

Microplastics

In 1989-90 we lived in visiting faculty housing at the Suzhou University of Silk Textile Technology, located about 110 kilometers west of Shanghai, PRC.. When we moved into the apartment, the authorities handed us some glass bottles and bags. Our first question was why? We soon learned that to get oil and rice we needed those items. The University was adjacent to one of the local farmer's markets and if I bought anything, tofu, vegetables, meat, eggs, etc., I needed to bring my own containers. I know things have changed since then but I know that growing up in the 40's and 50's the United States was pretty similar. Our containers in Suzhou were either glass or cloth.

I am the main shopper for our family. I would love to get my ingredients in containers I bring to the store but that is an impossibility. At least the eggs and flour come in paper products but most everything else is in some sort of plastic, all of which have the recycling symbol and a number. Unfortunately, the system is pretty much fake news as the only numbers that are really recyclable are the 1s and 2s. And this brings me to explore the title of the commentary, "Microplastics".

Microplastics can be roughly divided into three categories; microbeads, microfibers, and disintegration products of plastic items such as bags and bottles. Microbeads are a subcategory of microspheres. Microspheres have many different compositions, including glass, metal and plastic. They vary in size from 1 micron to 1000 microns. A human hair is 75 micrometers in diameter. Microspheres have many uses in the biosciences, one major one being the delivery of drugs. Microbeads, plastic spheres, are a component of many fluid items such as beauty products. They are used in the product often as an exfoliant (to remove dead skin cells) or to provide a smooth feeling when the product is rubbed on one's skin. Upon showering or hand/face washing, the microbeads then get into the sewer system and then into the natural environment when the outflow of the systems goes into local rivers or lakes.

Microfibers are the product of wear and tear of fleeces. Fleece has been touted as a wonderful product as it represents the recycling of plastic bottles and in many ways it is as most of us have one or two fleece jackets that provide comfort in a range of temperatures. Unfortunately, everytime your fleece rubs against something, small microfibers are dislodged and float in the air to be inhaled or until they finally sink to the floor to be swept back into the air by the casual housekeeper's broom. The fibers only get smaller and smaller as they remain in the environment.

The disintegration products of bags and bottles may even be more problematic than the previous categories. Because no manufacturer wants to see bags hanging off roadside vegetation or bottles in the gutters next to the roads, those items are constructed so as to disintegrate as they age. How many of us have tried to recycle a roadside plastic bag only to have it break into many smaller fragments upon picking it up. As time passes the disintegration pieces become smaller and smaller and end up in the micron size range.

There are two main problems when organisms inhale or ingest microplastics. The first is that the items represent empty calories. We are constantly told that the junk foods we eat are empty calories but just imagine that you are a beetle in the soil or a copepod in a lake and your food items instead of being carbohydrates, fats, or proteins are microplastics. You may feel satiated, but your gut is full of materials that have no caloric value and essentially you are being starved to death. Even if you are fed on by another organism, that organism is not getting a full caloric value because of the microplastics in the gut of its prey.

The second problem is related to what materials that are in the microplastics that might be dissolved out and have some sort of negative physiologic effect on the organism ingesting them. Many of us remember the BPA (phthalates) problem of a few years ago. Materials containing BPA have been outlawed in most countries of the world because of the negative consequences of the material on our well-being. Although the plastic bottles of water we purchase typically don't release bad stuff, what are the consequences of dissolution of materials from the bottle if the bottle is subject to high temperatures (like being left on under the windshield on a sunny day) or left on the back seat for weeks at a time.

Is there a solution to this problem? I hate to say it, but microplastics will be with us forever and their presence might be one of the geological evidences to say that we are now in the Anthropocene time period. We can begin to minimize them though, by going back to practices of our ancestors, milk in glass bottles, flour in cloth bags. At least with glass bottles we could build our homes and with cloth flour bags, sew our clothes. And, when you go out for a hike or walk, carry your water in your own water bottle. Avoid buying water in plastic bottles.

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