

Tiny bits of plastic pose big threat



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Tuesday, June 24, 2014 - 09:00

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The Straits Times

Tiny, innocuous-looking nibs of plastic, used in facial scrubs, soaps, toothpaste and cosmetics, are posing a big environmental threat.

These minute plastic microbeads, as they are known, have surfaced everywhere: from Singapore's coastal waters to pristine-looking Swiss lakes and even Arctic sea ice, and can carry poisons that get into the food chain.

The plastic pollution is washed down the drain, evades filters in wastewater treatment plants and flows into waterways, warned New York Attorney-General Eric Schneiderman recently.

"They serve as little toxin sponges. They soak up toxins and when the fish eat them, the toxins stay in the fish.

These can cause cancer, these can cause birth defects for folks who eat that fish.

These are a serious, serious health threat that we need to stop," said Mr Schneiderman, who is pushing for a Microbead-Free Waters Act in New York State.

Although microbeads have been a common ingredient in consumer products for years, their potentially disastrous impact on oceans and waterbodies has come under scrutiny only relatively recently.

Overseas, environmentalists have had some success in pushing for new laws to guard against the hidden menace.

Earlier this month, Illinois became the first American state to ban the use of microbeads in the manufacture and sale of personal care products; its legislation will take effect in 2017. Other US states, as well as some countries in Europe such as the Netherlands, are inching towards similar bans.

National University of Singapore civil and environmental engineering researcher Jeffrey Obbard, who has studied the presence of microplastics over the last decade or so, says tiny plastic fragments can now be found in mangrove sediments, beach sand, seawater and drainage canals all over Singapore.

The US National Oceanic and Atmospheric Administration defines microplastics as plastics less than 5mm in diameter, although many are much tinier.

Microbeads come under this group.

Face scrubs and products used for air-blasting are the primary source of the tiny beads, while other microplastics often come from plastic debris that is slowly worn down and degraded, breaking up into ever-smaller fragments.

Marine animals can ingest microplastics by accident, with repercussions up and down the food chain.

Researchers from the University of Exeter in England have found that marine lugworms - whose coiled castings can be seen in little piles on beaches at low tide - eat less when ocean

sediments are highly polluted with microplastics.

Not only are the beads themselves harmful - causing physical blockage of or damage to feeding appendages and digestive tracts - but also their ability to absorb toxins poses an even greater threat.

Microbeads can attract and accumulate chemicals such as cancer-causing polycyclic aromatic hydrocarbons created through fossil-fuel burning; polychlorinated biphenyls, a flame retardant; and dichlorodiphenyltrichloroethane or DDT, a pesticide.

When a creature at the bottom of the food chain such as a mussel or worm swallows the fragments, these chemicals get into its body and affect their health, as University of Plymouth scientists found last year. Chemicals can then accumulate further up the food chain as these creatures are eaten by fish or birds.

Eventually the toxins could make it all the way to our dinner tables, when people eat the poisons built up in bigger fish such as tuna and shark.

Although the relationship between a microbead's size and its environmental impact has not been fully studied, Associate Professor Obbard says studies done with his students a decade apart have found that this pollution is present, and increasing, all over Singapore.

Plastic particles were detected in beach sediment at four of seven beaches - St John's Island, Pasir Ris, East Coast Park and Kallang River, in seawater at the Republic of Singapore Yacht Club and Kranji, and in all seven mangrove habitats sampled at Berlayar Creek, Sungei Buloh, Lim Chu Kang and Pasir Ris.

While little work has been done on what level of microplastic might be hazardous, scientists are concerned because it is so widespread. At the top of the scale, researchers from the State University of New York, Fredonia, have found 1.1 million plastic particles per sq km in North America's Lake Ontario - rivaling the highest concentrations found in the world's ocean "garbage patches" where waste plastics collect.

Microplastics are present in the Great Lakes in the United States because they are small enough to slip through some of the area's water treatment systems.

While there is no specific legislation banning the use of microplastics in Singapore, water agency PUB says the island's treatment processes clump microplastics together with other impurities, which then sink and are filtered out.

In the NEWater microfiltration process, all particles down to 0.1 micron in size - smaller than a dust speck or a cornstarch particle - are removed. The smallest microbeads that have been detected are 10 times bigger.

Prof Obbard says the most likely source of microplastics in Singapore is general plastic waste that is ground down to small bits in the sea, rather than consumer products. With regard to the US legislation on microbeads, he notes that it would make good sense if Singapore follows suit, for the added protection of its waterways and marine environment.

Groups like the International Coastal Cleanup Singapore have worked for decades to scrub coastlines of plastic waste that breaks down into these minuscule fragments. But there is only so much a clean-up crew can do.

The best way to tackle the problem is at its source, which is why environmental groups like 5 Gyres in the US have pushed legislators and consumer companies to get rid of the microbeads for good.

In response, major producers of consumer products including Johnson & Johnson, L'Oreal and Procter & Gamble have said they aim to phase out the microbeads over the next few years. These beads are typically made from polyethylene or polypropylene.

A Procter & Gamble spokesman told The Sunday Times that the company will discontinue its use of polyethylene microplastic beads in skin exfoliating personal care products and toothpaste as soon as alternatives were approved.

"Although we currently cannot give brand-specific details or timings, we expect (them) to be out of all brands globally within very few years, by 2017 at the very latest."

And L'Oreal says it is looking for microbead alternatives like mineral particles or fruit seeds, and weighing the efficacy, safety, sustainable sourcing and overall cost of these. Consumers have a role to play, says International Coastal Cleanup Singapore coordinator N. Sivasothi, who is with the NUS Department of Biological Sciences.

"You can't really address an unseen threat with a clean-up... Yes, technically microplastic pollution stems from improper disposal of plastic waste," Mr Sivasothi says. But people should be conscious of what's in the products they use. "Everything you consume creates an impact somewhere."

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THE STRAITS TIMES

This article was first published on June 22, 2014.

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