Safe Solutions to Toxic Problems

A guide to eliminating persistent toxic substances from the Lake Superior Basin

Understanding the Persistent Toxic Cycle

Persistent toxic substances are chemicals that can cause disease, cancer, genetic mutations and reproductive problems in living things. These substances do not go away. They remain in the environment for long periods of time. They accumulate in the tissues of plants and animals, particularly those high on the food chain, including people.

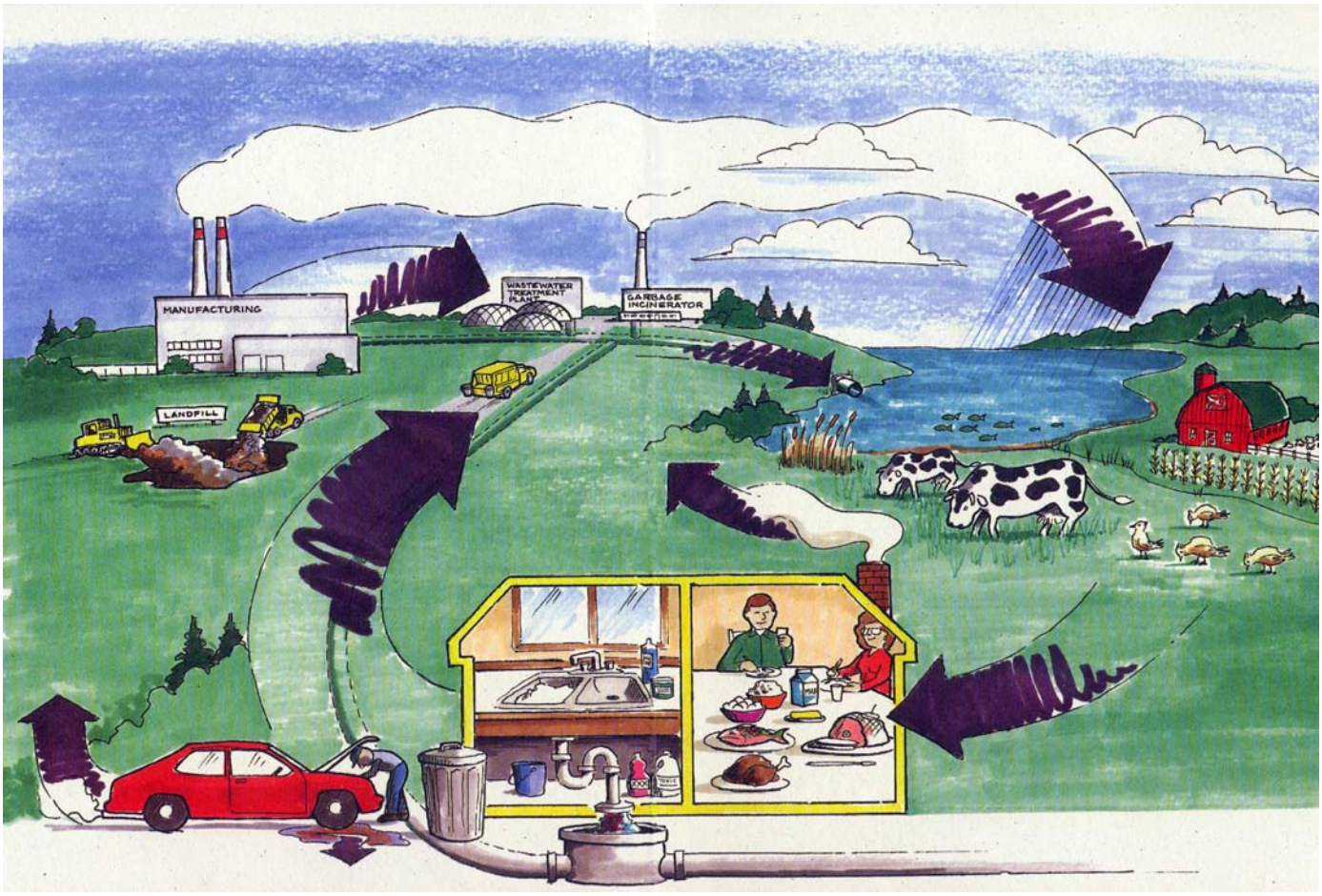
Mercury, Dioxins and Lead are three substances that enter Lake Superior through air emissions, wastewater, pesticide use, and discard consumer products in solid waste. This guide explains the impact of these substances on our environment and some ways we can help to eliminate them from the Lake Superior Basin.

By avoiding products that contain or create toxic substances, and choosing proper disposal methods, we can take important steps to keep the Lake Superior Basin pollution free. The drawing and chart show how mercury, dioxin and lead circulate in the environment. More detailed information can be found in Greater Detail, including solutions to eliminating persistent toxics.

The Western Lake Superior Sanitary District's goal is to achieve zero discharge of persistent toxic substances.

The Persistent Toxic Cycle

	Dioxin	Mercury	Lead
How it gets into the air	Manufacturing and burning of chlorinated products.	Burning of coal, oil, wood, natural gas or mercury-containing garbage. Erosion of rock, volcanic eruption, soil decomposition.	Burning of fuels and items containing lead. Erosion of rocks, blowing of lead dust, manufacturing processes such as smelting.
How it gets into water	Airborne dioxins fall in rain and snow. Dioxins are also discharged by manufacturing leaks and spills.	Airborne mercury falls in rain and snow. Mercury-bearing wastes are discharged into water pd into water.	Airborne lead falls in rain and snow. Lead-containing fluids are dumped and spilled. Leaching from old pipes and solder.
Effect on living things	Interferes with the endocrine gland system, causes cancer, affects reproductive & immune systems	Mercury is a neurotoxin which interferes with the way nerve cells function. It is especially damaging during fetal development and to young children.	Lead poisoning can cause paralysis, brain damage and visual disturbances. Low-level lead exposure in young children and a developing fetus can cause learning deficits, behavioral disorders and growth retardation.
Our contribution to the problem	Purchasing chlorinated products and burning garbage which contains chlorinated products	Use and improper disposal of mercury-containing products	Use, and improper disposal of lead-containing products



MORE DETAIL

DIOXINS

Dioxins are produced when chlorinated products are made and again when these products are burned. The production of dioxins requires heat, organic matter and chlorine. There is no known use for dioxins; they are a waste product.

Incineration, chemical manufacturing, and pulp and paper bleaching are some activities that produce dioxins. Many-weed killers, paper bleached with elemental chlorine and polyvinyl chloride (PVC) plastic are examples of chlorinated products.

The unregulated or inefficient combustion of garbage and medical waste is a major contributor of dioxin to the environment. There are large volumes of PVC plastic and other chlorinated products in these wastes. During the heat of combustion, chlorine undergoes many chemical reactions which may lead to the formation and release of dioxins.

Impact

Dioxins are highly toxic to humans and other animals. Inefficient combustion releases dioxins to the air and they fall to the ground and surface waters with dust and precipitation. Animals consume the dioxin-contaminated water and plants, and the dioxins accumulate in their fat. Human exposure occurs through eating food high in fat,

such as dairy products and beef. In animals, dioxins have been shown to interfere with the endocrine system which produces hormones. Hormones regulate the functions of many organs and influence sexual development and fertility.

Dioxins can cause cancer and have been shown to weaken the immune system and affect reproduction. Dioxins can be transmitted from mother to, child during pregnancy and nursing.

Prevention

Do not dispose of chlorinated products by burning them in a backyard burn barrel or small unregulated garbage burner, such as in a store, hospital or home. The low temperature in these burners will not destroy harmful pollutants and releases dioxin directly to the air. Regulated municipal waste incinerators burn at higher temperatures and contain pollution control equipment to filter out pollutants.

Avoid buying chlorinated products whenever possible.

Some Examples

•Look for the #3 in the recycling symbol on plastic bottle's and jugs. This is PVC plastic and contains chlorine. Choose other plastic containers that are chlorine-free.

• Many plastic items, such as toys or dishware, may not be labeled. Contact the manufacturer to find out what plastics are used in their products.

• Look for the word chlorine or the prefix "chlor" in the ingredient list of chemical products. Choose alternatives to these products.

• Avoid using chemical weed killers that contain chlorine.

There is no treatment process to completely remove dioxins from air emissions. We have to prevent them from entering the waste stream in the first place.

MERCURY

Mercury is a naturally occurring element found in very small amounts in oceans, rocks and soil. It has many useful properties. A liquid at room temperature, it contracts evenly with temperature changes.

Thermometers, switches and thermostats contain mercury. Paints, fungicides and household products make use of mercury's disinfecting properties. Mercury amalgam is used for dental fillings. Highly conductive to the flow of electricity, mercury is used in fluorescent light bulbs and batteries.

Mercury becomes airborne from natural sources when rocks break down, volcanoes erupt and soil decomposes. Large amounts of mercury become airborne when coal, oil, wood or natural gas are burned as fuel or when mercury-containing garbage is incinerated.

Airborne mercury falls with dust and precipitation, contaminating lakes and rivers. Once present in the water, chemical reactions convert mercury to methylmercury. Tiny aquatic

organisms absorb methylmercury. Mercury passes up the food chain and accumulates in the tissues of fish, wildlife and ultimately humans who eat these animals.

Impact

The most likely exposure to mercury is through eating contaminated fish. There is no method of cooking or cleaning fish that will remove mercury. It affects the human brain, spinal cord, kidneys and liver, and interferes with normal fetal development during pregnancy. High levels of mercury in infants can cause mental and physical retardation. Many states have developed guidelines for how often fish from the Great Lakes can be safely eaten.

Wildlife such as loons, eagles, otters, mink and ospreys eat large quantities of fish and incidentally consume mercury. It appears that loons are accumulating mercury to the point that it impairs reproduction. Body tissues in mink and otter populations also contain elevated mercury levels. An excess of mercury can lead to neurological impairment, especially damaging for predators who rely on speed and coordination to obtain food. Unfortunately, wildlife cannot change their eating habits in order to avoid mercury contamination.

Prevention

Choose alternatives to mercury products.

When an item containing mercury becomes waste, dispose of it properly. Contact your local household hazardous waste program to recycle mercury products.

Reduce energy consumption. Coal-burning power plants produce large amounts of mercury pollution. Use energy efficient fluorescent light bulbs and recycle them when spent.

LEAD

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Unique among common metals because of its softness and low melting point, lead is used in solder, leaded glass and storage batteries. Other products which contain lead include gasoline, plumbing, ammunition, paint and plastics. Because of its durability and resistance to corrosion, lead has been used for centuries in plumbing.

The primary source of lead in the environment is from lead emissions into the atmosphere. Although we no longer use leaded gasoline in this country, decades of exposure to emissions from vehicles burning leaded fuel, have contaminated the soil in urban areas. Antifreeze and motor oil used in combustion engines also accumulate lead and contaminate water or soil when disposed of improperly.

Today, lead-based paint is banned for use in homes, but paint from older homes ends up in the soil after years of deterioration or through remodeling or demolition. Commercial and industrial facilities continue to use lead based paint. Lead solder and leaded glass monitors from computers, televisions and other electronic equipment enter the solid waste stream when they become broken or unusable. Incineration or landfilling of this waste puts lead into the environment. Household plumbing may be a source of additional

lead exposure, especially if it delivers soft water. Lead from old pipes or solder joints is dissolved by water with an acidic pH.

Impact

Lead enters your body when you breathe air containing particles of lead-contaminated dust or consume lead contaminated water. It travels through the blood to virtually every organ in the human body. Lead is especially harmful to the central nervous, system *and kidneys.

Children are at risk because they swallow lead when they put toys or objects soiled with lead-containing dirt in their mouths. Pregnant women are vulnerable because lead passes from the mother's bloodstream into the bloodstream of the unborn child. Lead exposure in infants and young children has been shown to decrease intelligence, slow growth and cause hearing problems.

Prevention

Take precautions before doing any renovation or remodeling, which will disrupt painted surfaces in your home. Contact the Department, of Health for guidelines for safe removal of old paint.

Check the basement and garage for cans of old paint. Dispose of old paint through a household hazardous waste collection program.

Recycle or reuse electronic equipment when possible. Many nonprofit or charitable organizations in the community can reuse old computers.

The state of Minnesota mandates recycling lead-acid vehicle batteries, and waste motor oil. Return batteries at any facility that sells vehicle batteries. Recycle waste antifreeze and motor oil at service stations or a household hazardous waste facility. All automotive waste fluids should be managed properly. Contact your local household hazardous waste facility for information.

Choose alternatives to lead products when possible. Imported plastic toys, ceramics and canned goods may contain lead. Some arts and craft activities, such as pottery glazing, and making jewelry or fishing weights may contribute to lead exposure.

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