

Fact Sheet: A Summary of the Literature on the Chemical Toxicity of Plastics Pollution on Aquatic Life and Aquatic-Dependent Wildlife

Summary

EPA has published a white paper that describes current science literature on the toxic effects of plastics on aquatic life and aquatic dependent wildlife. This white paper seeks to identify a state of the science on the toxic effects of plastics and their associated chemicals on aquatic dependent wildlife and aquatic life. This report identifies opportunities for research to further our understanding of the potential toxic impacts of plastic ingestion throughout the food web.

Background

Plastic particles are generally the most abundant type of debris encountered in the marine environment with estimates suggesting that plastics comprise between 60% and 80% of total marine debris.

The effect of plastic on aquatic species is not well understood beyond the obvious physical impacts. Plastic debris may be a source of chemicals to the aquatic environment by leaching chemical ingredients used in plastic production. They can also be a “sink” because contaminants in the environment will attach (sorb) to the plastic and concentrate there. Once plastic is ingested, there is the potential for these chemicals to accumulate in organisms and cause toxic effects.

Key contaminants detected in plastics in the aquatic environment include: phthalates, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs),

polybrominated diphenyl ethers (PBDEs), alkylphenols, bisphenol A (BPA), and metals (e.g., cadmium, zinc, aluminum).

How does Plastic Enter the Water

The amount of plastic debris, such as plastic bags and microbeads, entering marine and freshwater environments has increased significantly since the mass-production of plastics began in the 1940s and 1950s.

Plastic debris originates primarily from land-based activities including landfills and littering. Sea-based sources of plastics include commercial and recreational fishing vessels, barges, recreational boaters, oil and gas platforms, and aquaculture farms.

Plastics can be transported to freshwater and marine environments via streams and rivers, stormwater and wastewater discharges, littering and improper disposal along shorelines, wind, and extreme weather events.

What is the Impact of Plastics on Aquatic Species?

Aquatic species can become entangled or smothered by plastic in the aquatic environment. Many species eat plastic, which may lead to the animal’s death directly or indirectly because of poor nutrition and dehydration.

When an animal eats plastic the chemicals associated with the plastic have the potential to accumulate and cause toxic effects. Some studies

suggest that plastics and their associated chemicals can have impacts such as contributing to liver issues, reduced feeding, and compromised immunity. Additional research is needed to learn the extent to which plastics transfer contaminants to organisms, as well as the toxic impacts of plastic ingestion.

Where can I find more information?

Please contact Christine Bergeron for more information on this paper:

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View on the web:

<https://www.epa.gov/wqc/aquatic-life-ambient-water-quality-criteria>

For additional information on EPA efforts regarding plastic pollution, visit EPA's Office of Water Trash Free Waters Program (<https://www.epa.gov/trash-free-waters>) which conducts research, outreach, and education for state and local governments, the private sector, and the general public on ways to reduce and prevent plastic and other debris from entering the aquatic environment.
