

Plastics in oceans decompose, release hazardous chemicals, surprising new study says

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A boy in Japan points out Styrofoam debris from the ocean. Credit: Katsuhiko Saïdo

In the first study to look at what happens over the years to the billions of pounds of plastic waste floating in the world's oceans, scientists are reporting that plastics -- reputed to be virtually indestructible -- decompose with surprising speed and release potentially toxic substances into the water.

Reporting here today at the 238th National Meeting of the American Chemical Society (ACS), the researchers termed the discovery "surprising." Scientists always believed that plastics in the oceans were unsightly, but a hazard mainly to [marine animals](#) that eat or become ensnared in plastic objects.

"Plastics in daily use are generally assumed to be quite stable," said study lead researcher Katsuhiko Saïdo, Ph.D. "We found that plastic in the ocean actually decomposes as it is exposed to the rain and sun and other [environmental conditions](#), giving rise to yet another source of global contamination that will continue into the future."

He said that [polystyrene](#) begins to decompose within one year, releasing components that are detectable in the parts-per-million range. Those chemicals also decompose in the open water and inside marine life. However, the volume of plastics in the ocean is increasing, so that decomposition products remain a potential problem.

Each year as much as 150,000 tons of plastic debris, most notably Styrofoam, wash up on the shores of Japan alone, Saïdo 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.

Saïdo, a chemist with the College of Pharmacy, Nihon University, Chiba, Japan, said his team found that when plastic decomposes it releases potentially toxic bisphenol A ([BPA](#)) and PS oligomer into the water, causing additional pollution. [Plastics](#) usually do not break down in an animal's body after being eaten. However, the substances released from decomposing plastic are absorbed and could have adverse effects. BPA and PS oligomer are sources of concern because they can disrupt the functioning of hormones in animals and can seriously affect reproductive systems.

Some studies suggest that low-level exposure to BPA released from certain plastic containers and the linings of cans may have adverse health effects.

Saïdo described a new method to simulate the breakdown of plastic products at low temperatures, such as those found in the oceans. The process involves modeling plastic decomposition at room temperature, removing heat from the plastic and then using a liquid to extract the BPA and PS

oligomer. Typically, he said, Styrofoam is crushed into pieces in the ocean and finding these is no problem. But when the study team was able to degrade the plastic, it discovered that three new compounds not found in nature formed. They are styrene monomer (SM), styrene dimer (SD) and styrene trimer (ST). SM is a known carcinogen and SD and ST are suspected in causing cancer. BPA and PS oligomer are not found naturally and, therefore, must have been created through the decomposition of the plastic, he said. Trimer yields SM and SD when it decomposes from heat, so trimer also threatens living creatures.

Source: American Chemical Society ([news](#) : [web](#))

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