

WHO activities on microplastics in drinking-water

Conference on Microplastics in
drinking-water – from source to tap
3 October 2024



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Guidelines for drinking-water quality:

a flagship normative publication of WHO



WHO International Standards for Drinking-water, 1st Edition, 1958
Immediate and wide recognition as an essential aid to the improvement of water quality and treatment

Guidelines for Drinking-water Quality, 3rd Edition, 2004
Guidelines for Drinking-water Quality, 4th Edition, 2011, 2017, **2022**



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Emerging contaminants within the context of WHO recommendations on water safety

- Most significant risk from drinking-water are microbial pathogens, followed by priority chemicals
- Many countries have limited capacities for monitoring and water treatment
- WHO guideline values considers the health evidence as well as practical aspects (e.g. treatment achievability, analytical detection limits)
- WHO advocates for the adoption of a preventive risk management approach to most effectively ensure drinking-water safety



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Guidelines for drinking-water quality:

numerous supporting publications



Provides the evidence base for WHO recommendations to “How to” guidance



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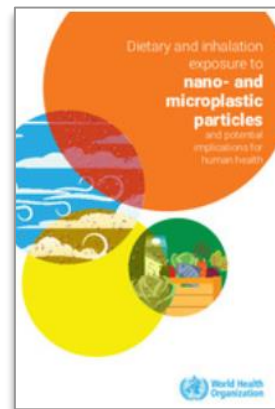
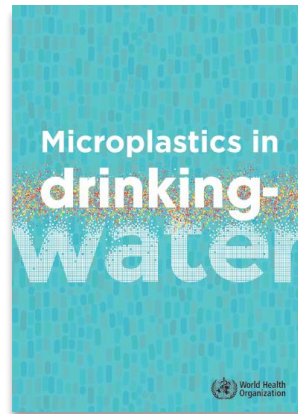
Microplastics: WHO response

Context

- WHO regularly issues health-based guidelines on health and environment
- Emerging issues, such as plastics are identified as important issues at WHO

Technical work

- Systematic review of data quality (Microplastics in Freshwaters and Drinking Water, Koelmans et al, 2019)
- WHO Review of Microplastics and Drinking-water (2019)
- WHO Review of Dietary and Inhalation Exposure to Microplastics (2022)



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WHO publications on microplastics in drinking-water and freshwater



Water Research
Volume 135, 15 May 2019, Pages 410–422



Review

Microplastics in freshwaters and drinking water: Critical review and assessment of data quality

Albert A. Koelmans^a, Nur Hazimah Mohar
Svenja M. Mintenig^{b,c}, Jennifer De France^a

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<https://doi.org/10.1016/j.watres.2019.02.054>

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Highlights

- Fifty studies on microplastics in drinking water.
- This included lake water, groundwater, drinking water.
- The quality of the studies was quantified.
- Four out of fifty studies scored positively.

Microplastics in drinking-water



Microplastics in drinking-water

Key messages

- Microplastics are ubiquitous in the environment and have been detected in a broad range of environments: in surface water, wastewater, fresh water, food, air and drinking water, both bottled and tap water. The data on exposure through ingestion in drinking water are limited at present, with low study quality. Assessing different methods and tools to sample and analyze microplastic particles.
- The potential to cause associated with microplastics come in three forms: physical, chemical and biological pathways as per their effects. Based on the limited evidence available, chemicals and additives associated with microplastics in drinking water pose a low concern for human health. Although there is insufficient information to draw firm conclusions on the physical related to the physical hazard of plastic particles, particularly for nanoscale particles, no reliable information suggests it is a concern.
- Unintentional exposure to the three sources of microplastic pollution in fresh water sources are inevitable on-off and wastewater effluent. However, optimal wastewater (and drinking water) treatment can effectively remove most microplastics from the effluent. For the significant proportion of the population that is not receiving adequate management, microplastics and other chemicals will pose a greater human health concern than microplastics.

Key questions and answers

What are microplastics?

As a category, microplastics encompass a wide range of materials composed of different substances, with different densities, chemical compositions, shapes and sizes. There is no scientific or agreed definition of microplastics, although they are frequently defined as plastic particles < 5 mm in length. However, this is not a scientific definition and is of limited value in the context of drinking water. The particles at the upper end of this size range are difficult to handle in drinking water. A subset of microplastics < 1 µm in length are often referred to as nanoplastics.

How do microplastics get into drinking-water?

Microplastics enter drinking-water sources in a number of ways. These can be of different sizes, shapes and colors, and are often found both in bottled and tap water, untreated surface water, industrial effluent, degraded plastic waste and atmospheric deposition. Surface run-off and wastewater effluent are recognized as the two main sources, but better data are required to quantify the sources and associated harm with microplastic pollution. Plastic bottles and caps that are used in bottled water may also be sources of microplastics in drinking water.

Recommendations

- Water suppliers and regulators should continue to prioritize removing microbial pathogens and chemicals from drinking water that are known significant risks to human health. As part of water safety planning, water suppliers should ensure that control measures are effective, including optimizing water treatment processes for particulate removal and residual safety, which will indirectly improve the removal of microplastic particles. Further monitoring of microplastics in drinking water is unnecessary at the time.
- To better assess the human health risks and inform management actions, researchers should undertake targeted, well-designed and equally coordinated research studies to better understand the occurrence of microplastics in the water cycle and in drinking water throughout the water supply chain. The sources of microplastic pollution and the uptake, fate and health effects of microplastics under relevant exposure scenarios.
- In the absence of any human health risks posed by exposure to microplastics in drinking water, measures should be taken by policy makers and the public to better manage plastics and reduce the use of plastic where possible, to minimize plastics release into the environment because there will be considerable benefits to the environment and human well-being.

How much microplastic has been found in drinking-water and drinking-water sources?

In the most recent study, reported microplastic particle counts ranged from around 1000 particles/L. Other studies have reported that microplastic in drinking water. These studies reported particle counts ranging from 1000 to 100,000 particles/L and mean values from 10³ to 10⁵ particles/L. A comparison of the data between the drinking water studies showed that the mean values in most cases between the studies ranged from 10³ to 10⁵ particles/L. The data that were a part of the largest study in this field < 1000 particles/L.

<https://www.who.int/publications/i/item/9789241516198>

<https://www.who.int/news/item/22-08-2019-who-calls-for-more-research-into-microplastics-and-a-crackdown-on-plastic-pollution>

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WHO calls for more research into microplastics and a crackdown on plastic pollution

22 August 2019 | News release | Geneva | Reading time: 1 min (391 words)

The World Health Organization (WHO) today calls for a further assessment of microplastics in the environment and their potential impacts on human health, following the release of an analysis of current research related to microplastics in drinking-water. The Organization also calls for a reduction in plastic pollution to benefit the environment and reduce human exposure.

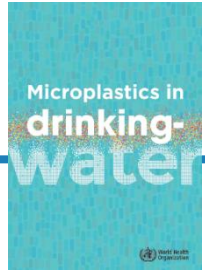
"We urgently need to know more about the health impact of microplastics because they are everywhere - including in our drinking-water," says Dr Maria Neira, Director, Department of Public Health, Environment and Social Determinants of Health, at WHO. "Based on the limited information we have, microplastics in drinking water don't appear to pose a health risk at current levels. But we need to find out more. We also need to stop the rise in plastic pollution worldwide."

According to the [analysis](#), which summarizes the latest knowledge on microplastics in drinking-water, microplastics larger than 150 micrometres are not likely to be absorbed in the human body and uptake of smaller particles is expected to be limited. Absorption and distribution of very small microplastic particles including in the nano size range may, however, be higher, although the data is extremely limited.

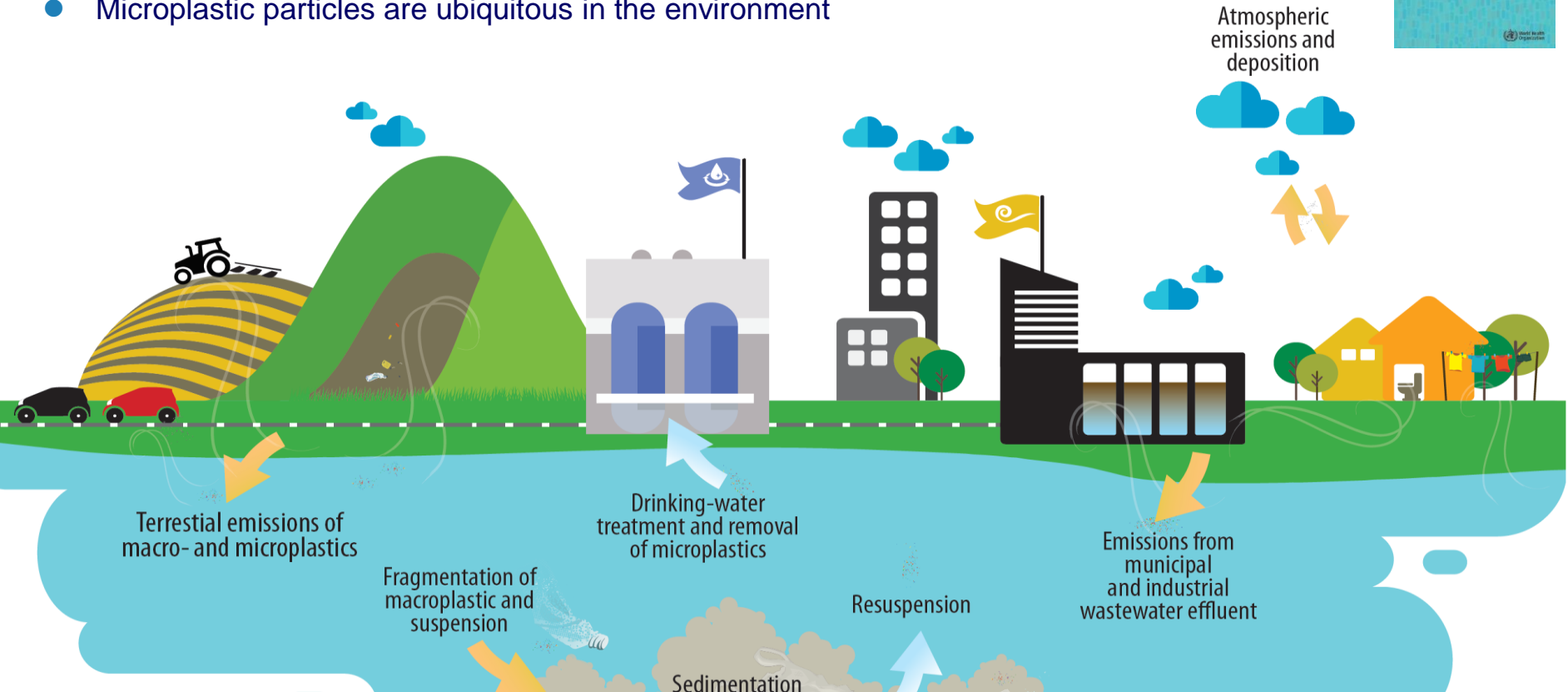


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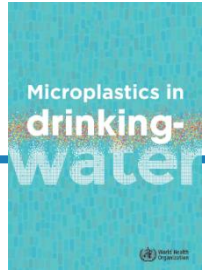
Key Messages



- Microplastic particles are ubiquitous in the environment



Key Messages

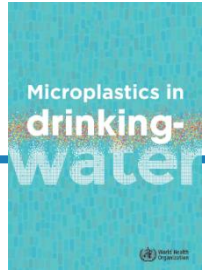


- Microplastic particles are ubiquitous in the environment
- The data on the occurrence of microplastic in drinking-water are limited, with few fully reliable studies using different methods and tools for sampling and analysis. (informed by systematic review)
- The potential hazards associated with microplastic come in three forms: physical particles, chemicals and microbial pathogens as part of biofilms. Based on the limited evidence available, microplastic in drinking water do not appear to pose a health risk at current levels
- Key secondary sources of microplastic pollution in fresh water sources are likely terrestrial run-off and wastewater effluent. However, optimized water treatment can effectively remove most microplastics from the effluent.
- For the significant proportion of the population that is not covered by adequate sewage treatment, microbial pathogens and other chemicals will be a greater human health concern than microplastics.



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Key Messages

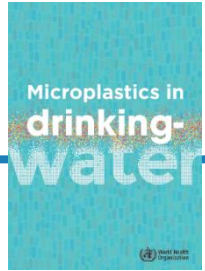


- More research is needed
 - To better understand microplastics occurrence throughout water supply chain
 - To better understand the significance of treatment-related waste streams as contributors of microplastics to the environment
 - Toxicological data on the most common forms of plastic particles relevant for human health risk assessment
 - Uptake and fate of microplastics following ingestion
 - Of particular interest are micro- and nanoplastics measuring $< 10 \mu\text{m}$



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Recommendations



- **Water suppliers and regulators** should continue to prioritize removing microbial pathogens and priority chemicals from drinking-water. Water suppliers should optimize water treatment processes for particle removal and microbial safety, which will improve removal of microplastic particles. Routine monitoring of microplastic particles in drinking-water is not necessary at this time.
- To better assess the human health risks and inform management actions, **researchers** should undertake targeted, well-designed and QCd investigative studies to better understand the occurrence of microplastic particles in the water cycle and in drinking-water throughout the water supply chain, the sources of microplastic pollution and the uptake, fate and health effects of microplastics under relevant exposure scenarios.
- Irrespective of any human health risks posed by exposure to microplastic in drinking-water, measures should be taken by **policy makers and the public** to better manage plastic and reduce the use of plastic where possible, to minimize the unintentional release of plastic into the environment.



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Thank you!