Background

Dioxins are a group of 210 chemicals that have similar structures and chemical properties. Dioxins in the environment are usually a mixture of these chemicals. Dioxins are not intentionally produced. There is no known use for dioxins. They are the by-products of industrial and combustion activities. Sources of dioxins include chemical and pesticide manufacture, burning household trash, forest fires, and waste incineration. Dioxins are found at low levels in air, soil, water, sediment (the bottom of rivers, streams, and lakes), and in foods like meats, dairy, fish, and shellfish. The highest levels of dioxins are usually found in soil, sediment, and in animal fat. Much lower levels are found in air and water.

Not all dioxins have the same toxicity. Toxicity is the ability to cause illness and adverse health effects. The most toxic chemical in the group is 2,3,7,8-tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD). Because it is the most toxic, 2,3,7,8-TCDD is the standard to which other dioxins are compared. When other dioxins are measured in the environment, they are converted to a "2,3,7,8-TCDD" equivalent concentration based on how toxic they are compared to 2,3,7,8-TCDD. These converted dioxin levels are then added together to determine the toxic equivalence (TEQ) concentration of the dioxins.

Dioxins in the environment

Dioxins are stable chemicals and can last for many years in the environment. When released into the air, they usually settle out locally. When released into lakes or rivers, most dioxins accumulate in the sediment and can be transported long distances by water currents. In soil, dioxins attach to soil particles and remain for long periods, where they can be re-released into the environment in the future. Burning household trash in your yard can contaminate your soil with dioxins.

Health concerns

People who have been exposed to high levels of dioxins have developed chloracne, a skin disease with severe acne-like pimples. Chloracne can persist for years, sometimes clearing only to recur several years later. Changes in blood and urine that may indicate liver damage have also been seen in some people. Exposure to high concentrations of dioxins may cause long-term alterations in glucose (blood sugar) metabolism and slight changes in hormone levels.

Exposure to low levels of dioxins can cause a variety of effects in animals, such as cancer, liver damage, and disruption of hormones. In many species of animals, dioxin weakens the immune system and causes a decrease in the system's ability to fight infection. In other animal studies, exposure to dioxin has caused reproductive damage and birth defects. Some animal species exposed to dioxins during pregnancy had miscarriages. The offspring of animals exposed to dioxins during pregnancy often had birth defects including skeletal deformities, kidney defects, weakened immune responses, and neurodevelopmental effects.

It is not known whether people exposed to low levels of dioxins will experience the same health effects seen in animal studies. However, based on the available information, dioxins are believed to have the potential to cause a wide range of adverse effects in humans. The U.S. Environmental Protection Agency (EPA) has characterized the mixture of dioxins to which people are usually exposed as "*likely human carcinogens*." The EPA has also characterized 2,3,7,8-TCDD as a "*human carcinogen.*" The U.S. Department of Health and Human Services, National Toxicology Program 9th Report on Carcinogens (January 2001) lists 2,3,7,8-TCDD as a substance "*known to be a human carcinogen*."

Fetuses, infants, and children may be especially sensitive to dioxin exposure because of their rapid growth and development. However, information on the effects of dioxin in children is limited. It is not known if children have experienced adverse health effects as a result of exposure to dioxin. *Although breast milk may be a source of dioxin exposure for nursing infants, overwhelming evidence supports the greater health benefits of breastfeeding in spite of any dioxins present.*

How can I be exposed to dioxins?

The general population is mainly exposed to dioxins through their diet by eating food that contains dioxins. People who eat lots of fish, fatty meats, or high-fat dairy products may be exposed to higher levels of dioxins. People who live near or work at hazardous waste sites containing dioxins, waste incinerators, or manufacturing facilities that produce dioxins as a by-product may have additional dioxin exposures beyond their diet.

Most dioxins taken in by animals, including humans, are stored in fatty body tissues where dioxins may persist for months or years. The half-life for dioxins (the time needed for the body to rid itself of half the contaminants) in humans is 5 to 14 years. Because they remain in the body for a long time, dioxins can cause adverse health effects long after exposures have ended.

Special tests are available to measure dioxin levels in body fat, blood, and breast milk, but these tests are very expensive and are not routinely available to the public.

How can I lessen my exposure to dioxins?

Since the major way dioxins enter our bodies is through the food we eat, this gives us an important opportunity to prevent exposure. Pay careful attention to fish advisories before eating fish from the Great Lakes or from inland lakes and streams. Fish advisories are available free from the Michigan Department of Community Health at 800-648-6942. Trimming fat from meat, consuming low-fat dairy products, and cooking foods in ways that decrease the fat content may also help reduce your level of dioxin exposure.

Do not burn household trash in backyard barrels or wood-burning stoves. Dioxins can be formed in burning trash and could remain in your backyard soil for many years.

Children should not play in soil or sediment near sites of known or suspected dioxin contamination. Children should wash their hands before eating to remove any dirt, and avoid putting toys or objects in their mouths. Clean fill dirt can be added over contaminated dirt in gardens and lawns if dioxin contamination is known or suspected. Care should be taken not to disturb the layer of clean soil covering the contaminated soil.

Has the federal government set standards for dioxins?

The Federal Government has set some specific standards for dioxins in the environment to safeguard the public health. For example, the EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter (ug/L or ppb) of drinking water. The U.S. Food and Drug Administration recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD above 50 parts per trillion. However, recent studies suggest that dioxins may be far more harmful to human health than was previously believed and these standards as well as others set for soil, sediment, and food may change in the future.

Where can I go for more information?

- **Local Health Department**
  See the Blue Pages of your phone book under local and county governments. Ask for the environmental health staff.
- **Michigan Department of Community Health**
  www.mdch.state.mi.us
  1-800-648-6942
- **U.S. Environmental Protection Agency**
  www.epa.gov/ncea/dioxin.htm
- **U.S. Agency for Toxic Substances and Disease Registry**
  www.atsdr.cdc.gov/dioxindt.html

Dioxins Fact Sheet

Michigan Department of Community Health
MDCH

Michigan Department of
DEQ
Environmental Quality

Michigan Department of
AGRICULTURE