Quantifying Gestational and Ingestion Routes of Micronanoplastic Exposure

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Plastic pollution, and subsequent exposure, often comes in the form of micro – and nano plastic particles (MNPs). Their impact on living organisms, including humans, remains unclear. Previous work in our laboratory identified the transfer of these MNPs from pregnant mothers to their unborn young and surviving offspring. The purpose of this study was to assess and quantify MNPs deposition in rat pups after gestational or ingestion exposure.

Twelve pregnant Sprague-Dawley rats were divided into two groups on gestational day 3: control (PN) and exposed (PPA). Aerosols of food-grade polyamide-12 particles were generated. Animals were exposed from gestational days 5 to 20 using a whole-body inhalation system. Pups were born in-house and underwent a cross-foster design: offspring from PPA-treated mothers were exchanged with PN offspring within 12 hours of birth and remained until sacrifice on postnatal day 14. Tissues from mothers and offspring were collected, fixed in 4% PFA, paraffin embedded, sliced, and stained with H&E. Maternal mammary and offspring tissues slides were analyzed using a Hyperspectral Darkfield microscopy to detect and visualize polyamide particles. Identification relied on spectral analysis, distinguishing particles based on unique wavelength signatures and spectral angle mapping for confirmation. Overall, we identified polyamide particles in the mammary tissues of exposed mothers.

Future research will emphasize assessing offspring tissues, for systemic distribution and time course outcomes. This study contributes to understanding the pathways of MNP transmission in mammals, with implications for maternal and developmental health.

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