



Toxic Chemicals What They Are, How They Affect You

U.S. Environmental Protection Agency
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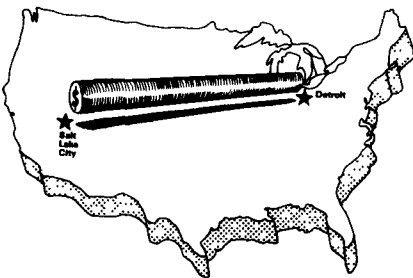
This fact sheet explains what toxic chemicals are, what they're used for, and how they can be harmful. Although here we examine just a sampling of the approximately 60,000 chemicals that are now in the marketplace, this fact sheet will shed light on some of the more common toxic chemicals EPA encounters.

What Does Toxic Mean?

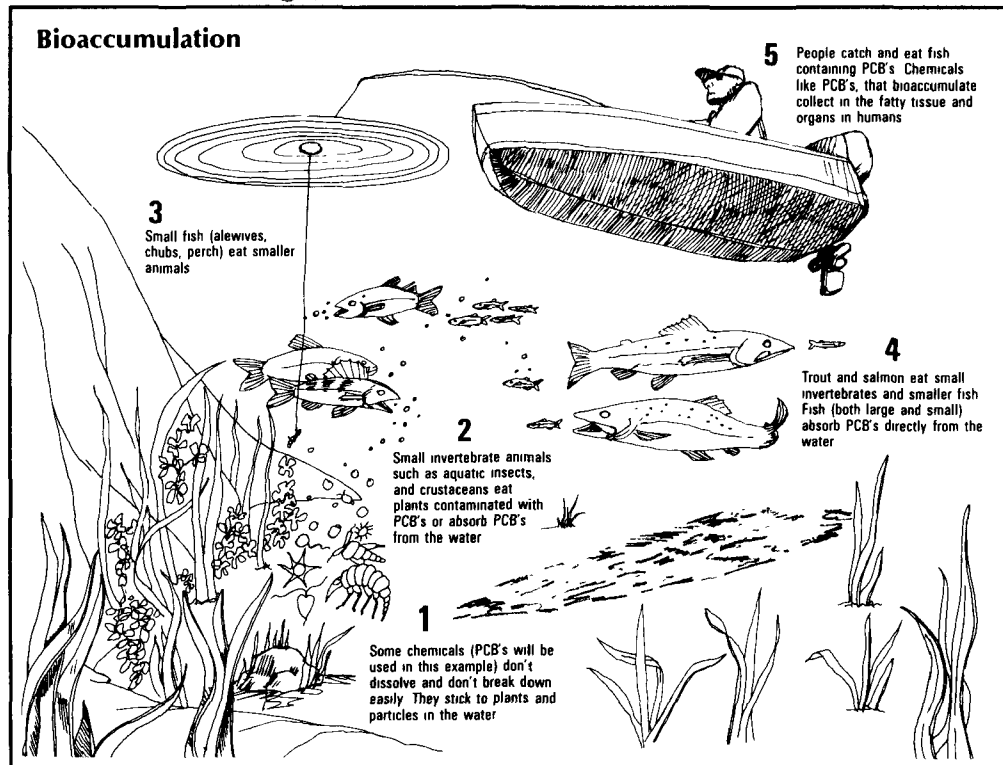
A chemical is toxic if it damages living tissue, impairs the central nervous system, or causes birth defects, illness, or death when eaten, drunk, inhaled, or absorbed through the skin.

How Much Exposure To A Chemical Causes Harm?

It depends on the chemical. The amount needed to trigger a toxic reaction varies with the nature of the substance, the route of exposure, and the length of exposure. Acute toxicity refers to an exposure of short duration. Chronic toxicity refers to repeated or prolonged exposures — often in tiny doses — to substances that in any single exposure would cause little or no harm.



Certain chemicals are so toxic that they are measured in parts per million (ppm) or even smaller parts per billion (ppb). One ppb would be one pound of a chemical in a billion pounds of soil. Or it can be compared to one silver dollar in a roll of



silver dollars stretching from Detroit to Salt Lake City.

But Why Are Such Small Doses Of Some Toxic Chemicals Hazardous?

Besides being poisonous at low levels, PCB's, lead, and various other chemicals are also extremely persistent. That is, they don't break down easily and therefore remain in the environment for years. Prolonged exposure to small doses of such chemicals are thought to cause a variety of health problems, including cancer.

Bioaccumulation

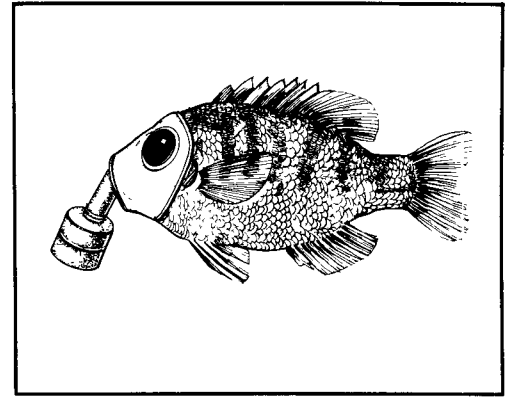
Bioaccumulation is another reason why prolonged exposure to low-level doses can be dangerous. Chemicals such as PCB's and mercury build up in the tissues of humans and animals through the process of bioaccumulation. It works like this: A chemical spilled into a river or lake is ingested and stored by small organisms like plankton; small fish eat the plankton; and larger fish eat the smaller fish. As the process works its way up the food chain, the chemical may become thousands of

times more concentrated in the tissues of the large fish than in the plankton. That's why some fish from parts of the Great Lakes are unsafe to eat.

What Is EPA Doing About Toxic Wastes?

Three major laws help EPA control toxic substances. The **Toxic Substances Control Act (TSCA)** regulates the production of a substance that poses an unreasonable risk to human health or the environment. The **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, commonly called Superfund, enables EPA to address immediate dangers, long-range hazards, and spills at old or abandoned waste sites. The **Resource Conservation and Recovery Act (RCRA)** allows the State and EPA to track hazardous wastes from generation through final disposal. Other laws that also help regulate toxics include the **Clean Water Act, Clean Air Act, Federal Insecticide, Fungicide and Rodenticide Act, and Hazardous Materials Transportation Act.**

Most toxic substances can be handled safely. Depending on the substance, however, certain methods of manufacturing, use, and disposal are preferable over others. High-temperature incineration, for example, is highly effective in destroying PCB's and other toxic chemicals, but not toxic metals such as lead and mercury. Secure, lined landfills are an acceptable disposal option for toxic substances. Here are some of the toxic chemicals EPA often finds when studying or cleaning up a Superfund site.



Asbestos

Asbestos — a building and insulating material widely used for years because of its strength and heat-resisting qualities, has been found to cause asbestosis — a severe lung ailment, certain types of lung cancer, and other respiratory problems. If not completely sealed in a product, asbestos can break into tiny fibers that float almost indefinitely in air. These fibers are smaller and more buoyant than ordinary dust particles and therefore are easily inhaled or swallowed. In 1972, asbestos was banned for use in clothing. In subsequent years it was banned in fire-proofing materials, in electric hair dryers, and in many other products. By 1982, of the 22,723 schools in EPA Region 5 that were inspected for asbestos problems, 4,634 required corrective measures.

Acrylonitrile

Acrylonitrile — a chemical used in the production of synthetic fibers, plastics, and acrylics. In 1980, 1.8 billion pounds were produced in the United States, making it the 42nd highest volume chemical produced in the Nation. Acute symptoms of acrylonitrile exposure are similar to cyanide poisoning: headaches, dizziness, tremors, and jaundice. Long-term exposure to acrylonitrile can cause damage to the liver, the kidneys, and the central nervous system. It's a suspected carcinogen in humans.

Arsenic

Arsenic — a grayish white element found naturally in the environment. Arsenic has been used in the production of boric acid, pharmaceutical products, and pesticides. It is a byproduct of copper, zinc, and lead smelting. Doses taken over long periods can cause birth defects and genetic damage in test animals; there is evidence that it can cause skin and lung cancer in humans.

Benzene

Benzene — used more and more in recent years in the synthesis of chemical compounds and drugs and in the rubber industry. It is also added to gasoline as an octane booster. Eight million tons are produced annually. Benzene is released into the air primarily through the distribution and use of petroleum products. Evidence shows that long-term exposure in the workplace can cause leukemia and that high dosages are fatal. EPA estimates that three-fourths of all Americans have probably been exposed to benzene in varying degrees. Much of the exposure occurs when pumping gas at gasoline stations.

Cyanide

Cyanide — a poison that asphyxiates the cells in the body. Warning signs of cyanide poisoning include dizziness, numbness, rapid pulse, and nausea. A large dose can cause immediate unconsciousness. It is primarily used in the extraction of ore, in electroplating, and in metal treatment. It is also used in fumigation and in the manufacturing of pharmaceuticals.

Dioxin

Dioxin — a generic term for a group of 75 related compounds known as polychlorinated dibenzo-p-dioxins. The most toxic compound of this group is 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD). Nobody produces dioxin on purpose. It is an unwanted but almost unavoidable byproduct that comes from manufacturing several commercial substances, chiefly the pesticide 2,4,5-TCP. Dioxin was also a contaminant in Agent Orange, the defoliant used during the Viet Nam War. Tests on laboratory animals indicate that 2,3,7,8-TCDD is one of the most toxic substances made by man. It is also a suspected carcinogen in humans, although scientists are still mystified by this chemical's effect on the human body. EPA has now begun a national study to determine the extent of dioxin in the environment.

Formaldehyde

Formaldehyde — a colorless, pungent gas used in plastics, plywood, foam insulation products, textiles, embalming fluids, room deodorants, and as a preservative in cosmetics. Prolonged exposure can cause eye irritation, respiratory problems, and fatigue. EPA is currently evaluating formaldehyde and may soon issue regulations to reduce exposure to this chemical.

Leachate

Leachate — a common term when talking about landfills. Leachate is not a specific chemical itself; it's a liquid that has percolated through wastes and contains components of those wastes. For instance, water may mix with leaking wastes inside a landfill, become contaminated, and then seep into the water table, polluting drinking water wells.

Heavy Metals

Cd **Cadmium**—used in electroplating, in the manufacture of batteries, and as a pigment. Chronic exposure to cadmium damages the liver and kidneys. It also has been associated with hypertension. Heavy smoking appears to increase the risk of cumulative toxic effects of cadmium exposure. Studies on animals have shown that cadmium can produce tumors and birth defects.

Cr **Chromium**—used in electroplating, in photography, and as a paint pigment. Acute ingestion of one form of chromium causes hemorrhages of the gastrointestinal tract. Airborne chromium has caused lung and other respiratory cancers in workers who were frequently exposed to it on the job.

PCB's

Polychlorinated Biphenyls (PCB's) — are a family of organic compounds used since 1926 in electric transformers as insulators and coolants, in lubricants, carbonless copy paper, adhesives, and caulking compounds. They are also produced in certain combustion processes. PCB's are extremely persistent in the environment because they do not break down into new and less harmful chemicals. PCB's are stored in the fatty tissues of humans and animals through the bioaccumulation


process. EPA banned the use of PCB's in 1976. In general, PCB's are not as toxic in acute short-term doses as some other chemicals, although acute and chronic exposure can cause liver damage. PCB's have also caused cancer in laboratory animals. When tested, most people show traces of PCB's in their blood and fatty tissues.


Pb **Lead** — a byproduct of metal smelting, it is used in the manufacture of batteries and pigments. It also is added to gasoline to improve octane ratings, although in August 1984 EPA proposed to dramatically reduce the level of lead in gasoline. Exposure to low levels of lead over long periods can cause brain, bone, and neurological damage, and learning disabilities in children. Studies have shown a direct correlation between levels of lead in gasoline and levels of lead in children's blood.


Hg **Mercury**—a silvery, liquid heavy metal found primarily in Spain, Yugoslavia, Mexico, Canada, and Algeria. Mercury is highly toxic and can be absorbed through the skin. It is used in thermometers, batteries, fluorescent light bulbs, pharmaceuticals, and many other products. Mercury bioaccumulates in the tissues of fish, making many larger ones unsafe to eat. Prolonged exposure can cause kidney, brain, and neurological damage.


Chlorinated Organic Compounds


EPA Region 5 has initiated a 10-year testing program to examine every community's underground water supply for these and similar chemicals, including TCE.


 **Carbon Tetrachloride** is a colorless liquid used in refrigerants, metal degreasers, agricultural fumigants, and as a dry-cleaning agent. Exposure to it can cause damage to the central nervous system, liver, and kidneys. Alcohol intensifies the likelihood of these effects. Studies of workers exposed to carbon tetrachloride have concluded that it is a carcinogen.

 **Dichloroethane (EDC)** is used in the production of vinyl chloride and as a chemical feedstock. It's also used as a lead scavenger, a leaded-gas additive, an extraction agent for caffeine, and a dry cleaning agent. In high doses, dichloroethane can cause damage to the liver, kidneys and lungs.

 **Trichloroethylene (TCE)** is used as an industrial degreaser; a solvent for oils, paints, and varnishes; a dry-cleaning agent; and an anesthetic. TCE is most often found in ground water because of spills at industrial facilities and other locations where TCE is used as a cleaning agent. The chemical is a central nervous-system depressant. People exposed to high levels of TCE become sleepy, experience headaches, and may develop liver or kidney damage. Animals exposed to high doses of TCE have developed cancer. Also, drinking alcoholic beverages tends to make the symptoms of TCE more severe.

 **Dichloroethylene** is a clear, colorless, volatile liquid used in cement latexes, film coating lacquers, paper coatings, and certain fibers. It causes health effects similar to carbon tetrachloride.

 **Tetrachloroethylene (PCE)** is used in dry cleaning, metal degreasing, textile dyeing, and various pesticides. It's a central nervous system depressant that can cause liver and kidney damage in animals.

 **Vinyl Chloride** is a gaseous raw material used in plastics, floor tiles, food packaging, and as a propellant in aerosol containers. Studies have shown that vinyl chloride causes liver cancer. Lung cancer and cancer of the lymphatic and nervous systems have also been reported.

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