Determinants of exposure to micro- and nano-plastics in women of reproductive age

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Abstract

Introduction: Despite ubiquitous applications of plastic, there is limited knowledge on internal exposure levels of micro- and nano-plastics (MNPs, i.e., plastic particles of less than 5 mm) and the determinants of exposure. Common sources that may contribute to MNP exposure remain poorly understood. We focus on characterizing MNP exposures in women of reproductive age because pregnancy and early life are critical periods with heightened vulnerability to environmental insults.
Methods: To characterize determinants of exposure to MNPs, a questionnaire was developed to assess factors which may contribute to MNP exposure such as household characteristics and food packaging. Additionally, participants were provided with a glass petri dish to set at home for a 30-day passive dust sample collection. Pyrolysis–gas chromatography–mass spectrometry (Py-GC/MS) was applied to characterize the accumulated MNPs in composition and mass. We enrolled 108 women of reproductive age living in Utrecht, the Netherlands. Descriptive statistics were used to describe the most frequent MNP exposure sources.

Results: Evaluation of the questionnaire indicated a wide contrast in plastic usage and potential exposure to MNPs. This includes differences in the use of plasticware for food preparation and household textiles, with limited differences observed in the frequency of consuming food packaged in plastic.The Py-GC/MS data will reveal the extent to which the spectrum of plastic use is reflected qualitatively and quantitatively in the associated dust samples collected.
Discussion: This is one of the first comprehensive surveys of potential determinants of MNPs to date. The results will identify important sources of MNPs and inform effective policy measures aimed at reducing MNP exposure and its associated risks. Future research will ascertain if levels of MNPs in household dust and potential determinants of MNP exposure are associated with internal levels of MNPs in the body.

Keywords: exposure assessment, inhalation, dust, pyrolysis GCMS

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