Effects of microplastics and nanoplastics on intestine inflammation

Martina Motto[1*], Anastasia Rella[1*], Ameen-Ur Rashid[2,3], Alessandro Galli[1], Silvia Valtorta[3,4], Sara Belloli[3,4], Rosa Maria Moresco[3,4,5], Anna Maria Colangelo[1]

E-mail: m.motto1@campus.unimib.it, anastasia.rella@unimib.it

[1]Dept of Biotechnology and Biosciences, University of Milano Bicocca; [2]PhD program in Neuroscience, Medicine and Surgery Department, University Milano-Bicocca, Monza; [3]Nuclear Medicine Dept, San Raffaele Scientific Institute (IRCSS), Milano; [4]CNR-IBSBC, Segrate; [5]Dept of Medicine and Surgery, University of Milano-Bicocca, Monza.

*These authors contributed equally

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Abstract

Environmental dispersion of microplastic (MPs) and nanoplastic (NPs) debris is becoming a prominent concern for the risks they pose to the human health (Aschner M, 2025). In the last century we are facing a massive usage and constant exposure to plastics in the daily life; moreover, their improper disposal leads to their partial decomposition/fragmentation by physical/chemical factors and accumulation in the environment. From here, MPs and NPs are absorbed by the human body through respiration with other air pollutants, as well as by ingestion through the food chain, due to the widespread presence of MPs and NPs in the water and all food products (Paul et al., 2020). Our previous study (Bonanomi et al., 2022) demonstrated that the internalization of plastic particles by human colon cells can alter cellular metabolism and promote the acquisition of a tumor-like phenotype.

Building on these findings, our study aims to assess whether MPs and NPs internalization is accompanied by an inflammatory response within the enteric nervous system. To this end, mice were exposed to MPs or NPs by oral gavage, with AOM/DSS-treated mice included as the positive control. Intestinal coronal sections were then analyzed by immunohistochemistry (IHC) to assess levels and distribution of GFAP and Iba1, markers of astrocytes and microglia, respectively. Our IHC data revealed that chronic (1-2 month) exposure to MPs causes indeed an inflammatory response similar to the positive control AOM, as indicated by the significant increase in GFAP and Iba1 levels, compared to SHAM mice; whereas no relevant activation is observed in NPs-treated mice. The different behavior of MPs and NPs reproduces what is observed on primary astrocytic culture in terms of mechanism of internalization and neurotoxicity.

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