CHE Collaborative for Health & Environment

Webinar Questions & Answers

Micro- and Nanoplastics and Public Health: EU research findings

June 25, 2024

For the full webinar, see:
https://www.healthandenvironment.org/che-webinars/96772

The webinar participants posed a number of questions, some of which were addressed during the webinar. Dr. Igor Snapow and Dr. Hubert Dirven (POLYRISK) have written the following answers to add to information that was shared during the webinar.

In addition to the Q&A shown here, please see the AURORA project's Frequently Asked Questions page at: https://auroraresearch.eu/project/faq/.

1. I am curious what MNPs are in plastic cups, bowls, etc. used in the kitchen, because food and drinks are being heated up in these plastics.

A variety of plastics, including PET, PVC, PP, and PS, are used in food storage and preparation containers. The possibility and mechanisms of micro- and nanoparticles' release, along with chemical leaching from these plastics into food and beverages, are not yet fully proven or understood. Moreover, there is insufficient biological data to determine any potential health effects.

2. Can you tell us about the analytical method(s), quantitative and qualitative, used in the MNPs in bottled water in Norway? Could it perhaps be the case that, in Norway, plastic bottles are of a higher quality, less brittle and therefore have a lower particle concentration? There are numerous studies that have identified the presence of a significant number of plastic particles in plastic bottles.

In brief, we used a cascade filtration system with multiple filters of varying pore sizes, followed by SEM analysis and µRaman spectroscopy. Five liters of each sample were analyzed. Notably, all commercial water bottles in Norway are made from 100% recycled material, which could influence our findings. Existing literature indicates a considerable variation in the number of particles present in bottled water.

3. Polyethylene and polypropylene particles are not easily suspendable in aqueous buffers due to their hydrophobicity/undergo agglomeration or float in media. How did you treat cells with these challenges? For immunological studies (Cytokines), did you measure for endotoxin presence in these samples (inhibition enhancement controls don't usually work with NMs) to elucidate differences due to such contaminants?

Our partner in the POLYRISK project successfully created stable aqueous suspensions of nanosized PP and PE particles. Dispersion of these particles in cell media is a widely discussed challenge. In our project, we confirmed the cellular uptake of the particles, although we currently cannot provide an exact ratio of ingested particles.

We are aware of the potential for endotoxin contamination and test our particles using methods such as the LAL and TLR4-induced NF-kB activity assays. Additionally, we include samples pretreated with endotoxin inhibitors in our experiments.

4. How do you know that there are 6,000 PBT chemicals among the long list of chemicals in plastic? What data sources support that?

We used the PlastChem report as a reference. The report can be found at this link: https://www.plasticpollutioncoalition.org/resource-library/plastchem-state-of-the-science-on-plastic-chemicals.

5. What do you think of the assumption that alveolar macrophages and intestinal macrophages take up nano- and microplastic particles and that this is a very important route?

Several published animal studies have demonstrated this route of uptake for micro- and nanoplastics. Additionally, it is well known that macrophages in various layers of the human body can ingest different environmental particles. Therefore, it would not be surprising if macrophages in humans are capable of taking up MNPs and transferring them into the bloodstream.

6. If there is deposition in the brain, what would the likely human health effects be?

It is difficult to answer this question as it depends on multiple factors including the type and source of plastics, their quantity, and the specific brain region involved. Importantly, current data are insufficient to conclude any potential human health effects.

7. With regard to the Marfella study, we have discussed intensively at the BfR, that they show correlations between MNP presence in plaques and health status, but do not claim causality. It could be also the other way around, that a general worse health status leads to more inflammation and therefore more MNP transported into the plaques, for example by chemotaxis of immune cells or blood flow. What do you think about that?

Thank you very much. This hypothesis is indeed interesting and relevant. To further speculate, it's possible that patients with poorer health status underwent more medical interventions, potentially resulting in higher exposure to plastics.

8. With regard to the Leslie study, unfortunately in the first version of the publication especially the highly contaminated samples were not reproduced in the duplicates. Did they repeat more replicates and got more robust results?

Here is a recently published study from this group that may provide the clarifications you are seeking: https://doi.org/10.1186/s43591-024-00090-w

9. Are there efforts being conducted to standardize both sampling and analytical methods to enhance the accuracy of testing results on MNPs in human organs/fluids?

In our plastic-filled world, it is essential to use measures to prevent contamination at every stage, from sample collection and storage to processing. Currently, there is no consensus in the field regarding these procedures, therefore there is a major need for harmonization and standardization.