

General Dioxin Information

What are dioxins?

Dioxins are a group of chemicals with similar structures and biological effects. They occur naturally and are also made by people unintentionally. They tend to stick to soil/sediment particles and do not break down easily in the environment. So, they're found everywhere. They're very stable and are easily absorbed by fat tissue.

Where do dioxins come from?

Dioxins can be formed during industrial processes such as burning saltwater-soaked wood for fuel, waste incineration, and certain types of chemical manufacturing. Other kinds of burning can also create dioxins. Burning includes home burn barrels, fireplaces, wood stoves, and natural burning, such as brush and forest fires.

What is meant by "natural background" and "current background" for dioxins?

The term "natural background" for dioxins means naturally produced dioxins, formed by things like brush and forest fires. The term "current background" refers to the level of dioxin in the environment today, mostly from man-made sources. Dioxin levels in the environment have been declining for the last 30 years due to reductions in man-made sources.

Are children more at risk to dioxin exposure?

Children, including infants who are nursing, could have a higher level of exposure to dioxin because:

- Children are smaller and receive higher doses of chemical exposure per body weight.
- Children are more vulnerable to toxic exposures as their bodies grow and develop.

Is the level of harm the same for the different forms of dioxins?

No, the level of harm is different because each form has a different level of toxicity. For example, 2,3,7,8-Tetrachlorodibenzo-p-Dioxin commonly known as TCDD is the most toxic form of dioxin. Yet dioxins are most often found in mixtures rather than as single compounds in the environment. Toxicity depends on the type of dioxin and the amounts that are present.

Are dioxins carcinogenic compounds?

According to the World Health Organization, dioxins and dioxin-like compounds are classified as likely to cause cancer in people.

Dioxins and Oakland Bay

How can dioxins affect my health?

Exposure to elevated amounts of dioxin may increase the risk of certain cancers. Some non-cancer health effects associated with dioxin exposure are immune system and reproductive system problems. Those effects have been found in animals and humans exposed to levels many times higher than those found in the sediments at Oakland Bay. The most common health effect in people exposed to large amounts of dioxin is chloracne. Cases of chloracne have typically been the result of accidents or big dioxin contamination events. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other effects of exposure to very large amounts of dioxin include skin rashes, skin discoloration, excessive body hair, and possibly mild liver damage.

Are the dioxin levels in Oakland Bay sediments harmful?

Based on a preliminary review of the sediment data and our experience with other Puget Sound sites (such as Budd Inlet and Rayonier Mill), the Department of Health believes it is unlikely that people will experience health effects from dioxin in sediments and water in Oakland Bay. We will be conducting a sediment health consultation and recommend collecting fish/shellfish tissue data, which will allow us to make a more definite statement.

What is the main source of exposure to dioxins for most people?

People can be exposed to dioxins through contaminated foods, drinking water, inhaling, and skin contact. For chemicals that are persistent and build up over time, like dioxins, contaminants in food are the primary source of exposure. Meat, dairy products, and fish contribute more than 90 percent of the dioxin intake for the general public. So, everyone has some dioxin in their body. Yet for most, it's not life threatening — health risk depends on the amount and length of time a person is exposed. Studies have shown that gut tissues in certain marine organisms (such as squid and the Pacific fish saury^a) occasionally contain high levels of dioxins. Eating gut tissues may greatly increase the dietary intake of dioxins.¹ Dioxins tend to build up in lipid-rich (fatty) tissues or organs of fish, such as the liver. Since shellfish do not contain much lipid-rich tissue, the Department of Health believes it is unlikely that shellfish in Oakland Bay will contain levels of dioxin that could harm people's health.

How are people exposed to dioxins in Oakland Bay?

The primary way people are likely to be exposed to dioxins in Oakland Bay is eating fish or shellfish which may contain high levels of dioxin. While the Department of Health believes it's unlikely that dioxin contamination of shellfish will be a health risk, we recommend fish and shellfish sampling at Oakland Bay.

^a The Pacific Saury is a fish with a small mouth and elongated body. This fish is a food source in some Asian cuisines and is also known as mackerel pike.

What have past studies shown about the levels of dioxins in sediments and/or shellfish in the Puget Sound?

Several studies across Puget Sound have identified dioxins in surface^b sediment at levels ranging from 0.16 to 97.6 parts per trillion (ppt) TEQ^c.^{2,3,4,5} Dioxin in Budd Inlet sediments^d were found at levels as high as 230 ppt.^{6,7} Dioxins have also been sampled in shellfish tissue across Puget Sound. Some levels range from 0.1 to 5.6 ppt total dioxins. The higher levels (such as the 5.6 ppt value) are primarily in ghost shrimp, which probably aren't eaten by consumers.² Based on previous Department of Health studies, the concentrations of dioxins in shellfish are low and it's unlikely that people will experience harmful health effects at these levels.

What is the level of risk for workers who might be exposed to dioxins?

Several studies have suggested that workers exposed to high levels of dioxins over many years^e may have an increased risk of cancer. Studies have also shown an increased risk of cancer, reproductive, or developmental effects^{8,9} from long-term exposure to dioxins. However, a preliminary review of the Oakland Bay sediment data suggests dioxin levels are low and it is unlikely there will be health impacts to workers.

Will the Department of Health's evaluation provide information about health risks from sediment dioxins?

Yes. The Department of Health will evaluate whether contaminants found in the sediment can harm the health of people who may come into contact with the sediment, swim, harvest fish or shellfish, and play on the shoreline of Oakland Bay. The department will also evaluate shellfish and/or fish data once collected, to evaluate the level of potential harm to human health from consumption of fish and shellfish.

Can we continue with recreational activities in Oakland Bay (such as walking on beach, boating, fishing, playing in sand)?

Yes. Existing data suggest there is little risk from recreational contact with Oakland Bay sediments. The Department of Health Office of Shellfish and Water Protection recommends that people not harvest or eat fish or shellfish from Shelton Harbor and/or other areas that are prohibited for harvest because of bacterial pollution. If you're concerned about contact with sediments, the Department of Health recommends that you rinse your hands and feet with clean, potable water after recreational contact with the sand, sediment, and water from this area. The Department of Health is not currently recommending any restrictions on shellfish harvesting in Oakland Bay other than the existing closure in Shelton Harbor.

^b Surface sediment samples taken between 0-10 cm depth.

^c TEQ refers to Toxic Equivalence. Scientists use the term toxic equivalency factor (TEF) to compare the toxicity of different types or mixtures of dioxins to the toxicity of 2,3,7,8-TCDD, which is the most toxic.

^d Subsurface sediment samples taken between 3-4 feet depth

^e The length of time can be over 30 to 70 years based on the level of exposure and how often people are exposed in the workplace (i.e., every day during 8 hour period five days/week).

What can people do to reduce their risk of exposure to dioxin from ingestion?

There are several steps you can take to reduce your dioxin exposure:

- Reduce your intake of animal fats (meat, milk)
- Eat a balanced diet, including an adequate amount of fruits, vegetables, and cereals
- Teach children not to eat sand or dirt

How can I keep my family safe from possible sediment pollution?

You can reduce exposure to contaminants in soil or sediment by following a few simple steps.

- Wash your hands and face before eating and after working or playing in soil/sediment. Use a scrub brush to clean dirt under your fingernails.
- Wash children's toys that may come into contact with beach sediments.
- Remove shoes before entering the house. Place a "wipe-off" mat outside entrances.
- Vacuum several times a week. Use a bag designed to filter "allergens" or a HEPA (High Efficiency Particulate Arrestor) filter. Change the filter bag monthly.
- Keep pets clean. If your pets visit beach areas they can pick up sediments in their fur. Pets can track this dirt inside your home. Wipe-off their fur and paws before they come indoors. Brush and bathe pets regularly.

Where can I find more information?

Department of Ecology -

www.ecy.wa.gov/programs/tcp/sites/psi/overview/psi_baywide.html

World Health Organization - www.who.int/mediacentre/factsheets/fs225/en/index.html

Agency for Toxic Substances and Disease Registry - www.atsdr.cdc.gov/tfacts104.pdf

Environmental Protection Agency - www.epa.gov/pbt/pubs/dioxins.htm

Reference List

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2. Washington State Department of Health. Budd Inlet Health Consultation, Thurston County, Olympia, Washington. 9-30-2008.
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4. Washington State Department of Ecology. Dioxins, Furans, and other Contaminants in Surface Sediment and English Sole Collected from Greater Elliot Bay (Seattle). 6-1-2008. 08-03-017.
5. U.S.Army Corps of Engineers. Maps of Washington State Dioxin TEQs compiled in 2007. 2007.
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7. Washington State Department of Ecology. Sediment Characterization Study Budd Inlet, Final Data Report. 2008.
8. National Research Council (NCR). Health Risks from Dioxin and Related Compounds, Evaluation of the EPA Reassessment. 2001.
9. The National Academies. Health Risks from Dioxin and Related Compounds - Evaluation of the EPA. 2006.