Abstract
Nanoplastics as a Vehicle for Environmental Pollutants: A Hazard for Human Health †

Carina Ladeira 1,2,3,* and José Cabêda 4

1 H&TRC—Health & Technology Research Center, Escola Superior de Tecnologia da Saúde de Lisboa (ESTeSL), Instituto Politécnico de Lisboa, Avenida D. João II, lote 4.69.01, Parque das Nações, 1900-096 Lisboa, Portugal
2 NOVA National School of Public Health, Public Health Research Centre, Universidade NOVA de Lisboa, 1600-560 Lisbon, Portugal
3 Comprehensive Health Research Center (CHRC), 1150-082 Lisbon, Portugal
4 Guarda Nacional Republicana, Destacamento Territorial de Vila Franca de Xira, Núcleo de Proteção Ambiental, Rua Calouste Gulbenkian, 2625-575 Vialonga, Portugal; joseluiscabeda@gmail.com

* Correspondence: carina.ladeira@estesl.ipl.pt
† Presented at the 1st International Electronic Conference on Toxics, 20–22 March 2024; Available online: https://sciforum.net/event/IECTO2024.

Keywords: nanoplastics; vector; risk assessment; hazard; human health

Plastic waste degrades into small particles, which depending on their size can be classified as microplastics (0.001–5 mm) or nanoplastics (up to a maximum of 0.001 mm), and which can be transported by air, water and food. In humans, contamination by these particles occurs through the airways, through contact with personal products, and through the consumption of food and water. This causes direct or indirect damage to the body’s homeostasis. Studies carried out in the area of nanoplastics verify that due to their size, these particles have a capacity for internalization, causing damage to membranes and organelles, inflammation, cytotoxicity, and cell death, among others.

In addition to these effects per se, nanoplastics are the polymers with the greatest impact on the environment, as they can absorb and, in this way, act as vectors of highly toxic compounds, such as aromatic hydrocarbons, heavy metals, persistent organic pollutants (POPs), and endocrine disrupting chemicals (Bisphenol A, Phthalates), among others. In the specific case of POPs, they are directly linked to hormonal, immunological, neurological, and reproductive dysfunctions. They remain in the environment for a long time and, once ingested, they have the ability to attach themselves to the body fat, blood, and body fluids of animals and humans. Packaged products also contain Bisphenol A in their composition, a known endocrine disruptor, exposure to which is associated with various diseases such as diabetes, polycystic ovary syndrome, infertility, and uterine fibroids, among others.

In summary, given the ubiquity of plastics in the environment, their potential for transporting other toxic substances, as well as their versatility of absorption through different routes of exposure, they meet the conditions to be considered a hazard for human health.

Author Contributions: Conceptualization, investigation, writing—original draft preparation, review and editing were performed by C.L. and J.C. All authors have read and agreed to the published version of the manuscript.

Funding: Supported by H&TRC—Health & Technology Research Center, Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa. H&TRC author gratefully acknowledges the FCT/MCTES national support through the UIDP/05608/2020 (https://doi.org/10.54499/UIDP/05608/2020), UIDB/05608/2020 (https://doi.org/10.54499/UIDB/05608/2020) and IPL/2021/PLASCOG_EN_ESTeSL.

Institutional Review Board Statement: Not applicable.
Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: The authors declare no conflict of interest.

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.