

Inhalation of nanoplastics in the mouse model: tissue bio-distribution and effects on the olfactory system

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Background:

The presence of micro- and nanoplastics in the environment and the possibility of their potential penetration into biological tissues has been established, but the health impact remains unclear. Developing a protocol for administering nanoplastics via aerosol is a crucial step in studying their effects on human health

Methods and Results:

For this purpose, adult mice were inhaled via aerosol for 3 hours a day during 7 days with an aerosol solution containing polystyrene nanoplastics (PS-NPs with a diameter=100 nm) labelled with a red fluorophore. Biodistribution analysis revealed that NPs accumulated in tissues, such as brain, lung, adipose tissue, and testicles, but were cleared after one month. We observed long-term impairments in olfactory discrimination, decreased neuronal functionality, and pro-inflammatory activation in microglia in olfactory bulb following NPs exposure. Surprisingly, we noted a compensatory increase in olfactory neurogenesis, although insufficient to counteract the olfaction impairment induced by the PS-NPs

Conclusions and Significance:

This study demonstrates for the first time neurotoxic effects of inhaled nanoplastics in the olfactory system. The relevance of this study is high considering the increase of NPs in the atmosphere and the fact that 95% of patients with Alzheimer's and Parkinson's suffer from olfactory disorders, appearing 10-15 years before the symptoms.

Keywords: Inhalation of nanoplastics; olfactory system; neurogenesis; microglia; mice behaviour

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