

A world with plastic on tap

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Microplastic contamination has been found in tap water in countries around the world, leading to calls from scientists for urgent research on the implications for health.

Scores of tap water samples from more than a dozen nations were analysed by scientists for an investigation by Orb Media, who shared the findings with the Guardian. Overall, 83% of the samples were contaminated with plastic fibres.

The US had the highest contamination rate, at 94%, with plastic fibres found in tap water sampled at sites including congressional buildings, the Environmental Protection Agency's headquarters and Trump Tower in New York. Lebanon and India had the next highest rates.

European nations, including the UK, Germany and France, had the lowest contamination rates, but this was still an average of 72%. The average number of fibres found in each 500ml sample ranged from 4.8 in the US to 1.9 in Europe.

The new analyses indicate the ubiquitous extent of microplastic contamination in the global environment. Previous work has been largely focused on plastic pollution in the oceans, which suggests people are eating microplastics via contaminated seafood.

"We have enough data from looking at wildlife, and the impacts that it's having on wildlife, to be concerned," said Dr Sherri Mason, a microplastic expert at the State University of New York at Fredonia, who supervised the analyses for Orb, a nonprofit organisation. "If it's impacting [wildlife], how do we think that it's not going to somehow impact us?"

A separate small study in the Republic of Ireland released in June also found microplastic contamination in a handful of tap water and well samples. "We don't know what the [health] impact is and for that reason we should follow the precautionary principle and put enough effort into it now, immediately, so we can find out what the real risks are," said Dr Anne Marie Mahon at the Galway-Mayo Institute of Technology, who conducted the research.

Mahon said there were two principal concerns: very small plastic particles and the chemicals or pathogens that microplastics can harbour. "If the fibres are there, it is possible that the nanoparticles are there too that we can't measure," she said. "Once they are in the nanometre range they can really penetrate a cell and that means they can penetrate organs, and that would be worrying."

The scale of global microplastic contamination is only starting to become clear, with studies in Germany finding fibres and fragments in all of the 24 beer brands tested, as well as in honey and sugar. In Paris in 2015, researchers discovered microplastic falling from

159
The number of samples taken from more than a dozen countries

94%
The US has the highest rate of plastic fibre water contamination

300m
Tonnes of plastic produced each year; just 20% of it is recycled

10

Image: iStockphoto.com

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Sometimes a single revelation opens our eyes to a whole new view of the world. The contamination of tap water around the world with microplastics unmasks Earth as a planet pervasively polluted with plastic. What that means for the 7 billion people who live on it, no one yet knows. All the experts can agree on is that, given the warning signs, the need to find out is urgent. We knew the oceans were awash with plastic. Brightly coloured and often floating, the debris from consumer society forms colossal, ugly swirls and litters even the remotest beaches from the Arctic to the deep Pacific.

But the wholesale pollution of the land was hidden. Tap water is gathered from hills, rivers, lakes and wells, sampling the environment as it goes. It turns out that tiny fibres of plastic are everywhere. Perhaps it should not really be a surprise. Plastic is a fantastic material, flexible and – unless burned – essentially indestructible. It is so useful that it now makes up about half of all human-related waste. But while humanity has realised its benefits, it has yet to realise the cost.

The tap water revelation has drawn attention to disparate pilot studies that were hinting at ubiquitous plastic pollution. We appear to be drinking and probably eating microplastics all the time. Does it matter? No one knows, but the research on marine plastic contamination raises cause for concern. Marine creatures that consume microplastics can be harmed by them and not just by physical obstruction. Plastics often contain a wide range of chemicals to change their properties or colour and many of these are toxic or hormone disruptors. Plastics can attract other pollutants too, including dioxins, metals and some pesticides.

Microplastics have also been shown to attract microbial pathogens. The conditions in animal guts are also known to enhance the release of pollutants from plastics. As a recent scientific review says, “there is evidence that particles may even cross the gut wall and be translocated to other body tissues, with unknown consequences”. The only land animals in which the consumption of microplastic has been closely studied are two species of earthworm and a nematode. Another unanswered question is how microplastics get into our water and food. The UK’s Chartered Institution of Water and Environmental Management says the biggest proportion are fibres shed by synthetic textiles and tyre dust from roads, with more from the breakdown of waste plastics.

A lot of the debris is washed into wastewater treatment plants, where the filtering process does capture many of the plastic fragments. But about half the resulting sludge is ploughed back on to farmland.

Like so many environmental problems, the impacts only become clear years after damage has been done. If we are lucky, the plastic planet we have created will not turn out to be too toxic to life. Above all we need to know if we are all drinking, eating and breathing microplastic every day and what that is doing to us, and we need to know urgently.