Estimating lifetime microplastic exposure

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Credit: AI-generated image (disclaimer)

Every day, people are exposed to microplastics from food, water, beverages and air. But it's unclear just how many of these particles accumulate in the human body, and whether they pose health risks. Now, researchers reporting in ACS' *Environmental Science & Technology* have developed a lifetime microplastic exposure model that accounts for variable levels from different sources and in different populations. The new model indicates a lower average mass of microplastic accumulation

than previous estimates.

Microplastics, which are tiny pieces of plastic ranging in size from 1 µm to 5 mm (about the width of a pencil eraser), are ingested from a variety of sources, such as bottled water, salt and seafood. Their fate and transport in the human body are largely unknown, although the particles have been detected in human stool. In addition to possibly causing tissue damage and inflammation, microplastics could be a source of carcinogens and other harmful compounds that leach from plastic into the body. Previous studies have tried to estimate human exposure to the particles and their leached chemicals, but they have limitations, including discrepancies in the databases used, a failure to consider the entire microplastic size range and the use of average exposure rates that do not reflect global intakes. Nur Hazimah Mohamed Nor, Albert Koelmans and colleagues wanted to develop a comprehensive model to estimate the lifetime exposure of adults and children to microplastics and their associated chemicals.

To make their model, the researchers identified 134 studies that reported microplastic concentrations in fish, mollusks, crustaceans, tap or bottled water, beer, milk, salt and air. They performed corrections to the data so that they could be accurately compared among the different studies. Then, the team used data on food consumption in different countries for various age groups to estimate ranges of microplastic ingestion. This information, combined with rates of microplastic absorption from the gastrointestinal tract and excretion by the liver, was used to estimate microplastic distribution in the gut and tissues. The model predicted that, by the age of 18, children could accumulate an average of 8,300 particles (6.4 ng) of microplastics in their tissues, whereas by the age of 70, adults could accrue an average of 50,100 microplastic particles (40.7 ng). The estimated amounts of four chemicals leaching from the plastics were small compared with a person's total intake of these compounds, the researchers concluded. These data suggest that prior studies might have

overestimated microplastic exposure and possible health risks, but it will be important to assess the contributions of other food types to ingestion and accumulation, the researchers say.

More information: Nur Hazimah Mohamed Nor et al. Lifetime Accumulation of Microplastic in Children and Adults, *Environmental Science & Technology* (2021). DOI: 10.1021/acs.est.0c07384

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