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Microplastics: A Hidden Crisis

Microplastic particles are ubiquitous contaminants in our environment and have been identified in many studies from different geographical locations. They are a result of our global consumption of plastic and the pollution it causes. However, little is known about their impact on human health, which calls for further investigative research.

Insights

Plastic waste

It is estimated that more than 75% of the 8.3 billion metric tons of plastic produced over the last 65 years have turned into waste, of which up to 13 million metric tons end up in our oceans every year.[1,2]

Where do they come from?

Global microplastic sources

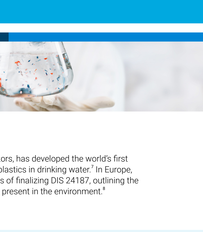
A recent 'global evaluation of sources' highlighted that synthetic textiles, car tires, and city dust are the top three contributors of microplastic pollution in the world's oceans.[3]

Estimated share of total microplastics in the world's oceans by source:[3]

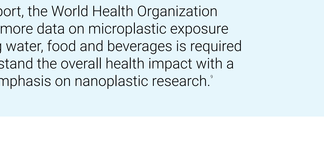
Laundry is a key contributor

Microplastics coming from wash loads

Research has revealed that between 8,800 to more than 6,877,000 microfiber particles are released from domestic laundry cycles, per wash.[4] These fibers are discharged into water systems, which may potentially end up in our oceans.

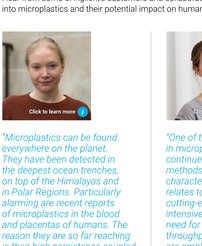


Did you know?



It's in our drinking water

93% of bottled water, from 11 countries across different continents, tested by the State University of New York, contained microplastic contamination.[5] On average, 325 plastic particles were identified in the study for every liter of water sold.[5]



It's even been detected in human blood

A recent study showed that 77% of donors carried a quantifiable mass of plastic particles in their blood.[6] Polyethylene terephthalate (PET) was discovered in 50% of samples, followed by polystyrene (PS) in 36%, polyethylene (PE) in 23%, and poly(methyl methacrylate) (PMMA) in 5%.[6]

Testing

New global standards are needed

The California State Water Control Board, in partnership with collaborators, has developed the world's first standardized analytical methods for the testing and reporting of microplastics in drinking water.[7] In Europe, the International Organization for Standardization (ISO) is in the process of finalizing DIS 24187, outlining the recommended principles for the analysis of plastics and microplastics present in the environment.[8]

> In a 2022 report, the World Health Organization indicated that more data on microplastic exposure from air, drinking water, food and beverages is required to better understand the overall health impact with a particular emphasis on nanoplastic research.[9]

Partnering for research

A critical step to addressing the global issue of plastic particle pollution is the expansion of research into the characterization of microplastics.

Agilent works with a range of partners to provide the necessary workflow solutions needed to boost research into this environmental challenge:

Labs | **Universities and research facilities** | **Private companies** | **Public institutions**

Hear from some of Agilent's customers and collaborators around the world who are conducting investigative research into microplastics and their potential impact on human health:

"Microplastics can be found everywhere on the planet. They have been detected in the deepest ocean trenches, on top of the Himalayas and in Polar Regions. Particularly alarming are recent reports of microplastics in the blood and placentas of humans. The reason they are so far reaching is their high persistence coupled with their mobility, through water, air and even by transport through animals, such as migratory birds."

Roxana Sühring
Assistant Professor, Department of Chemistry and Biology,
Toronto Metropolitan University

"One of the greatest obstacles in microplastics research continues to be analytical methods for detection and characterisation. This also relates to the trade-off between cutting-edge and labour-intensive methods versus the need for automation and high throughput. These challenges are amplified with smaller particles sizes and complex environmental matrices. In my view, the persistency and fate of microplastics in the environment needs further attention."

Nanna Hartmann
Senior Researcher, Department of Environmental and Resource Engineering, DTU Sustain, Technical University of Denmark

"Massive amounts of plastic debris are accumulating in the world's ecosystem, which is being converted into microplastics through environmental aging processes. The aging dynamics haven't yet been quantitatively revealed due to the limitations of the analytical tools, which are critical for risk assessment. However, Agilent's single particle ICP-MS technique is now enabling us to investigate the size and number of microplastic particle."

Yuxiong Huang
Associate Professor, Institute of Environment and Ecology, Shenzhen International Graduate School, Tsinghua University

Concluding thoughts

The future of research around microplastics in the environment will involve interdisciplinary and collaborative approaches to better understand this complex and pressing issue and to find effective solutions for mitigating its impacts. Keys areas of study will include:

- Monitoring and quantification
- Toxicity and effects on health
- Sources and pathways
- Investigating microplastics as chemical mixture pollution problem

There will also need to be a program of public awareness and engagement.

Global partnerships with Agilent Technologies are already helping researchers deliver the insights needed by regulators to help bring microplastics in the environment under control.

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