



Persistent Bioaccumulative and Toxic (PBT) Chemical Program

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Dioxins and Furans

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Note: EPA no longer updates this information, but it may be useful as a reference or resource.

What is Dioxin (2,3,7,8-TCDD)?

The term Dioxin is commonly used to refer to a family of toxic chemicals that all share a similar chemical structure and a common mechanism of toxic action. This family includes seven of the polychlorinated dibenzo dioxins (PCDDs), ten of the polychlorinated dibenzo furans (PCDFs) and twelve of the polychlorinated biphenyls (PCBs). PCDDs and PCDFs are not commercial chemical products but are trace level unintentional byproducts of most forms of combustion and several industrial chemical processes. PCBs were produced commercially in large quantities until production was stopped in 1977. Dioxin levels in the environment have been declining since the early seventies and have been the subject of a number of federal and state regulations and clean-up actions; however, current exposures levels still remain a concern.

Why Are We Concerned?

Because dioxins are widely distributed throughout the environment in low concentrations, are persistent and bioaccumulated, most people have detectable levels of dioxins in their tissues. These levels, in the low parts per trillion, have accumulated over a lifetime and will persist for years, even if no additional exposure were to occur. This background exposure is likely to result in an increased risk of cancer and is uncomfortably close to levels that can cause subtle adverse non-cancer effects in animals and humans.

What Harmful Effects Can Dioxin Produce?

Dioxins have been characterized by EPA as likely to be human carcinogens and are anticipated to increase the risk of cancer at background levels of exposure.

In 1997 the International Agency for Research on Cancer classified 2,3,7,8, TCDD, the best studied member of the dioxin family, a known human carcinogen. 2,3,7,8 TCDD accounts for about 10% of our background dioxin risk.

At body burden levels 10 times or less above those attributed to average background exposure, adverse non-cancer health effects have been observed both in animals and, to a more limited extent, in humans. In animals these effects include changes in hormone systems, alterations in fetal development, reduced reproductive capacity, and immunosuppression. Effects specifically observed in humans include changes in markers of

early development and hormone levels. At much higher doses, dioxins can cause a serious skin disease in humans called chloracne.

Where Can Dioxin Be Found?

Dioxins can be commonly detected in air, soil, sediments and food. Dioxins are transported primarily through the air and are deposited on the surfaces of soil, buildings and pavement, water bodies, and the leaves of plants. Most dioxins are introduced to the environment through the air as trace products of combustion. The principal route by which dioxins are introduced to most rivers, streams and lakes is soil erosion and storm water runoff from urban areas. Industrial discharges can significantly elevate water concentrations near the point of discharge to rivers and streams. Major contributors of dioxin to the environment include:

- Incineration of Municipal Solid Waste
- Incineration of Medical Waste
- Secondary Copper Smelting
- Forest Fires
- Land Application of Sewage Sludge
- Cement Kilns
- Coal Fired Power Plants
- Residential Wood Burning
- Chlorine Bleaching of Wood Pulp
- Backyard burning of household waste may also be an important source.

How Are We Exposed to Dioxins?

Most of us receive almost all of our dioxin exposure from the food we eat: specifically from the animal fats associated with eating beef, pork, poultry, fish, milk, dairy products. Most of us get these foods through the commercial food supply. Since most of the meats and dairy products we consume are not produced locally but have been transported hundreds or thousands of miles, the majority of our dioxin exposure does not come from dioxin sources within our own community. Additionally, because we are all being exposed from the same national food supply, we are all receiving a similar exposure with the main difference between individuals being individual food preferences.

Important exceptions to this pattern of general population exposure are individuals who, over an extended period of time, eat primarily locally grown meat, fish or dairy products that have significantly greater dioxin levels than those found in the commercial food supply. Individuals in this situation receive greater exposure and are at greater risk than the general population. These elevated dioxin food levels can be the result of nearby local sources or from past contamination of soil or sediments. Another example of elevated exposure is nursing infants; however, health experts generally agree the overall benefits to infants of nursing far out weigh potential risks.