestinal epithelial cells' apical region.

The Central Nervous System: MPs act as a vehicle for a wide range of EDCs that have the potential to disrupt hormonal systems, particularly during the prepubertal stage of early life development. According to one study, prenatal exposure to low levels of EDCs may result in neurological problems and developmental impairments in the kids. Additionally, these EDCs alter the central nervous system's cellular and molecular structure, which can later cause issues with behavior, memory, learning, and neurodegenerative diseases.

Immunity system: MPs' physicochemical characteristics may cause them to have an impact on the immune system. According to Park et al., the physical stress of PE-MPs set off the immune response cascade in the stomach walls.

Circulatory System: The circulatory system, which transports blood and lymph throughout the body, is made up of the heart, blood arteries, lymph, and glands. Particle size, particle content, and the biology of the gastrointestinal (GI) tract of the organism—which can range from a filter feeder to a mammalian physiology—all have an impact on how MPs particles are absorbed and transported once they enter the digestive system. Following exposure, microscopic particles build up in the digestive tubules and move into the bloodstream.

How can we protect the infant from BPA?

Avoid BPA when pregnant or nursing. Breastfeed instead, or think about using powdered formula, avoid heating up plastic bottles. Use BPA-free bottles wherever possible. Women who are expecting or nursing should think about substituting fresh or frozen produce for canned goods. Replacing any old, damaged, or cloudy polycarbonate plastic containers, especially water bottles. Not heating food or beverages in polycarbonate plastic containers.

How to lessen the use of microplastics in daily life:

- 1. Invest in organic clothing or clothing made of organic materials:** Microplastics are heavily influenced by synthetic garments, such as polyester. When possible, go for sustainable, eco-friendly clothing made of natural fibers like cotton, silk, wool, hemp, and other organic materials.
- 2. Modify your washing procedures:** When clothes are washed and dried, they experience additional wear and tear. Washers and dryers produce microfibers from a variety of materials, but the microplastics made from polyester and other synthetic materials are the most worrisome.
- 3. Avoid single-use plastics:** They ultimately degrade and release secondary microplastics into the environment. The retail sector uses a ton of plastic, particularly when it comes to plastic bags. Bring cloth bags or a rucksack with you when you go shopping to reduce the usage of single-use plastics. Requesting paper bags rather than plastic ones Purchasing food from zero-waste supermarkets and other environmentally friendly businesses, by substituting reusable metal, glass, or bamboo straws for throwaway plastic ones, reducing the usage of single-use plastic water bottles and replacing them with reusable ones.
- 4. Purchase plastic-free cosmetics:** Microbeads may be found in a range of personal care and home goods. Look for wording on labels that suggest the usage of microbeads as you carefully read them. Avoid items that include components like polyethylene, also known as PE, polypropylene, often known as PP, polyethylene terephthalate, also known as PET or PETE, polymethyl methacrylate, also known as PMMA, and nylon. Choose eco-friendly cosmetics and home goods that use substitute components, which are frequently marketed as "natural alternatives" to microbeads.
- 5. Take public or alternative transportation:** Car tires, which account for 28% of the microplastics discovered in the water, are a significant source of microplastics. Driving causes the tires to degrade, releasing the minute particles into the atmosphere. There are many less microplastic-emitting tires on the road the fewer automobiles there are.
- 6. Avoid microwaving food in plastic:** containers since plastic and microwaves don't mix. When heated, plastic containers release plastics. This still remains true even if plastic containers are marked "microwave safe." The container is microwave safe if it won't melt in the microwave, not if it won't leach toxins into your food.
- 7. Regularly Hoover and dust:** Microplastics make up a significant 39% of dust particles found in and around the home. By keeping your house as fresh and spotless as you can, you can lower that amount. Dusting and vacuuming at least once a week will help. Using air purifiers or filters that are specifically designed to catch microplastics, choosing hard flooring over carpet since the latter emits more microplastics into the atmosphere, Encourage environmental sustainability measures.

Conclusion:

It is now clear that people consume microplastics. Ingestion (via tainted food or by trophic transfer), inhalation, or skin contact are possible entry points. The destiny and consequences of microplastics when they are ingested by humans are still debatable and poorly understood. If a distribution of particles in secondary tissues, such as the liver, muscles, and brain is possible, then only microplastics smaller than 20 m should be able to penetrate organs, and those with a size of about 10 m should be able to access all organs, cross cell membranes, cross the blood-brain barrier, and enter the placenta. It is advised to reduce plastic use during pregnancy and breast-feeding to reduce the microplastic contamination to the babies. Avoiding plastic may reduce many problems in life. Prevention is better than cure. Completely avoiding plastics by using sustainable products in our everyday life will help us and our mother earth free from plastic pollution.

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