LOWELL CENTER FOR
SUSTAINABLE PRODUCTION

FACT SHEET

March, 2003

Dioxin

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)

Dioxin is not intentionally manufactured; it is a by-product of combustion and production processes involving chlorine. Dioxin is a known human carcinogen. Human and laboratory research indicates that exposure to dioxin can affect the normal development of the nervous system, functioning of the immune and endocrine systems, and cause birth defects and at low levels affect reproduction. Exposures to high levels of dioxin, occurring through chemical accidents and building fires, can cause painful skin lesions, called chloracne, changes in liver function, increased risk of heart disease and diabetes, and developmental delays.

Health Effects

Dioxin refers to a group of chemical compounds (chlorinated dibenzo-p-dioxins) that share common chemical structures and can cause similar health effects in animals and humans. One particular member of the group, 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is one of the most toxic substances known to science and the toxicity levels of all other dioxins are compared to it.

TCDD is a known human carcinogen associated with non-Hodgkin's lymphoma, multiple myeloma, and soft tissue sarcoma, as well as cancers in the respiratory tract and possibly also the prostate. Long-term exposure has been linked to impairment of the immune and developing nervous systems, as well as endocrine and reproductive function. One study of the population of Seveso, Italy contaminated with dioxin following an explosion in a chemical factory in 1976 found that fewer boys were born to parents who had been exposed to high levels of TCDD. Studies of people occupationally exposed to herbicides contaminated with dioxin found an increased risk of heart disease and diabetes, and people exposed to high levels of dioxin can develop painful skin lesions, called chloracne, and changes in liver and thyroid function.

At low levels of exposure, animal studies show reproductive and developmental effects during critical windows of development. Rats exposed to dioxin *in utero* have decreased sperm counts. Monkeys exposed during pregnancy experience increased spontaneous abortions and the offspring of monkeys exposed before conception, during pregnancy, and while lactating develop learning impairments and impaired social behavior.

Sources

Municipal solid waste incineration, backyard refuse barrel burning, medical waste incineration, secondary copper smelting and cement kilns are the most common sources of dioxin emissions to air in the U.S. When products and materials that contain chlorine, such as polyvinyl chloride (PVC) are incinerated, dioxin compounds can be created and released, particularly if the incinerator is not well-maintained. Other sources of dioxin include chlorine-bleaching of paper and pulp, land application of dioxin-contaminated sewage sludge, and coal-fired power plants.

Dioxins emitted from incinerator stacks and industrial sources are carried through the air and settle on grasses eaten by grazing animals and in bodies of water where fish are exposed. Dioxin enters the human food chain from these sources. Dioxin also can be passed on to a nursing infant; exposure level would depend on the dioxin levels in the mother's milk. People may be exposed to high levels of dioxins as a result of building fires and chemical accidents.

Alternatives

Methods to reduce dioxin exposure involve reducing the use of products whose manufacture, use, disposal, or burning produce dioxins. Alternatives are widely available for many polyvinyl chloride (PVC products). Numerous hospitals have switched to PVC-free medical devices (intravenous tubing and feeding tubes). Several companies, including Seventh Generation, have implemented alternative processes for whitening paper products. Alternatives to backyard burning and incineration of waste (two major sources of dioxin), include composting, recycling and waste segregation, which can greatly reduce dioxin emissions into the air.

References

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Additional Resources

Dioxin Fallout in the Great Lakes: http://www.qc.edu/CBNS/dxnsum.html

Greater Boston Physicians for Social Responsibility (GBPSR): http://www.igc.org/psr

Lowell Center for Sustainable Production—Sustainable Hospitals Project: http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi