

Hard plastics decompose in oceans, releasing endocrine disruptor BPA

23 March 2010



Organisms live off of the decomposing epoxy and polyurethane plastic paint used to seal the hull of this ship. Credit: Katsuhiko Saido

Scientists today reported widespread global contamination of sea sand and sea water with the endocrine disruptor bisphenol A (BPA) and said that the BPA probably originated from a surprising source: Hard plastic trash discarded in the oceans and the epoxy plastic paint used to seal the hulls of ships.

"We were quite surprised to find that polycarbonate plastic biodegrades in the environment," said Katsuhiko Saido, Ph.D. He reported on the discovery today at the 239th National Meeting of the American Chemical Society, being held here.

Saido and Hideto Sato, Ph.D., and colleagues are with Nihon University, Chiba, Japan.

"Polycarbonates are very hard plastics, so hard they are used to make screwdriver handles, shatter-proof eyeglass lenses, and other very durable products. This finding challenges the wide public belief that hard plastics remain unchanged in the environment for decades or centuries. Biodegradation, of course, releases [BPA](#) to the environment."

The team analyzed sand and seawater from more than 200 sites in 20 countries, mainly in Southeast

Asia and North America. All contained what Saido described as a "significant" amount of BPA, ranging from 0.01 parts per million (ppm) to 50 ppm. They concluded that polycarbonates and [epoxy resin](#) coatings and paints were the main source.

In research reported at the ACS's August 2009 National Meeting, Saido and colleagues first busted the myth of the everlasting quality of plastics. They revealed that light, white-foamed plastic decomposed rapidly at temperatures commonly found in the oceans. In decomposing, that plastic releases potentially toxic substances. In the new report, Saido's group now has added hard plastics and hard epoxy resins -- to the plastics that decompose under conditions commonly found in the oceans. Millions of gallons of epoxy resins are used each year to seal the hulls of ships, protecting them from rust and fouling with barnacles and other deposits.

"When epoxy resin breaks down, it releases BPA, a typical endocrine disruptor," Saido explained. "This new finding clearly demonstrates the instability of epoxy, and shows that BPA emissions from epoxy do reach the ocean. Recent studies have shown that molluscs, crustaceans and amphibians could be affected by BPA, even in low concentrations."

He said that waste plastics are finding their way into the environment through littering, and also may be carried by water into the oceans, spreading this pollution widely. Each year as much as 150,000 tons of plastic debris wash up on the shores of Japan alone, Saido said. Vast expanses of waste, consisting mainly of plastic, float elsewhere in the oceans. The so-called Great Pacific Garbage Patch between California and Hawaii was twice the size of Texas and mainly plastic waste. Plastics are, in fact, the main source of garbage in marine debris, according to Saido. "This process is expedited by the low temperatures at which plastic degradation can occur, temperatures present in oceans," he

added.

"Marine debris plastic in the ocean will certainly constitute a new global [ocean](#) contamination for long into the future," Saido predicted

Provided by American Chemical Society

APA citation: Hard plastics decompose in oceans, releasing endocrine disruptor BPA (2010, March 23) retrieved 17 October 2019 from <https://phys.org/news/2010-03-hard-plastics-decompose-oceans-endocrine.html>

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