There’s just no getting away from microplastic contamination

And we still don’t know where a huge portion of our plastic waste even ends up.

Cathleen O'Grady - 4/22/2019, 11:16 AM

Microplastics may be having a moment in the spotlight, as the public is increasingly aware of their presence in the environment around us. But as more evidence of their presence comes to light, it’s becoming clearer that we don’t yet have a handle on how big or bad the problem is. A huge amount of small plastic particles end up in the sea, but recent research has also found them in lakes and mountain river floodplains, and even as airborne pollution in megacities.

A new paper in *Nature Geoscience* reports finding microplastics in a region that should be pristine: the French Pyrenees Mountains. The researchers estimated that the particles could have traveled from as far as 95km away, but they suggest that it could be possible for microplastics to travel even farther on the wind—meaning that even places relatively untouched by humans are now being polluted by our plastics.

The mystery of the disappearing plastic

Every year, millions of tonnes of plastic are produced. In 2016, this figure was estimated to be around 335 million tonnes. We have no idea where most of this ends up. The amounts that are recovered in recycling plants and landfill don't match the amount being produced. Some of it stays in use, sometimes for decades, which explains part of the discrepancy. An estimated 10 percent ends up in the oceans. Although these numbers could change with further research, there's still a gap.

Wherever that plastic is ending up, we know that it's breaking down over time, disintegrating into micro particles less than 5mm in size, and some even breakdown to the nanoscale at less than one micrometer. (For context, the micrometer is a unit that's often used to discuss bacteria and cells—the human sperm head is around 5 micrometers in length.) The effect that these particles will have on a global scale as they continue to accumulate is not even remotely understood.

A huge part of getting a handle on the consequences is just understanding where all the plastic ends up. The Pyrenees are an ideal place to assess how far it might travel, as they're sparsely populated, difficult to get to, and have no industrial activity or large-scale farming. So for five months, a team of researchers gathered samples from the Bernadouze meteorological station, 6km (~3.7 miles) away from the closest village. The samples were from "atmospheric fallout"—anything falling from the sky, either wet or dry, ranging from dust to rain and snow.

The problem with microplastics being (potentially) everywhere is that contamination becomes a concern. Plastic fibers from clothing, containers, and equipment could all hypothetically make their way into the sample. To guard against this, the researchers took precautions like wearing cotton clothing as they approached the sample collection devices, approaching from downwind, and storing everything in glass. They also collected and processed "blank" samples taken from closed containers left at the field site to double-check that any plastics found in the real samples had really made their way there through the atmosphere.

The plastics are blowin' in the wind

Microplastics were found in every sample the researchers gathered—on average, 365 particles per square meter were deposited every day. The most common kind of plastic was polystyrene, followed by polyethylene (the kind of plastic used in plastic bags and single-use packaging).

The number of particles being deposited correlated strongly with wind speeds, with more particles being found following higher winds. Precipitation—both wind and snow—were also strongly linked. The researchers looked at the wind speeds and directions that had been recorded throughout the study, and they used this to calculate how far particles of the sizes they found could have been transported, estimating that the plastics could have come from nearly 100km away.

That's a "highly simplified assessment," the team notes—it doesn't take into account all the different atmospheric variables that could change the numbers. With evidence that dust particles (which are well within the range of sizes of plastic particles) can travel up to 3,500km (~2,175 miles), it's possible they could come from even farther away.

Research that analyzes the size of the plastic particles it finds shows that there's a trend toward finer particles over time. As particles get smaller, their ability to be dispersed far and wide increases. Microplastics have now been found everywhere from drinking water to city air, and there's evidence of plastic particles in fish liver, suggesting that they could pass through organ systems. All of this makes it clear that tiny, invisible plastic dust is becoming ubiquitous on our planet. We're only just starting to understand what the effects of that will be.

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