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Microplastics as New Air Pollutants

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Microplastics (MPs) are broadly used in manufacturing and everyday life, as they are very light, flexible, and durable. MPs with a size range of 1 µm to 5 mm are defined as emerging pollutants that persist and accumulate in the environment. These particles are generated due to the degradation of plastics, such as the fibers from synthetic materials [1].

Over the past sixty years, plastic production has increased each year from 1 to 300 million tons (Plastics Europe 2013) [2]. After use, plastic debris break down to millimetric and inframillimetric particles. MPs can be classified into two groups according to their origins; Primary MPs, which are mainly produced in micro-sizes (< 5 mm); and secondary MPs originating from the breakdown of larger plastic particulars [3]. MPs are extremely diverse in terms of chemical structure, specific density, size, shape, and color. These factors are very significant in their final environmental fate and bioavailability [4]. The atmosphere is a known place for the accumulation and distribution of MPs. However, the form of MPs in the atmosphere is found fragmented. In the few studies conducted on the subject, MP fibers were observed with a length of less than 5 µm, and a diameter of 3 µm [5].

Atmospheric MPs significance may be underestimated or overestimated with other compounds as a part of air pollutants. No studies have been found that fully show the characteristics of MPs. Particle characteristics like density, diameter, atmospheric factors, and geographic characteristics, such as wet deposition, dominant wind, urban topography, and temperature might affect straight distribution, movement, and persistence duration of MPs in the air [6]. Different types of MPs found in the ambient air consist of anthropogenic form of PVA (poly vinyl acetate); PUR (polyurethane); PET (polyethyleneterephthalate); PE (polyethylene); PES (polyester); PAN (polyacrylonitrile); PAA (poly N-methyl acrylamide); RY (rayon); EVA (ethylene vinyl acetate); EP (epoxy resin); ALK (alkyd resin); and natural structure (cotton and

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wool). These are classified into fragments, films, foam, granules, microbeads and fibers. The common form of MPs in the air is fiber [7 8].

These particles have potential for penetration into the respiratory system due to their fine size. Several studies reported that MPs had high toxic properties to aquatic organisms by accumulation, obstruction, and inflammation in tissues after transposition [9].

It is ambiguous that exposure to airborne MPs could be a threat for human health, due to their unconfirmed potential extended effects. The final route of breathing MPs and their accumulation in the respiratory system is unknown [10]. Furtheremore, it seems that many other polluatnts that are present in the form of airborn particles, such as transition metals, hydrocarbons (organic compounds), and pathogenic agents had synergistic health effects. However, the risks of inhaling microplastics and their fate in the body is unclear. For example, inhaled MPs can penetrate to the blood circulatory system and be transported to mediastinal lymph nodes. Of course, according to the World Health Organization, there is still no acceptable evidence of the harmful effects of microplastics. However, this issue needs more extensive and detailed research. But the health effects of human exposure can include digestive and respiratory effects, oxidative stress and cancer.

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