Microplastics

Plastic Microbeads in the Great Lakes

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Photo: 5Gyres.org

For years people have worried about the environmental impacts from plastics left behind in the oceans and Great Lakes. Pictures of birds tangled in six-pack rings or turtles choking on plastic bags have documented the danger of discarded plastics that linger in the environment. Recently, attention has turned to the Great Lakes and small plastic particles and microbeads that have been found there. Some plastic particles result from the breakdown of larger plastic items, but others are small plastic spheres known as microbeads.

These minute plastic beads are typically used as scrubbing agents or exfoliants in personal care products. They are often brightly colored and can been seen suspended in the body washes, facial scrubs and toothpastes that contain them. As these products are used by consumers, microbeads are rinsed off and go directly down the drain with water that eventually makes its way to waste water treatment plants. Although some of the particles are captured through treatment, many are not and sewage treatment overflows can also dump these microbeads directly into the ecosystem.

Although harmless in appearance, microbeads have the potential to cause environmental damage. Some of the microbeads are about the size of certain fish eggs, so these small plastic particles can be ingested by Great Lakes fish and other aquatic organisms. Once eaten the plastic material could deprive these organisms of nutrients supplied by food or possibly get lodged in their stomachs or digestive systems. Additionally, plastics can absorb toxins, such as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), making these harmful substances more readily available within the food web. These toxins remain in fish where they can move up the food chain, as smaller fish are eaten by larger predators.

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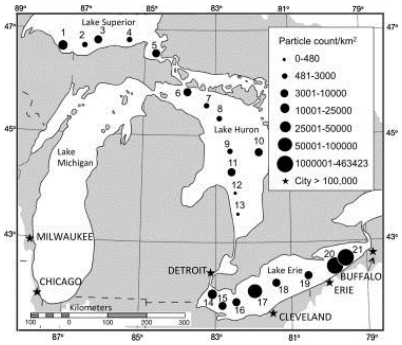

Figure: Microplastic pollution in the surface waters of the Laurentian Great Lakes

Fisheries scientists have found plastic particles in Great Lakes fish, but microplastics have not been a focus of study. Research is underway to determine the extent of the environmental threat from microplastics like microbeads, although scientists have already proven that toxic chemicals such as PAHs and PCBs can damage DNA and cause neurological damage in aquatic animals.

The use of microbeads in personal care products has become increasing more popular. Walk down a drug store or supermarket isle featuring skin care products and it is easy to find many types of facial scrubs, pore cleaners and body washes that contain these colored microbeads including bright blue, purple or orange spheres. Each container can hold thousands of these microbeads that can eventually make their way out to the aquatic ecosystem.

Consumers can play an active role in reducing the threat posed by these micro-plastics by not purchasing products that contain the microbeads, or list that “polyethylene” or “polypropylene” in the ingredients. Products that feature natural exfoliates, such as sea salt, oatmeal or crushed apricot or walnut shells can be used in place of those containing plastic spheres. Fortunately, some companies, such as Johnson & Johnson, Proctor and Gamble and Colgate-Palmolive, have agreed to phase out microplastics in the near future.

New York is currently working on legislation to ban the production, manufacture, distribution and sale in the state of any beauty product, cosmetic or other personal care product containing plastic particles less than 5 millimeters in size.

Research conducted in 2012 and 2013, by Dr. Sherri Mason from SUNY Fredonia and her colleagues, has found microplastics in waters of each of the Great Lakes. Researchers dragged a floating manta trawl net along the surface of the water which captured anything larger than a third of a millimeter in diameter, including plastic, plankton, fish and plants. The scientists found that the concentration of plastic particles increased as they sailed from Lake Superior to Lake Huron to Lake Erie to Lake Ontario.

This seems logical, since water flows from one lake to another, but the researchers were surprised by the amount of plastics found in Lakes Erie and Ontario. Dr. Mason has noted that these lakes contain some of the highest concentrations of plastic pollution anywhere in the world.

Their research paper, "Microplastic Pollution in the Surface Waters of the Laurentian Great Lakes," published in December 2013 in the scientific journal *Marine Pollution Bulletin*, documents the existence of microbeads in three of the Great Lakes. Subsequent research has found microbeads in Lake Michigan and Lake Ontario, posing a threat for all the lakes.

During their 2012 sampling over the 21 sites, the researchers found as many as 450,000 particles per square kilometer, with an average of 43,000 particles per square kilometer. Most of these particles were less than one millimeter in size. Afterwards, the samples were examined using scanning electron microscopy (SEM) to differentiate the plastic spheres from other materials. Many of the particles the research team found were perfectly spherical plastic balls, leading to the conclusion that microbeads from personal care products were prevalent in their samples.

Unfortunately, there is no way to remove microplastics from the Great Lakes once they are released. Even if some filtration system was developed, there is no feasible way to separate the microbeads from valuable phytoplankton and zooplankton necessary for productivity in the lakes. The only way to stop the threat from microplastics is to prevent them from entering the ecosystem and consumers can help by selecting products that do not contain them. New York Sea Grant is dedicated to informing the public about such ecosystem threats as microplastics and microbeads.

To read the entire journal article,
http://www.sciencedirect.com/science/article/pii/S0025326X13006097.