

Microplastic Pollution and Human Health

Narrator: Each year, roughly 4.8 to 12.7 million metric tons of plastic are dumped or get washed into the ocean. Of plastic on the ocean's surface, 93,000 to 236,000 metric tons are microplastic. It creates problems for our oceans, our aquatic life, and our health.

Due to microplastics in marine environments, including nearby soils, drinking water, and air, scientists and health professionals are concerned about potential health risks for humans. I spoke with Dr. Mark Hahn at Woods Hole Oceanographic Institution about microplastics and how researchers are working to better understand them.

Hahn: Microplastics are small pieces of plastic or other polymer-based material. Typically, they're defined as being less than five millimeters, about the size of a pencil eraser. And some of these microplastics are referred to as primary microplastics, which means they're plastic particles that were manufactured for some use. For example, the plastic pellets that are used as raw material for making plastic products, or plastic microbeads that were added to some personal care products in the past.

Other microplastics are formed by fragmentation of larger plastics, and these are called secondary microplastics. In addition to what people typically think of as plastics, microplastics can also include synthetic fibers from clothing as well as tire wear particles formed by the abrasion of car and truck tires.

Narrator: Microplastics are found everywhere. They're in all marine environments: on beaches, in surface water, and remote places like the arctic and deep-sea sediments. They're found in fish and shellfish and can accumulate up the food chain to humans. They're even in soil, drinking water, and air.

Hahn: The sources in the routes of exposure to humans are not really well understood yet. But there are some major sources that we know about, and they include drinking water and inhalation of microplastic particles in the air. We also seem to be exposed through consumption of contaminated food, including seafood as well as some other types of food. But in general, we don't have a very good understanding of the totality of exposure of humans.

Narrator: Dr. Hahn explained that plastics often include additive chemicals that may be harmful. Plastic trash can also accumulate or bond with additional harmful chemicals in the water or ground.

Hahn: Persistent organic pollutants are chemicals that are resistant to degradation and they tend to adsorb to plastics. The surface of plastics tends to become contaminated with some of these contaminants in the environment, things like polychlorinated biphenyls, polybrominated diphenyl ethers, and related persistent organic pollutants.

So there has been a concern that animals, including people, ingesting microplastics that had been contaminated with these persistent organic pollutants will be taking up the pollutants that leach off of the plastics that had been taken up.

Narrator: According to Dr. Hahn, microplastics are a potential risk to human health.

Hahn: Well, it's the most basic level. You can think that they're a problem because they're not natural components of our environment, so they shouldn't be there to begin with. But more to the point, I think they're a problem because of the potential that they can cause adverse effects on organisms including humans that may be exposed to them. And there are a variety of types of effects that people think about. There might be physical effects, for example, interfering with feeding mechanisms in some of the filter feeders that are exposed to microplastics. Or there might be biological effects of the plastic particles that get ingested or of the chemicals that they carry on them.

Narrator: Dr. Hahn and his interdisciplinary group at the Woods Hole Oceanographic Institute work to shed light on the growing problem of microplastics. They are building better assessment tools and instruments. And they're learning more about effects on marine environments, marine life, and human health.

Hahn: The term microplastics refers not to a single contaminant but rather a very complex mixture of contaminants with a variety of different polymers and additives and sizes and shapes. And so trying to investigate the potential impacts of that complex set of materials is really quite a daunting task.

If we could narrow down the subset of plastic particles that is of greatest concern, for example, because it's most able to get taken up into our bodies, then that would allow us to narrow our focus and get a much better understanding of what the potential impacts might be.

My lab is interested in the concentrations of microplastics in local seafood in Cape Cod here, and we're also interested in understanding the fate and possible effects of nanoplastics. These are the smallest size plastics that are very difficult to measure.

And there's some concern about nanoplastics, that the nanoplastics may be better able to cross the intestine and get into animals that consume them. So we're beginning to do a systematic study of how the particle size of plastics affects their ability to be taken up across the intestine.

We hope that will allow us to narrow down our focus on the particles that are most likely to be toxic to the organism.

Narrator: Dr. Hahn reminds us that exposures from eating seafood is not fully understood, and presently not a cause for concern.

Hahn: When we're eating certain kinds of shellfish where we eat the entire animal, then whatever that animal has in it we'll be exposed to. But for things like fish where we're just eating typically the fillet, the muscle from the fish, most of the microplastics seem to be localized in the intestine of the fish, and so if we're only eating the muscle part, probably not getting much exposure from the fish.

Narrator: the National Institutes of Health recommends a few ways for individuals to reduce their exposure to microplastics including, minimizing use of consumer products that contain microplastics,

choosing paper bags over plastic bags, recycling plastics, and never throwing plastics into lakes, rivers, oceans, or other bodies of water.

Narrator: Thank you to today's guest, Dr. Mark Hahn, Senior Scientist in the Biology Department at the Woods Hole Oceanographic Institution. We look forward to seeing where your research takes you. To learn more about microplastics, visit our website at niehs.nih.gov/podcasts.

Narrator: You've been listening to Environmental Health Chat. Our podcast is brought to you by the Division of Extramural Research and Training at NIEHS, part of the National Institutes of Health, an agency of the U.S. Department of Health and Human Services.