ADEQ Arizona Department of Environmental Quality

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FACT SHEET

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Bioaccumulation in Fish

What is bioaccumulation?

Bioaccumulation is the gradual buildup of substances, such as mercury or other chemicals, in the body of an organism. These chemicals will not break down in the body or are not able to be excreted. This will cause the chemical to accumulate over time.

What are the impacts of bioaccumulation?

For fish, bioaccumulation of chemicals can be harmful to the health of the fish, impacting their growth and development and ability to reproduce. These harmful chemicals include, but are not limited to, mercury, selenium, polychlorinated biphenyls (PCBs), and per- and polyfluorinated substances (PFAS). For humans, bioaccumulation of chemicals from eating fish can impact our health, especially in vulnerable populations such as young children and pregnant women. Toxic chemicals are associated with a range of adverse human health effects, including effects on the nervous system, reproductive and developmental problems, cancer, and genetic impacts. Health impacts are not immediate, but may develop over time.

Where do these chemicals come from?

Chemicals come from local sources such as improperly stored wastes, abandoned dumps, and legacy mine sites. Chemicals can also be carried in the air and deposited in an area from sources around the world in a process called atmospheric deposition. Some chemicals could be from historic sources, such pesticides that have been banned for use. Although not manufactured anymore, these historic chemicals can be present in the environment for long periods of time because they don't break down easily.

How can these chemicals be removed from the environment?

For drinking water, there are numerous treatment options. Public drinking water systems are required to treat and test their water for a variety of harmful contaminants. Wastewater treatment plants are also required to treat water before discharging into lakes or streams. For surface and groundwater, once these chemicals are in the environment they are difficult to remove. Some chemicals can break down over time, but some may take many years or decades. Other chemicals are more persistent and may never break down.

What leads to higher bioaccumulation in certain fish?

Larger fish, bottom feeding fish, and those that eat other fish accumulate more contaminants and may need to be avoided. Larger fish are generally older fish, which means there is more time to bioaccumulate chemicals in their tissues. For bottom feeding fish, pollutants can sink to the bottom of a lake or stream where they are eaten by these fish. Fish that eat other fish, especially bottom feeders, bioaccumulate mercury in their tissue at a higher rate as well.

What are examples of bioaccumulation in fish?

Mercury from coal fired power plants is deposited across the globe. As a result, it is common to find mercury in fish populations around the world. The mercury is taken up by bacteria and phytoplankton in the water. Smaller fish eat the bacteria and phytoplankton; then larger fish eat the smaller fish and so on. Over time, the mercury bioaccumulates in the fish tissues of older fish or fish higher up on the food chain.

How much fish is safe to eat?

The U.S. Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) developed advice for fish consumption. Generally, EPA and FDA advise adults to eat two or three servings per week of fish that have lower bioaccumulation rates. One serving of fish is four ounces. Fish with higher bioaccumulation rates can be consumed, but the EPA and FDA recommend limiting consumption. Pregnant women and parents of young children should consult EPA and FDA recommendations before eating fish. If eating fish caught from a stream or lake, check to see if there is a specific advisory for the fish in that waterbody.

Where can I find more information on the dietary guidelines for fish consumption?

You can find more information at:
epa.gov/fish-tech/epa-fda-advice-about-eating-fish-and-shellfish

How can I find out about fish consumption advisories in Arizona?

You can find information at azdeq.gov/fca
Bioaccumulation Infographic: static.azdeq.gov/wqd/fa/bio_infographic.pdf

Arizona Game and Fish Department

azgfd.com/fishing-2/fish-consumption-advisories/