

## Health Impacts

### PCBs

- PCBs concentrate in the food web and bioaccumulate in the fatty tissue of fish, wildlife and people. Virtually everyone has PCBs in their bodies. (WWF) High levels of human exposure are primarily through contaminated fish consumption and maternal transfer.
- There are fish consumption advisories for all the Great Lakes due to PCBs. (GW)
- Studies have shown chronic, low-level prenatal exposure to PCBs was associated with neurobehavioral deficits in infants whose mothers consumed contaminated Lake Michigan fish. (LaMP)
- Chronic low level PCB exposures can cause liver damage, reproductive abnormalities, birth defects, immune suppression, neurological and endocrine system disorders, retarded infant development, and stunted intellectual function. (WWF, ATSDR)
- The International Agency for Research on Cancer ranks PCBs as a probable human carcinogen. (WWF) The Department of Health and Human Services (DHHS) has determined that PCBs may reasonably be anticipated to be carcinogens. (ATSDR)

### Chlordane

- Chlordane bioaccumulates in the food chain, concentrating in the fatty tissues of fish. Exposure to chlordane may occur through several routes, including consumption of contaminated fish and other foods, and maternal transfer. (WWF)
- There are fish consumption advisories for Lakes Michigan, Superior and Huron due to chlordane. (GW)
- Chlordane may affect the reproductive ability or causes birth defects or behavioral effects in children exposed before birth or while nursing. (ATSDR)
- Chlordane has been linked to liver and blood disorders, severe neurological effects, and damage to the endocrine and reproductive systems. Effects on the kidneys and on the cardiovascular, respiratory, and gastrointestinal systems have also been observed. (WWF)
- Chlordane is designated a probable human carcinogen by the U.S. Environmental Protection Agency. (WWF)

### DDT

- DDT bioaccumulates in human, animal and fish tissue. Exposure in the Great Lakes region is primarily due to contaminated fish consumption. (WWF)
- Fish consumption advisories due to DDT have been issued for certain Great Lakes tributaries, including the Menominee River in the Lake Michigan Basin. (LaMP)
- DDT has been shown to be a hormone-disrupting chemical that can affect the reproductive and nervous systems. (WWF)
- The U.S. Environmental Protection Agency has identified DDT as a probable human carcinogen, based on laboratory studies. The Department of Health and Human Services (DHHS) has determined that DDT may reasonably be anticipated to be a human carcinogen. (WWF, ATSDR)

## **Mercury**

- Mercury bioaccumulates in the muscular tissue of fish and other animals. Routes of exposure include contaminated fish consumption and maternal transfer. (LaMP)
- There are fish advisories in effect for mercury throughout the Great Lakes including Lake Michigan. (LaMP)
- Effects of fetal exposure include brain damage, mental retardation, in coordination, blindness, seizures, and inability to speak. Children exposed to mercury may exhibit effects on the nervous and digestive systems and to the kidney. (ATSDR)
- Deafness, blindness and death have been associated with long-term consumption of mercury-contaminated fish.
- Nervous system effects include irritability, shyness, tremors, changes in vision or hearing, and memory problems. Mercury may also cause kidney and liver damage. (ATSDR)
- USEPA has concluded that mercury chloride and methylmercury are possible human carcinogens. (ATSDR)

## **Dioxins & Furans**

- Dioxins and furans accumulate in fatty tissues and are magnified up the food web. Exposure can be through eating contaminated fish and other foods and maternal transfer.
- There are fish consumption advisories in effect for dioxins in Lakes Huron and Ontario, as well as tributaries of other Great Lakes. In the Lake Michigan Basin, the Menominee River has a fish advisory for dioxins. (LaMP, GW)
- There is no safe level of dioxins; even concentrations of parts-per-trillion can impact human and animal tissue. Some of the health effects of dioxins occur at levels to which all of us are exposed in our daily lives. Among these low-exposure effects are altered immune function, increased susceptibility to infections, thyroid and liver function abnormalities, weight loss, and disruption of the endocrine system. (WWF, ATSDR)
- Higher levels of dioxin exposure have been linked to severe birth defects, child growth retardation, reduced levels of male reproductive hormones, altered ratios of male to female births, diabetes, and cancer.
- Dioxins are classified by the International Agency for Research on Cancer, the World Health Organization (WHO) and the DHHS as a known human carcinogen. (ATSDR, WWF)

## **Lead**

- Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the immune system.
- Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced

growth in young children. These effects are more common after exposure to high levels of lead.

- In adults, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can cause abortion and damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.
- The Department of Health and Human Services (DHHS) has determined that lead acetate and lead phosphate may reasonably be anticipated to be carcinogens, based on studies in animals. (ATSDR)

### **Cadmium**

- Fish, plants, and animals take in cadmium from the environment. Human exposure may result from inhalation through ambient levels or cigarette smoke or from ingestion of contaminated water, fish, plants, and animals. (ATSDR)
- Long-term exposure to lower levels of cadmium in air, food, or water leads to a build up of cadmium in the kidneys and possible kidney disease. Other potential long-term effects are lung damage and fragile bones. (ATSDR)
- Based upon weak human and strong animal evidence, the U.S. Department of Health and Human Services has determined that cadmium and its compounds may be carcinogenic. (LaMP)

### **Chromium**

- Exposure can be through breathing contaminated air or ingesting food or water contaminated with chromium from soil or sediments. (LaMP)
- The U.S. Department of Health and Human Services has determined that certain chromium compounds are carcinogens. (LaMP)
- Chromium can damage the lungs, and cause allergic responses in the skin or asthma attacks. (ATSDR)

### **Arsenic**

- Arsenic generally bioaccumulates in fish in the less harmful organic form. Human exposure may occur by ingesting contaminated water, soil, or air at contaminated sites.
- High levels of inorganic arsenic in food or water can be fatal. Arsenic damages many tissues including nerves, stomach and intestines, and skin. Breathing high levels can give you a sore throat and irritated lungs.
- Low-level exposure may lead to nausea, vomiting, diarrhea, decreased production of red and white blood cells, abnormal heart rhythm, blood vessel damage, and “pins and needles” sensations in the hands and feet.
- The Department of Health and Human Services (DHHS) has determined that arsenic is a known carcinogen. Breathing inorganic arsenic increases the risk of lung cancer. Ingesting inorganic arsenic increases the risk of skin cancer and tumors of the bladder, kidney, liver, and lung (ATSDR).

### **Hexachlorobenzene**

- HCB has a significant ability to bioaccumulate in fish and wildlife. Exposure in humans is primarily through contaminated food consumption, including fish, dairy products, certain vegetables and meats, and through maternal transfer, including breast milk. (LaMP)
- HCB can damage the liver, thyroid, kidneys, as well as the endocrine, immune, reproductive, and nervous systems. There is evidence of increased susceptibility to infections, immune effects, and decreased survival rates in infants exposed to HCB. (LaMP, ATSDR)
- The International Agency for Research on Cancer designates HCB as a possible carcinogen. The U.S. Department of Health and Human Services (DHHS) has determined that hexachlorobenzene may reasonably be expected to be a carcinogen. (LaMP, ATSDR)

### **Toxaphene**

- Toxaphene bioaccumulates in animals. Exposure may result from eating contaminated animals, particularly fish and shellfish, drinking water from contaminated wells, or ingesting contaminated soil. It has also been found in human breast milk. (WWF)
- There is a fish consumption advisory in Lake Superior due to toxaphene. (GW) With continued atmospheric loadings there is the potential for fish advisories due to toxaphene in Lake Michigan as well. (LaMP)
- Toxaphene has been linked with shortened life span, endocrine disruption, reproductive problems, reduced fertility, and behavioral changes in animals. (WWF)
- Damage to the liver, kidneys, adrenal glands, and the immune system have also been noted in exposed animals, as have birth defects resulting from prenatal exposure. (WWF)
- The U.S. Environmental Protection Agency ranks toxaphene a probable human carcinogen. The Department of Health and Human Services (DHHS) has determined that toxaphene may reasonably be anticipated to be a carcinogen. (WWF, ATSDR)

### **PAHs**

- Routes of exposure include air, water and consumption of contaminated foods, water or milk; Breast milk can be a route of exposure for infants of mothers exposed to PAHs. (LaMP)
- No harmful effects have been proven in humans, although animal studies have shown adverse effects on the reproductive cycle, skin, body fluids, and the ability to fight disease after both short- and long-term exposure. (ATSDR)
- The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens. (ATSDR)
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### **Atrazine**

- Exposure may result from ingesting food and drinking water contaminated with the triazines,
- Harmful health effects include dermatitis and eye irritation. High exposure levels may affect the nervous system.
- USEPA has classified atrazine as a possible human carcinogen. (LaMP)

## **References**

ATSDR: Agency for Toxic Substances and Disease Registry. *ToxFAQs Chemical Fact Sheets*.  
[www.atsdr.cdc.gov/toxfaq.html](http://www.atsdr.cdc.gov/toxfaq.html)

GW: U.S. Environmental Protection Agency. *Deposition of Air Pollutants to the Great Waters – Third Report to Congress*. Office of Air Quality, Planning & Standards. June 2000.  
[www.epa.gov/oar/oaqps/gr8water/](http://www.epa.gov/oar/oaqps/gr8water/)

LaMP: *Lake Michigan Lakewide Management Plan (LaMP 2000)*.  
[www.epa.gov/grtlakes/lakemich/](http://www.epa.gov/grtlakes/lakemich/)

WWF: World Wildlife Federation. *POPs Treaty Factsheets*.  
[www.panda.org/toxics/spotlights/pops\\_factsheets.cfm](http://www.panda.org/toxics/spotlights/pops_factsheets.cfm)