

COMMUNICATION BRIEF

## The invisible threat: micro and nanoplastics in ecosystems and human bodies

### La amenaza invisible: micro y nanoplásticos en ecosistemas y cuerpos humanos

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#### ABSTRACT

Contamination by micro- and nanoplastics became a growing environmental and health concern worldwide. These tiny particles, originating from the degradation of plastics or created for industrial use, invaded ecosystems and the human body. In Argentina, this problem emerged as a significant challenge for public health. Microplastics were detected in rivers, the Argentine Sea and even in breast milk, which caused alarm due to their possible health effects, such as hormonal alterations, inflammation and accumulation in vital organs. The main sources included urban plastic waste, the textile industry, cosmetic products and agricultural practices. Although similar situations were also observed in Latin America, research and public policies showed different levels of progress. The urgent need to improve waste management, promote more effective regulations and environmental education to mitigate the impact of these pollutants was highlighted.

**Keywords:** Microplastics; Public Health; Pollution; Plastic Waste; Environmental Policies.

#### RESUMEN

La contaminación por micro y nanoplásticos se convirtió en una preocupación ambiental y sanitaria creciente a nivel mundial. Estas diminutas partículas, provenientes de la degradación de plásticos o creadas para usos industriales, invadieron ecosistemas y el cuerpo humano. En Argentina, esta problemática emergió como un reto significativo para la salud pública. Los microplásticos fueron detectados en ríos, el Mar Argentino y hasta en leche materna, lo que generó alarma por sus posibles efectos sobre la salud, como alteraciones hormonales, inflamación y acumulación en órganos vitales. Las principales fuentes incluyeron residuos plásticos urbanos, la industria textil, productos cosméticos y prácticas agrícolas. Aunque en América Latina también se observaron situaciones similares, la investigación y las políticas públicas presentaron distintos niveles de avance. Se destacó la necesidad urgente de mejorar la gestión de residuos, impulsar regulaciones más efectivas y promover la educación ambiental para mitigar el impacto de estos contaminantes.

**Palabras clave:** Microplásticos; Salud Pública; Contaminación; Residuos Plásticos; Políticas Ambientales.

#### BACKGROUND

Micro- and nanoplastic pollution has become a growing environmental and health concern worldwide.<sup>(1,2,3,4,5,6)</sup> These tiny particles, derived from the degradation of larger plastic products or intentionally designed for specific industrial uses, have invaded various ecosystems and, alarmingly, the human body.<sup>(7,8,9,10)</sup> In Argentina, the issue of microplastics is emerging as a significant public health challenge, reflecting trends observed in other Latin American countries.<sup>(11,12,13,14,15)</sup>

Microplastics are plastic particles smaller than 5 millimeters, while nanoplastics are smaller, measuring less than 1 micrometer.<sup>(16,17,18,19)</sup> These particles can originate primarily from manufacturing in that size for

specific products, such as cosmetics, or secondarily, from the fragmentation of larger plastic waste due to environmental exposure.<sup>(20,21,22,23,24,25,26)</sup> The primary sources of microplastics include:<sup>(27,28)</sup>

- Urban plastic waste: Improperly discarded bags, bottles, and containers that degrade in the environment.
- Textile industries: Synthetic fibers are released during the washing of garments made from materials such as polyester and nylon.
- Personal care products: Exfoliants and toothpastes containing plastic microbeads.
- Agricultural activities: Use of plastics in greenhouses and mulch, which generate microplastics when degrade.

Recent research has detected the presence of microplastics in various environments in Argentina:<sup>(29,30)</sup>

- Aquatic ecosystems: Studies in the Matanza-Riachuelo and Reconquista river basins have revealed microplastic pollution, affecting biodiversity and potentially human health.
- Argentine Sea: A growing accumulation of microplastics has been identified, posing a threat to marine wildlife and fishing industries.
- Breast milk: The detection of microplastics in breast milk samples suggests direct exposure of infants to these particles, raising concerns about possible effects on child development.

The presence of micro- and nanoplastics in the human body is a cause for concern due to their potential adverse effects:<sup>(31)</sup>

- Endocrine disruptors: Compounds such as phthalates and bisphenol A, present in plastics, can alter hormonal balance, affecting reproductive and metabolic systems.
- Inflammation and cellular toxicity: The accumulation of these particles can induce inflammatory responses and oxidative stress, contributing to the development of chronic diseases.
- Accumulation in vital organs: Microplastics have been found in organs such as the lungs, liver, and brain, although the extent of their health effects is still being investigated.

The problem of microplastics in Argentina reflects trends observed in other Latin American countries, although with its particularities:

- Sources of pollution: As in Argentina, in countries such as Brazil and Mexico, inadequate solid waste management and high production of single-use plastics contribute significantly to microplastic pollution.
- Research and monitoring: While projects such as MappA have been launched in Argentina to monitor the presence of microplastics in freshwater bodies, research is still in its infancy in other Latin American countries, making it difficult to assess the problem accurately.
- Public policies: Some countries in the region have implemented regulations to reduce the use of single-use plastics, but the effectiveness and enforcement of these policies vary considerably between nations.
- Public awareness: The Latin American population is growing concerned about plastic pollution, but concrete actions and changes in consumption habits still face cultural and economic challenges.

Micro- and nanoplastic pollution represents an emerging public health challenge in Argentina and Latin America. It is essential to conduct further research on its effects, improve waste management, promote policies that reduce the production and consumption of single-use plastics, and foster environmental education to mitigate this problem and protect the health of present and future generations.

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