

Understanding Human Exposure to Nanoplastics/Microplastics: Novel Agents Bring Novel Challenges

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Overview

Micro- and Nanoplastics are polymeric particles that can be synthesized or formed from degradation of bulk plastic/waste. The recent awareness regarding micro- and nanoplastics in the global environment (including air, oceans, rivers, sediments, soils, plants), and their presence in food, seafood, and water, resulting in human exposure, is causing public concern. This concern has been documented in numerous recent scientific publications, news articles, and documentaries. While some information and publications are available regarding microplastics, their exposure and fate, in-depth understanding, quantitative assessment of cumulative exposures of these mixtures, and constituent components' assessment are limited. More important, information on nanoplastics is virtually non-existent due to the complexity in isolating them from the environment for their characterization and assessment. The increased surface area of nanoplastics with their hydrophobic surfaces enhances the binding of organic pollutants, which can result in potentially increased exposure to these chemicals and additives. There is an urgent need to investigate nanoplastics, their compositions, shapes, sizes, and exposures as mixtures from multiple sources so that we can understand if their cumulative exposures could have any adverse effects on health.

Many US Government agencies have held workshops and recently started conducting and funding research into this global problem, in addition to ongoing efforts in other countries. Due to the scientific complexity and resource requirement, it was realized that a coordinated interagency effort could minimize redundancies and efficiently address the concerns. A federal interagency nanoplastics interest group was formed in 2018 through the [Nanotechnology Environmental Health Implications](#)¹ (NEHI) working group, which met to discuss and better understand US government-wide efforts, infrastructure, and identify synergies for collaborations. In September 2019, the European Commission's Joint Research Centre and US Food and Drug Administration (FDA) co-organized a [global summit on nanoplastics](#)² in Italy with global regulators and stakeholders and the National Institute of Environmental Health Sciences (NIEHS) sponsored a recent [National Academies of Science, Engineering, and Medicine Workshop on Microplastics](#)³ (January 27-28, 2020) to better understand their characterization and human exposures and discuss how to address environmental health questions. All of these efforts are culminating in a greater understanding of the multitude of research questions regarding the isolation and collection of micro- and nanoplastics from the environment, and the importance of characterizing their various attributes and quantifying their compositions to

¹ <https://www.nano.gov/about-nni/working-groups/neh>

² <https://ec.europa.eu/jrc/en/event/conference/gsr19-global-summit-regulatory-science-2019-nanotechnology-and-nanoplastics>

³ <http://nas-sites.org/emergingscience/environmental-health-effects-of-microplastics/>

identify hazard and exposure levels. Such broad scoping and understanding should lead to the development of a well-coordinated and thorough strategy with short- and long-term goals.

The NIEHS-FDA collaboration on this topic began with discussions at the [2016 Global Summit on Nanotechnology](#).⁴ Existing collaboration on the development of standard methods and methodologies for nanotechnology through stakeholder involvement has generated a unique network of experts to leverage for addressing questions on nanoplastics. The research infrastructure and tools developed for designing and characterizing engineered nanomaterials can be utilized for the characterization and biological assessment of nanoplastics. This presentation will present information about the current understanding of the global problem, collaboration between FDA and NIEHS, and scope of proposed work.

⁴ <https://www.astm.org/COMMIT/GSRS16 Final Report.pdf>