Appendix E

Toxicity Profiles for Contaminants of Potential Concern

Section E.1

Metals and Organometallic Compounds

Section E.2

Organic Compounds

Section E.2.1

Volatile Organic Compounds

Section E.2.2

Semivolatile Organic Compounds

Section E.2.3

Polycyclic Aromatic Hydrocarbons

Section E.2.4

Pesticides

Section E.2.5

Polychlorinated Biphenyls (Aroclors)

Section E.2.6

Dioxins/Furans

APPENDIX E TOXICITY PROFILES FOR CONTAMINANTS OF POTENTIAL CONCERN

E.1 Metals and Organometallic Compounds

Aluminum	ATSDR FAQ, ATSDR PHS
Antimony	ATSDR FAQ, ATSDR PHS, IRIS
Arsenic	ATSDR FAQ, IRIS (Arsenic, Inorganic)
Barium	ATSDR FAQ, IRIS (Barium and Compounds)
Cadmium	ATSDR FAQ, IRIS
Chromium	ATSDR FAQ, ATSDR PHS, IRIS [Chromium (III), Insoluble Salts; Chromium (VI)]
Copper	ATSDR FAQ, IRIS; NCEA (Provisional Oral RfD for Copper)
Cyanide	ATSDR FAQ, IRIS (Cyanide, Free)
Lead	ASTDR FAQ, IRIS (Lead and Compounds [Inorganic])
Manganese	ATSDR FAQ, IRIS
Mercury	ATSDR FAQ, IRIS (Mercuric Chloride)
Methylmercury	IRIS
Nickel	ATSDR FAQ, ATSDR PHS, IRIS (Nickel, Soluble Salts)
Selenium	ATSDR FAQ, IRIS (Selenium and Compounds)
Thallium	ATSDR FAQ, IRIS (Thallium [1] Sulfate; Thallium Chloride)
Vanadium	ATSDR FAQ, ATSDR PHS; IRIS (Vanadium Pentoxide)
Zinc	ATSDR FAQ, IRIS (Zinc and Compounds)

E.2 Organic Compounds

E.2.1 Volatile Organic Compounds

Benzene	ATSDR FAQ, IRIS, NCEA (Provisional Oral RfD for Benzene)
Bromodichloromethane	ATSDR FAQ, IRIS
Chlorobenzene	ATSDR FAQ, IRIS
Chloroform	ATSDR FAQ, IRIS
Methylene chloride	ATSDR FAQ, IRIS (Dichloromethane)
Xylene	ATSDR FAQ, IRIS (Xylenes)

E.2.2 Semivolatile Organic Compounds

Di(2-ethylhexyl)phthalate	ATSDR FAQ, IRIS
Dibenzofuran	IRIS, NCEA (Provisional Oral RfD for Dibenzofuran)
1,2-Dichlorobenzene	IRIS

1,3-Dichlorobenzene	IRIS, NCEA (Provisional Oral RfD for 1,3-Dichlorobenzene)
1,4-Dichlorobenzene	ATSDR FAQ, IRIS, NCEA (Provisional Oral RfD for 1,4-Dichlorobenzene)
Hexachlorobenzene	ATSDR FAQ, IRIS
1,2,4-Trichlorobenzene	IRIS

E.2.3 Polycyclic Aromatic Hydrocarbons

PAHs (general)	ATSDR FAQ
Acenaphthylene	IRIS
Benz[a]anthracene	IRIS
Benzo[a]pyrene	IRIS
Benzo[b]fluoranthene	IRIS
Benzo[g,h,i]perylene	IRIS
Benzo[k]fluoranthene	IRIS
Chrysene	IRIS
Dibenz[a,h]anthracene	IRIS
Fluoranthene	IRIS
Indeno[1,2,3-c,d]pyrene	IRIS
2-Methylnaphthalene	NCEA (Provisional Toxicity Value Assessment: RfD for 2-Methylnaphthalene)
Naphthalene	ATSDR FAQ, IRIS
Phenanthrene	IRIS
Pyrene	IRIS

E.2.4 Pesticides

Aldrin	ATSDR FAQ (Aldrin and Dieldrin), IRIS
Chlordane	ATSDR FAQ, IRIS (Chlordane, Technical)
4,4'-DDD	ATSDR FAQ (DDT, DDE, and DDD), IRIS (p,p'-Dichlorodiphenyl dichloroethane [DDD]), NCEA (Provisional RfD for p,p'-DDD and p,p'-DDE)
4,4'-DDE	IRIS (p,p'-Dichlorodiphenyl dichloroethylene [DDE])
4,4'-DDT	IRIS (p,p'-Dichlorodiphenyl trichloroethane [DDT])
Dieldrin	IRIS
Heptachlor epoxide	ATSDR FAQ (Heptachlor/Heptachlor Epoxide), IRIS
delta-Hexachlorocyclohexane	ATSDR FAQ (Hexachlorocyclohexanes), IRIS
gamma-Hexachlorocyclohexane	IRIS

E.2.5 Polychlorinated Biphenyls (Aroclors)

PCBs	ATSDR FAQ, IRIS
Aroclor 1016	IRIS
Aroclor 1248	IRIS
Aroclor 1254	IRIS

E.2.6 Dioxins/Furans

Chlorodibenzofurans	ATSDR FAQ
Chlorinated dibenzo-p- dioxins	ATSDR FAQ, ATSDR PHS
Hexachlorodibenzo-p-dioxin, mixture	IRIS

NOTE: In the electronic version of this document, all the NCEA files except 2-methylnaphthalene were received from USEPA as a single file and are included as a single file, including the cover letter and one substance file not used in this HHRA.

NAPHTHALENE
CAS # 91-20-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to naphthalene happens mostly from breathing air contaminated from the burning of wood or fossil fuels, industrial discharges, tobacco smoke, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has been found in at least 536 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is naphthalene?

(Pronounced năfʹthə-lēnʹ)

Naphthalene is a white solid that is found naturally in fossil fuels. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell.

The major products made from naphthalene are moth repellents. It is also used for making dyes, resins, leather, tanning agents, and the insecticide, carbaryl.

What happens to naphthalene when it enters the environment?

- Naphthalene enters the environment from industrial uses, and from its use as a moth repellent.
- It also enters from the burning of wood or tobacco, and from accidental spills.
- Naphthalene evaporates easily.
- In air, moisture and sunlight break it down, often within 1 day.
- Naphthalene in water is destroyed by bacteria or evaporates into the air.
- Naphthalene binds weakly to soils and sediment.
- It does not accumulate in animals or fish.
- If dairy cows are exposed to naphthalene, some of it will be in their milk.
- If laying hens are exposed, some of it will be in their eggs.

How might I be exposed to naphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or from burning wood or fossil fuels.
- Breathing air in homes or businesses where cigarettes are smoked, wood is burned, or moth repellents are used.
- Drinking water from contaminated wells.
- Touching clothing, blankets, or coverlets that are treated with naphthalene.

How can naphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. People, particularly children, have developed this problem after eating naphthalene-containing mothballs or deodorant blocks. Some of the symptoms of this

problem are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin.

Animals sometimes develop cloudiness in their eyes after swallowing naphthalene. It is not clear if this also develops in people.

When mice were repeatedly exposed to naphthalene vapors for 2 years, their noses and lungs became inflamed and irritated.

How likely is naphthalene to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) and the EPA have not classified naphthalene as to its human carcinogenicity.

No studies are available in people. Naphthalene has caused cancer in studies in female mice, but not in male mice or in rats of either sex.

Is there a medical test to show whether I've been exposed to naphthalene?

Tests are available that measure levels of naphthalene and its breakdown products in urine, stool, blood, or maternal milk. A small sample of your body fat can also be removed and analyzed for naphthalene. These tests are not routinely available in a doctor's office. However, a sample taken in a doctor's office can be sent to a special laboratory, if needed.

These tests cannot determine exactly how much naphthalene you were exposed to or predict whether harmful effects will occur.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water containing over 0.5 parts of naphthalene per million parts of water (0.5 ppm) for more than 10 days, or 0.4 ppm for longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime, the EPA suggests it contain no more than 0.02 ppm naphthalene. The EPA requires that discharges or spills into the environment of 100 pounds or more be reported.

The Occupational Safety and Health Administration (OSHA) has set a limit of 10 parts per million (10 ppm) for the level of naphthalene in workplace air over an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) considers more than 250 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Insecticide: A substance that kills insects.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

❑ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.

❑ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

❑ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

❑ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❑ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.

❑ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.

❑ Breathing air near hazardous waste sites and drinking contaminated well water.

❑ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

POLYCHLORINATED BIPHENYLS

of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

❑ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❑ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❑ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❑ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CHLORINATED DIBENZO-p-DIOXINS (CDDs)

Agency for Toxic Substances and Disease Registry ToxFAQs **February 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about chlorinated dibenzo-p-dioxins (CDDs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chlorinated dibenzo-p-dioxins (CDDs) (75 chemicals) occurs mainly from eating food that contains the chemicals. One chemical in this group, 2,3,7,8-tetrachlorodibenzo-p-dioxin or 2,3,7,8-TCDD, has been shown to be very toxic in animal studies. It causes effects on the skin and may cause cancer in people. This chemical has been found in at least 91 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are CDDs?

CDDs are a family of 75 chemically related compounds commonly known as chlorinated dioxins. One of these compounds is called 2,3,7,8-TCDD. It is one of the most toxic of the CDDs and is the one most studied.

In the pure form, CDDs are crystals or colorless solids. CDDs enter the environment as mixtures containing a number of individual components. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known.

CDDs are not intentionally manufactured by industry except for research purposes. They (mainly 2,3,7,8-TCDD) may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

What happens to CDDs when they enter the environment?

- When released into the air, some CDDs may be transported long distances, even around the globe.
- When released in waste waters, some CDDs are broken down by sunlight, some evaporate to air, but most attach to soil and settle to the bottom sediment in water.
- CDD concentrations may build up in the food chain, resulting in measurable levels in animals.

How might I be exposed to CDDs?

- Eating food, primarily meat, dairy products, and fish, makes up more than 90% of the intake of CDDs for the general population.
- Breathing low levels in air and drinking low levels in water.
- Skin contact with certain pesticides and herbicides.
- Living near an uncontrolled hazardous waste site containing CDDs or incinerators releasing CDDs.
- Working in industries involved in producing certain pesticides containing CDDs as impurities, working at paper and pulp mills, or operating incinerators.

How can CDDs affect my health?

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, dis-

coloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people. Exposure to high concentrations of CDDs may induce long-term alterations in glucose metabolism and subtle changes in hormonal levels.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. Exposure to lower levels can cause a variety of effects in animals, such as weight loss, liver damage, and disruption of the endocrine system. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. Some animal species exposed to CDDs during pregnancy had miscarriages and the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

How likely are CDDs to cause cancer?

Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD.

The World Health Organization (WHO) has determined that 2,3,7,8-TCDD is a human carcinogen.

The Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer.

How can CDDs affect children?

Very few studies have looked at the effects of CDDs on children. Chloracne has been seen in children exposed to high levels of CDDs. We don't know if CDDs affect the ability of people to have children or if it causes birth defects, but given the effects observed in animal studies, this cannot be ruled out.

How can families reduce the risk of exposure to CDDs?

- ❑ Children should avoid playing in soils near uncontrolled hazardous waste sites.
- ❑ Discourage children from eating dirt or putting toys or other objects in their mouths.
- ❑ Everyone should wash hands frequently if playing or working near uncontrolled hazardous waste sites.
- ❑ For new mothers and young children, restrict eating foods from the proximity of uncontrolled sites with known CDDs.

Is there a medical test to show whether I've been exposed to CDDs?

Tests are available to measure CDD levels in body fat, blood, and breast milk, but these tests are not routinely available. Most people have low levels of CDDs in their body fat and blood, and levels considerably above these levels indicate past exposure to above-normal levels of 2,3,7,8-TCDD. Although CDDs stay in body fat for a long time, tests cannot be used to determine when exposure occurred.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter of drinking water (0.00003 µg/L). Discharges, spills, or accidental releases of 1 pound or more of 2,3,7,8-TCDD must be reported to EPA. The Food and Drug Administration (FDA) recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD greater than 50 parts per trillion (50 ppt).

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological profile for chlorinated dibenzo-p-dioxins. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CHLORODIBENZOFURANS (CDFs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about chlorodibenzofurans (CDFs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chlorodibenzofurans (CDFs) occurs mainly by eating certain contaminated foods. In people, exposure to CDFs is most likely to cause skin and eye irritation, and increased vulnerability to respiratory infection and nervous system effects. This chemical has been found in at least 51 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What are chlorodibenzofurans (CDFs)?

(Pronounced klôr′ō dī bĕn′-zō fyŏor′ôn′)

Chlorinated dibenzofurans, or CDFs, are a family of chemicals that contain one to eight chlorine atoms attached to the carbon atoms of the parent chemical, dibenzofuran. There are 135 different types of CDFs with varying harmful health and environmental effects. The compounds that contain chlorine atoms at the 2,3,7,8-positions of the dibenzofuran molecule are known to be especially harmful.

Not all of the different types have been found in large enough quantities to study the physical properties. However, of those that have been studied, they do not dissolve in water easily and appear to be in the form of colorless solids.

There is no known use for these chemicals. Other than for research purposes, they are not deliberately produced by industry. Most CDFs are produced in small amounts as undesirable by-products of certain processes, such as manufacturing other chemicals or bleaching at paper and pulp mills. CDFs can also be released from incinerators.

What happens to CDFs when they enter the environment?

- CDFs exist in the air as solid particles and sometimes vapors.
- They can enter the environment from car exhausts or from burning coal, wood, or oil for home heating, and the production of electricity.
- Vaporized CDFs are broken down by other chemicals in the atmosphere.
- They can be removed from the air in snow and rain.
- They attach to soil and sediment in lakes and rivers.
- They are not likely to move into groundwater from soil.
- They accumulate in fish to tens of thousands times higher levels than in the water or sediment.
- They also build up in other animals, birds, and people that are exposed to CDFs in their food.

How might I be exposed to CDFs?

- Eating contaminated foods, such as meat, fish, and milk (90% of daily exposure, which is only a few picograms [pg], results from eating contaminated food).
- Breathing air or drinking water that is contaminated, or coming in contact with contaminated soil.
- Using products such as milk cartons, coffee filters, and tampons could result in very low exposures.
- Breathing contaminated workplace air.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

How can CDFs affect my health?

Very little is known about the health effects in people or animals from breathing or touching CDFs. A study in mice showed that skin exposure to low levels over several weeks produced effects similar to those from ingesting CDFs.

Most of the information on the adverse health effects comes from studies in people who were accidentally exposed to food contaminated with CDFs. The amounts that these people were exposed to were much higher than are likely from environmental exposures or from a normal diet.

CDFs caused skin and eye irritations, including severe acne, darkened skin color, and swollen eyelids with discharge from the eyes. CDF poisoning also caused vomiting and diarrhea, anemia, more frequent lung infections, numbness, effects on the nervous system, and mild changes in the liver. Children born to exposed mothers had skin irritation and more difficulty learning.

Many of the same effects that occurred in people also occurred in laboratory animals that ate CDFs. Animals also had severe weight loss, and their stomachs, livers, kidneys, and immune systems were seriously injured. Some animals had birth defects and testicular damage, and in severe cases, some animals died. These effects in animals were seen when they were fed large amounts of CDFs over a short time, or small amounts over several weeks or months.

How likely are CDFs to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified CDFs for carcinogenicity.

It is not definitely known if CDFs cause cancer in people. There are no cancer studies in animals that ate or breathed CDFs. One study found that when CDFs were applied to the skin of animals, they did not cause cancer, but when they were applied with another compound called MNNG, which is known to initiate tumors, cancer did develop.

Is there a medical test to show whether I've been exposed to CDFs?

There are tests available to measure CDFs in your blood, body fat, and breast milk. The tests can tell you if you have been exposed, but they can't tell you the exact amount of CDFs or for how long you were exposed. The tests also cannot predict whether you will experience harmful health effects. Nearly everyone in the United States and other industrialized countries has been exposed to low levels of CDFs because they are in the environment.

Has the federal government made recommendations to protect human health?

There are no federal guidelines or recommendations for protecting human health or the environment from exposure to CDFs.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogenicity: Ability to cause cancer.

Picogram (pg): One trillionth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for chlorodibenzofurans. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ALDRIN and DIELDRIN
CAS # 309-00-2 and 60-57-1

Agency for Toxic Substances and Disease Registry ToxFAQs **April 1993**

This fact sheet answers the most frequently asked health questions (FAQs) about aldrin and dieldrin. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to aldrin and dieldrin happens mostly from eating contaminated foods, such as root crops, fish, or seafood. Aldrin and dieldrin build up in the body after years of exposure and can damage the nervous system. Aldrin has been found in at least 36 of 1,300 National Priorities List sites identified by the Environmental Protection Agency (EPA). Dieldrin has been found in at least 162 of the 1,300 sites.

What are aldrin and dieldrin?

(Pronounced ôl′ drĭn and dī-ĕl′ drĭn)

Aldrin and dieldrin are insecticides with similar structures. They are discussed together in this fact sheet because aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. The less pure commercial powders have a tan color. Aldrin and dieldrin do not occur naturally in the environment.

From 1950 to 1970, aldrin and dieldrin were popular pesticides for crops like corn and cotton. Because of concerns about damage to the environment and the potential harm to human health, EPA banned all uses of aldrin and dieldrin in 1974 except to control termites. In 1987, EPA banned all uses.

What happens to aldrin and dieldrin when they enter the environment?

- Sunlight and bacteria change aldrin to dieldrin so we mostly find dieldrin in the environment.
- They bind tightly to soil and slowly evaporate to the air.
- Dieldrin breaks down very slowly.
- Plants take in and store aldrin and dieldrin from the soil.
- Aldrin rapidly changes to dieldrin in plants and animals.
- Dieldrin is stored in the fat and leaves the body very slowly.

How might I be exposed to aldrin or dieldrin?

- Dieldrin is everywhere in the environment, but at very low levels.
- Since its use was banned, most foods contain very little, if any, dieldrin.
- Foods such as fish, seafood, dairy products, fatty meats, and root crops grown in contaminated water or soil may have higher levels of dieldrin.
- Air, surface water, or soil near waste sites may also contain higher levels.

How can aldrin and dieldrin affect my health?

Aldrin and dieldrin mainly affect the central nervous system. Accidental or intentional ingestion of high levels of aldrin and dieldrin result in convulsions and death. These levels are many thousands of times higher than the average exposure.

Ingesting moderate levels of aldrin or dieldrin over a longer period may also cause convulsions. This occurs because aldrin and dieldrin build up in our bodies.

We don't know the effects of exposure to low levels of aldrin or dieldrin over a long time. Some workers who made or applied the insecticides had nervous system effects with excitation leading to convulsions. Lesser effects in some workers included:

- headaches
- dizziness
- vomiting
- irritability
- uncontrolled muscle movements

Workers removed from the source of exposure rapidly recovered from most of these effects.

Studies in animals indicate that aldrin or dieldrin may reduce the body's ability to resist infection.

How likely are aldrin and dieldrin to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that aldrin and dieldrin are not classifiable as to their carcinogenicity to humans. There is no direct evidence that aldrin or dieldrin causes cancer in humans. Studies on workers generally show no increase in cancer or deaths due to cancer. Mice given high amounts of dieldrin, however, did develop liver cancers.

Is there a medical test to show whether I've been exposed to aldrin or dieldrin?

Tests are available that measure the amount of dieldrin in blood, fat, breast milk, and body tissues. The blood test is most often used. The amount of dieldrin in the body indicates how much dieldrin you were exposed to, but not when, since dieldrin stays in the body for a long time. The blood test is simple, but are not routinely performed at your doctor's office.

Some studies in people predict that levels above 0.20 milligrams of dieldrin in a liter of blood (0.20 mg/L) may result in harmful effects such as convulsions or uncontrollable muscle movements.

Has the federal government made recommendations to protect human health?

The Environmental Protection Agency (EPA) defines aldrin and dieldrin as hazardous solid waste. In 1974, EPA banned all uses of aldrin or dieldrin except as a termite killer. By 1987, EPA banned all uses. EPA concludes that the maximum amount of aldrin and dieldrin that can be present in our water and seafood should not exceed 74 picograms per liter (pg/L) of aldrin or 71 pg/L of dieldrin.

The Food and Drug Administration (FDA) regulates the residues of aldrin and dieldrin in raw foods. The allowable range for residues is from 0 to 0.1 parts of dieldrin to one million parts of food (0-0.1 ppm) depending on the type of food product. This limits the intake of aldrin and dieldrin in food to safe levels.

Glossary

Carcinogenicity: Ability to cause cancer.

Ingestion: Taking food or drink into your body.

ppm: Parts per million.

Picogram (pg): One trillionth of a gram.

Milligram (mg): One thousandth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for aldrin/dieldrin. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CHLORDANE
CAS # 57-74-9

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about chlordane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chlordane occurs mostly from eating contaminated foods, such as root crops, meats, fish, and shellfish, or from touching contaminated soil. High levels of chlordane can cause damage to the nervous system or liver. This chemical has been found in at least 171 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is chlordane?

(Pronounced klôr′dān′)

Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988. Technical chlordane is not a single chemical, but is actually a mixture of pure chlordane mixed with many related chemicals. It doesn't occur naturally in the environment. It is a thick liquid whose color ranges from colorless to amber. Chlordane has a mild, irritating smell.

Some of its trade names are Octachlor and Velsicol 1068. Until 1983, chlordane was used as a pesticide on crops like corn and citrus and on home lawns and gardens.

Because of concern about damage to the environment and harm to human health, the Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.

What happens to chlordane when it enters the environment?

- Chlordane entered the environment when it was used as a pesticide on crops, on lawns and gardens, and to control termites.
- Chlordane sticks strongly to soil particles at the surface and is not likely to enter groundwater.
- It can stay in the soil for over 20 years.
- Most chlordane leaves soil by evaporation to the air.
- It breaks down very slowly.
- Chlordane doesn't dissolve easily in water.
- It builds up in the tissues of fish, birds, and mammals.

How might I be exposed to chlordane?

- By eating crops grown in soil that contains chlordane.
- By eating fish or shellfish caught in water that is contaminated by chlordane.
- By breathing air or touching soil near homes treated for termites with chlordane.
- By breathing air or by touching soil near waste sites or landfills.

How can chlordane affect my health?

Chlordane affects the nervous system, the digestive system, and the liver in people and animals. Headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea, and jaundice have occurred in people who breathed air containing high concentrations of chlordane or accidentally swallowed small amounts of chlordane. Large amounts of chlordane taken by mouth can cause convulsions and death in people.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

A man who had long-term skin contact with soil containing high levels of chlordane had convulsions. Japanese workers who used chlordane over a long period of time had minor changes in liver function.

Animals given high levels of chlordane by mouth for short periods died or had convulsions. Long-term exposure caused harmful effects in the liver of test animals.

We do not know whether chlordane affects the ability of people to have children or whether it causes birth defects. Animals exposed before birth or while nursing developed behavioral effects later.

How likely is chlordane to cause cancer?

The International Agency for Research on Cancer has determined that chlordane is not classifiable as to its carcinogenicity to humans. Studies of workers who made or used chlordane do not show that exposure to chlordane is related to cancer, but the information is not sufficient to know for sure. Mice fed low levels of chlordane in food developed liver cancer.

Is there a medical test to show whether I've been exposed to chlordane?

Laboratory tests can measure chlordane and its breakdown products in blood, fat, urine, feces, and breast milk. The amount of breakdown products measured in body fat or breast milk does not tell how much or how long ago you were exposed to chlordane or if harmful effects will occur.

Has the federal government made recommendations to protect human health?

In 1988, the EPA banned all uses of chlordane. The EPA recommends that a child should not drink water with more than 60 parts of chlordane per billion parts of drinking water (60 ppb) for longer than 1 day. EPA has set a limit in drinking water of 2 ppb.

EPA requires spills or releases of chlordane into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) limits the amount of chlordane and its breakdown products in most fruits and vegetables to less than 300 ppb and in animal fat and fish to less than 100 ppb.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Health and Safety (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 0.5 milligrams of chlordane per cubic meter (mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek. These agencies have advised that eye and skin contact should be avoided because this may be a significant route of exposure.

Glossary

Carcinogenicity: Ability to cause cancer.

Long-term: Lasting one year or longer.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for chlordane (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

DDT, DDE, AND DDD

Agency for Toxic Substances and Disease Registry ToxFAQs September 1995

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to DDT, DDE, and DDD happens mostly from eating contaminated foods, such as root and leafy vegetables, meat, fish, and poultry. At high levels, it can damage the nervous system, causing excitability, tremors, and seizures in people. These chemicals have been found in at least 337 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What are DDT, DDE, and DDD?

(Pronounced DDT, DDE, and DDD)

DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) was a manufactured chemical widely used to control insects on agricultural crops and insects that carry diseases like malaria and typhus. It does not occur naturally in the environment. DDT is a white, crystalline solid with no odor or taste.

Because of damage to wildlife and the potential harm to human health, the use of DDT was banned in the United States, except for public health emergencies. DDT is still used in some other countries.

Two similar chemicals that sometimes contaminate DDT products are DDE (1,1-dichloro-2,2-bis(chlorophenyl) ethylene) and DDD (1,1-dichloro-2,2-bis(p-chlorophenyl) ethane). DDD was also used to kill pests, but its use has also been banned. One form of it has been used medically to treat cancer of the adrenal gland. DDE has no commercial use.

What happens to DDT, DDE, and DDD when they enter the environment?

- DDT entered the environment when it was used as an insecticide.
- DDT in air lasts for only a short time. Half the DDT in air is gone within 2 days.
- It does not dissolve easily in water.
- DDT sticks strongly to soil particles and does not move quickly to underground water.
- DDT lasts a very long time in soil; half the DDT in soil will break down in 2–15 years.
- Some DDT will evaporate from soil and surface water into the air and some is broken down by sunlight or by microorganisms in soil or surface water.
- DDT in soil usually breaks down to form DDE or DDD.
- Levels of DDT build up in plants and in the fatty tissues of fish, birds, and animals.

How might I be exposed to DDT, DDE, and DDD?

- Eating domestic foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water; levels generally are low and of little concern except near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on human breast milk from mothers who have been exposed.
- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

People who worked with DDT for a long time had some reversible changes in the levels of liver enzymes.

In animals, short-term exposure to large amounts of DDT in food affected the nervous system. In animals, long-term exposure to DDT affected the liver. Animal studies suggest that short-term exposure to DDT in food may have a harmful effect on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

The Department of Health and Human Services (DHHS) has determined that DDT may reasonably be anticipated to be a human carcinogen. DHHS has not classified DDE and DDD, but the Environmental Protection Agency (EPA) has determined that they are probable human carcinogens.

Liver cancer has been seen in animals that were fed DDT. Studies in DDT-exposed workers did not show increases in cancer.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds.

These tests cannot show the exact amount of DDT, DDE, or DDD to which a person was exposed or tell if harmful effects will occur. These tests are not routinely available at doctors' offices.

Has the federal government made recommendations to protect human health?

In 1972, the EPA banned all uses of DDT, except for public health emergencies. EPA requires spills or releases of DDT into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) has set limits on DDT levels in most foods.

The Occupational Safety and Health Administration (OSHA) set an exposure limit of 1 milligram of DDT per cubic meter (1 mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit of 0.5 mg/m^3 in workplace air over a 10-hour workday, 40-hour workweek.

Glossary

Carcinogen: A substance that can cause cancer.

Evaporate: To change into a vapor or a gas.

Milligram (mg): One thousandth of a gram.

Short-term: Lasting 14 days or less.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for 4,4'-DDT, 4,4'-DDE, 4,4'-DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

HEPTACHLOR/ HEPTACHLOR EPOXIDE

CAS # 76-44-8 and 1024-57-3

Agency for Toxic Substances and Disease Registry ToxFAQs **April 1993**

This fact sheet answers the most frequently asked health questions (FAQs) about heptachlor/heptachlor epoxide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to heptachlor and heptachlor epoxide happens mostly from eating contaminated foods and milk, or skin contact with contaminated soil. At high levels, they can cause damage to your nervous system. Heptachlor and heptachlor epoxide have been found in at least 129 and 87 sites, respectively, of 1,300 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are heptachlor/heptachlor epoxide?

(Pronounced hĕpʹtə-klôrʹhĕpʹtə-klôr ĕ-pŏkʹsīd)

Heptachlor is a manufactured chemical and doesn't occur naturally. Pure heptachlor is a white powder that smells like camphor (mothballs).

The less pure grade is tan. Trade names include Heptagran®, Basaklor®, Drinox®, Soleptax®, Termide®, and Velsicol 104®.

Heptachlor was used extensively in the past for killing insects in homes, buildings, and on food crops, especially corn. Use slowed in the 1970s and stopped in 1988.

Heptachlor epoxide is also a white powder and is a break-down product of heptachlor. The epoxide is more likely to be found in the environment than heptachlor.

What happens to heptachlor and heptachlor epoxide when they enter the environment?

- ❑ Heptachlor doesn't dissolve easily in water; heptachlor epoxide dissolves more easily.
- ❑ They stick strongly to soil particles and evaporate slowly to air.
- ❑ Heptachlor epoxide can stay in the soil and water for many years.
- ❑ Animals change heptachlor to the epoxide.
- ❑ Plants can take up heptachlor from the soil.
- ❑ Levels build up in the tissues of fish and cattle.

How might I be exposed to heptachlor and heptachlor epoxide?

- ❑ Eating crops grown in soil that contains heptachlor.
- ❑ Eating fish, dairy products, and fatty meats from animals exposed to heptachlor in their food.
- ❑ Breathing air, drinking water, or skin contact with soil near waste sites or landfills.
- ❑ Breast milk (from mothers who had high exposures).

How can heptachlor and heptachlor epoxide affect my health?

Heptachlor and heptachlor epoxide are clearly toxic to humans and animals and can damage the nervous system. There are some human data on brief exposures to high levels. A few reports showed that people who accidentally swallowed

pesticides containing heptachlor, or who spilled pesticides on their clothes became dizzy, confused, or had convulsions.

Most of what we know about the health effects of these pesticides comes from studies on mice and rats fed heptachlor and heptachlor epoxide in the food or water. Very high levels for short periods produce serious liver problems. Mice had trouble walking and rats developed tremors. High levels of heptachlor in the feed for several weeks damaged the livers of rats and the livers and adrenal glands of mice.

We do not know if heptachlor or the epoxide affect the ability of men or women to have children. Animals that ate food containing heptachlor before and/or during pregnancy had smaller litters or were unable to reproduce. Some of the offspring had cataracts and some didn't live long after birth.

How likely are heptachlor and heptachlor epoxide to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that heptachlor and heptachlor epoxide are not classifiable as to their carcinogenicity to humans because insufficient data are available to establish a clear assessment.

Is there a medical test to show whether I've been exposed to heptachlor and heptachlor epoxide?

Laboratory tests can measure heptachlor and heptachlor epoxide following exposure to high levels. The blood tests for these chemicals must be done within a short period after exposure.

Levels in fat can be measured for a much longer period after exposure. If heptachlor or heptachlor epoxide are found in your fat, it isn't possible to tell exactly when you were exposed to these chemicals or if harmful health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA banned the sale of all heptachlor products and restricted the use of heptachlor to the control of fire ants in power transformers. EPA recommends a maximum of 2.78 parts of heptachlor and heptachlor epoxide per trillion parts of drinking water or seafood (2.78 ppt) that you eat each day. For longer exposures, a child should not drink water with greater than 5,000 ppt heptachlor or 150 ppt heptachlor epopxide. Quantities greater than 1 pound of heptachlor or heptachlor epoxide that enter the environment must immediately be reported to the National Response Center.

The Food and Drug Administration (FDA) limits the amount of heptachlor and heptachlor epoxide on raw food crops and on edible seafood to from 0-10 parts per billion (ppb), depending on the type of food product. The limit on edible seafood is 300 ppb, and for the fat of food-producing animals is 200 ppb.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the Occupational Safety and Health Administration (OSHA) recommend a maximum in workplace air over an 8-hour workday for a 40-hour work week of 0.5 milligrams of heptachlor per cubic meter (0.5 mg/m^3).

Glossary

Carcinogenicity: Ability to cause cancer.

Milligram (mg): One thousandths of a gram.

ppt: Parts per trillion.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for heptachlor and heptachlor epoxide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

HEXACHLORO-CYCLOHEXANES

CAS # 319-84-6, 319-85-7, 319-86-8, 58-89-9

This fact sheet answers the most frequently asked health questions (FAQs) about hexachlorocyclohexanes. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to hexachlorocyclohexanes happens mostly from eating contaminated foods or by breathing contaminated air in the workplace. Exposure to high levels of hexachlorocyclohexanes can cause blood disorders, dizziness, headaches; seizures, and changes in the levels of sex hormones. These substances have been found in at least 144 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are hexachlorocyclohexanes?

(Pronounced hĕksʹə-klôrʹō-sīʹklōʹhĕksʹān)

Hexachlorocyclohexanes (HCH) are a group of manufactured chemicals that do not occur naturally in the environment. HCH has eight chemical forms (called isomers). The four most common are alpha-, beta-, gamma, and delta-HCH. The most common of these is gamma-HCH (also known as lindane). Lindane is a white solid substance that may evaporate into the air as a colorless vapor with a slightly musty odor. It is the common form of hexachlorocyclohexane.

Lindane was used as an insecticide on fruit and vegetable crops (including greenhouse vegetables and tobacco) and forest crops (including Christmas trees). It is still used in ointments to treat head and body lice, and scabies.

Lindane has not been produced in the United States since 1977. It is still imported to and formulated in the United States.

What happens to hexachlorocyclohexanes when they enter the environment?

- In air, HCH can be present as a vapor or attached to small particles such as soil or dust.
- Lindane can remain in the air for up to 17 weeks and travel long distances.
- Particles with attached HCH may be removed from the air by rain.
- In soil, sediments, and water, it is broken down by algae, fungi, and bacteria to less harmful substances.
- HCH isomers are broken down quickly in water; lindane does not remain in water longer than 30 days.
- The length of time that HCH isomers remain in soil is not known.
- It can accumulate in the fatty tissue of fish.

How might I be exposed to hexachlorocyclohexanes?

- Eating contaminated foods, such as plants, meat, and milk.
- Breathing contaminated air in or near factories where products using HCH are made.
- Through skin when applied as a lotion or shampoo to control lice and scabies.
- Drinking contaminated water or breathing contaminated air near waste sites or landfills.

How can hexachlorocyclohexanes affect my health?

Some people who breathed contaminated workplace air during the namufacturing of pesticides, including lindane,

had blood disorders, dizziness, headaches, and changes in the levels of sex hormones. Some people who swallowed large amounts had seizures and sometimes died.

Animals fed high levels of HCH had convulsions and some became comatose. Liver and kidney effects and a reduced ability to fight infections occurred at moderate levels.

Animal showed a decreased ability to reproduce when they were fed moderate to high levels of HCH.

How likely are hexachlorocyclohexanes to cause cancer?

The Department of Health and Human Services (DHHS) has determined that HCH may reasonably be anticipated to be a carcinogen. Liver cancer has been seen in laboratory rodents that ate HCH for a long period of time.

How can hexachlorocyclohexanes affect children?

There are no studies on the effects of HCH on children. It is not known whether HCH can cause birth defects in people. Animal studies have not shown birth defects in the babies of animals fed HCH during pregnancy. HCH has been detected in human breast milk.

How can families reduce the risk of exposure to hexachlorocyclohexanes?

If you work with HCH, take all safety precautions to avoid bringing the dust home on your clothing. If you use products containing HCH, follow directions for use carefully. Make sure that you keep it in tightly covered containers and store the containers safely where children cannot reach them. Always store chemicals in the original labeled containers. Do not store HCH in containers that children would find attractive to eat or drink from, such as soda bottles.

Is there a medical test to show whether I've been exposed to hexachlorocyclohexanes?

Laboratory tests can measure HCH in blood, urine, and semen. These tests do not tell you how much HCH you've been exposed to or if harmful effects will occur. The tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit in drinking water of 0.2 parts of lindane per billion parts of water (0.2 ppb). The EPA requires that spills or accidental discharges of lindane into the environment of 1 pound or more must be reported to the EPA.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend a maximum level of 0.5 milligrams lindane per cubic meter (0.5 mg/m^3) of workplace air for an 8-hour workday, 40-hour workweek. These agencies advise avoiding eye and skin contact because this may be a route of significant exposure.

Source of information

Agency for Toxic Substances and Disease Registry (ATSDR) 1999. Toxicological profile for alpha-, beta-, gamma-, and delta-hexachlorocyclohexane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

1,4-DICHLOROBENZENE

CAS # 106-46-7

Agency for Toxic Substances and Disease Registry ToxFAQs **June 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about 1,4-dichlorobenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,4-dichlorobenzene happens mostly from breathing high levels in indoor air or workplace air. Extremely high exposures can cause dizziness, headaches, and liver problems. 1,4-Dichlorobenzene has been found in at least 281 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is 1,4-dichlorobenzene?

(Pronounced 1,4-dī′ klôr′ ō bĕn′ zēn′)

1,4-Dichlorobenzene is a chemical used to control moths, molds, and mildew, and to deodorize restrooms and waste containers. It is also called para-DCB or p-DCB. Other names include Paramoth, Para crystals, and Paracide reflecting its widespread use to kill moths.

At room temperature, p-DCB is a white solid with a strong, pungent odor. When exposed to air, it slowly changes from a solid to a vapor. It is the vapor that acts as a deodorizer or insect killer. Most people recognize the odor as the smell of mothballs, and can smell p-DCB in the air at very low levels. Most p-DCB in our environment comes from its use in moth repellent products and in toilet deodorizer blocks.

What happens to 1,4-dichlorobenzene when it enters the environment?

- In air, it breaks down to harmless products in about a month.
- It does not dissolve easily in water.
- It is not easily broken down by soil organisms.
- It evaporates easily from water and soil, so most is found in the air.
- It is taken up and retained by plants and fish.

How might I be exposed to 1,4-dichlorobenzene?

- Breathing indoor air in public restrooms and homes that use p-DCB as a deodorizer.
- Breathing air around some mothballs (check the label).
- Breathing workplace air where p-DCB is manufactured.
- Drinking contaminated water around hazardous waste sites.
- Eating foods such as pork, chicken, and eggs that are contaminated with p-DCB from its use as an odor control product in animal stalls.
- Eating fish from contaminated waters.

How can 1,4-dichlorobenzene affect my health?

There is no evidence that moderate use of common household products that contain p-DCB will result in harmful effects to your health. Harmful effects, however, may occur from high exposures. Very high usage of p-DCB products in the home can result in dizziness, headaches, and liver problems. Some of the patients who developed these symptoms had been using the products for months or even years after

they first began to feel ill.

Workers breathing high levels of p-DCB (1,000 times more than levels in deodorized rooms) have reported painful irritation of the nose and eyes. There are cases of people who have eaten p-DCB products regularly for months to years because of its sweet taste. These people had skin blotches and lower numbers of red blood cells.

How likely is 1,4-dichlorobenzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that p-DCB may reasonably be anticipated to be a carcinogen. There is no direct evidence that p-DCB can cause cancer in humans. However, animals given very high levels in water developed liver and kidney tumors.

How can 1,4-dichlorobenzene affect children?

Children are exposed to p-DCB in many of the same ways that adults are. Children may be at higher risk, due to accidental exposures such as swallowing p-DCB used in the home in mothballs or toilet bowl deoderant blocks. There is very little information on how children react to p-DCB exposure, but children would probably show the same effects as adults.

No studies in people or animals show that p-DCB crosses the placenta or can be found in fetal tissues. Based on other similar chemicals, it is possible that this could occur. There is no credible evidence that p-DCB causes birth defects. One study found dichlorobenzenes in breast milk, but p-DCB has not been specifically measured.

How can families reduce the risk of exposure to 1,4-dichlorobenzene?

You should not let children play with or drink toilet bowl water because it may contain p-DCB. Do not let children rub mothballs or cleaners containing p-DCB on their skin. Pesticides, bathroom deoderizers, and mothballs containg p-DCB should be stored out of reach of young children. Always store household chemicals in their original containers. Never store them in containers children would find attractive to eat or drink from, such as old soda bottles.

Is there a medical test to show whether I've been exposed to 1,4-dichlorobenzene?

Tests are available to measure your exposure to p-DCB. The most common test measures a breakdown product of p-DCB called 2,5-dichlorophenol in urine and blood. If there is 2,5-dichlorophenol in the urine, it indicates that the person was exposed to p-DCB within the previous day or two. The test that measures p-DCB in your blood is less common.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 75 micrograms of p-DCB per liter of drinking water (75 µg/L).

p-DCB is also an EPA-registered pesticide. Manufacturers must provide certain information to EPA for it to be used as a pesticide.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 75 parts of p-DCB per million parts air in the workplace (75 ppm) for an 8-hour day, 40-hour workweek.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological profile for 1,4-dichlorobenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

DI(2-ETHYLHEXYL) PHTHALATE CAS #117-81-7

This fact sheet answers the most frequently asked health questions (FAQs) about di(2-ethylhexyl) phthalate. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to di(2-ethylhexyl) phthalate or DEHP is generally very low. Increased exposures may come from intravenous fluids delivered through plastic tubing, and from ingesting contaminated foods or water. DEHP is not toxic at the low levels usually present. In animals, high levels of DEHP damaged the liver and kidney and affected the ability to reproduce. DEHP has been found in at least 587 of 1,300 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is DEHP or di(2-ethylhexyl) phthalate?

(Pronounced dī ĕthʹəl (2-hĕksʹ ĕthəl) thălʹ āt)

Di(2-ethylhexyl)phthalate is a manufactured chemical that makes plastic more flexible. It is also called DEHP. DEHP is a colorless liquid with almost no odor. DEHP is in polyvinyl chloride (PVC) plastic products like toys, vinyl upholstery, shower curtains, adhesives, and coatings. Vinyl plastic may contain up to 40% DEHP.

DEHP is also used in inks, pesticides, cosmetics, and vacuum pump oil. It is used to detect leaks in protective face gear, and as a test material for filtration systems. Trade names for DEHP are Platinol DOP®, Octoil®, Silicol 150®, Bisoflex 81®, and Eviplast 80®. Use of trade names is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry, the Public Health Service, or the U.S. Department of Health and Human Services

What happens to DEHP when it enters the environment?

- DEHP is everywhere in the environment because of its use in plastics, but it evaporates into air and dissolves into water at very low rates.
- DEHP from plastic materials, coatings, and flooring can increase indoor air levels.
- It dissolves faster in water if gas, oil, or paint removers are present.
- It attaches strongly to soil particles.
- Small organisms in surface water or soil break it down into harmless compounds.
- It doesn't break down easily in deep soil, or in lake or river bottoms.
- It is in plants, fish, and other animals, but animals high on the food chain are able to breakdown DEHP, so tissue levels are usually low.

How might I be exposed to DEHP?

DEHP is usually present at very low levels even in the sources of potentially higher exposures listed below.

- Using medical products packaged in plastic such as blood products.
- Eating some foods packaged in plastics, especially fatty foods like milk products, fish and seafood, oils, but levels still usually quite low.
- Drinking well water near waste sites, but levels usually are low.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

- Breathing workplace air or indoor air where DEHP is released, but usually not at levels of concern.
- Fluids from plastic intravenous tubing if used extensively as for kidney dialysis.

How can DEHP affect my health?

There is no evidence that DEHP causes serious health effects in humans. Most of what we know about the health effects of DEHP comes from high exposures to rats and mice. Adverse effects in animals were generally seen only at high doses or with long-term exposures. You are not likely to be exposed to these very high levels. Moreover, absorption and breakdown of DEHP in humans is different than in rats and mice, so the effects seen in rats and mice may not occur in humans. The studies in rats and mice with DEHP in the air produced no serious harmful effects. There was no effect on lifespan or the ability to reproduce.

Brief exposure to very high levels of DEHP in food or water damaged sperm, but the effect reversed when DEHP was removed from the diet. Longer exposures to high doses affected the ability of both males and females to reproduce and caused birth defects. High levels of DEHP damaged the livers of rats and mice. Long exposures of rats to DEHP caused kidney damage similar to the damage seen in the kidneys of long-term dialysis patients.

Whether or not DEHP contributes to human kidney damage, is unclear at present. You should have no health effects from skin contact with products containing DEHP because it cannot be taken up easily through the skin.

How likely is DEHP to cause cancer?

The Department of Health and Human Services (DHHS) has determined that DEHP may reasonably be anticipated to be a carcinogen. There is no evidence that DEHP causes cancer in humans, but high exposures in rats and mice increased liver cancer. Based on these studies, the Department of Health and Human Services (DHHS) has determined that DEHP may reasonably be anticipated to be a carcinogen.

Is there a medical test to show whether I've been exposed to DEHP?

A test is available that measures a breakdown product of DEHP called mono-2-ethylhexyl)phthalate (MEHP). MEHP is measured in your urine or blood. This test is good only for recent exposures because DEHP remains in your body for only a short time. These tests require special equipment that is not routinely available in a doctor's office.

Has the federal government made recommendations to protect human health?

The EPA proposed a limit of 6 parts DEHP per billion parts of drinking water (6 ppb). The Food and Drug Administration (FDA) limits the types of food packaging materials containing DEHP. The Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) limits the average level of DEHP in workplace air to 5 milligrams per cubic meter (mg/m^3) over an 8-hour workday and 10 mg/m^3 for a 15-minute exposure.

Glossary

Carcinogen: Substance that can cause cancer.

CAS: Chemical Abstracts Service.

Ingesting: Taking food or drink into your body.

ppb: Parts per billion.

Milligram (mg): One thousandth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for di(2-ethylhexyl) phthalate. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

HEXACHLOROBENZENE
CAS # 118-74-1

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about hexachlorobenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to hexachlorobenzene occurs primarily from eating low levels in contaminated food. The main health effect from eating highly contaminated food is a liver disease. Hexachlorobenzene has been found in at least 84 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is hexachlorobenzene?

(Pronounced hĕk′sə-klôr′ ō-bĕn′zēn′)

Hexachlorobenzene was widely used as a pesticide to protect the seeds of onions and sorghum, wheat, and other grains against fungus until 1965. It was also used to make fireworks, ammunition, and synthetic rubber. Currently, there are no commercial uses of hexachlorobenzene in the United States.

Hexachlorobenzene is a white crystalline solid that is not very soluble in water. It does not occur naturally in the environment. It is formed as a by-product while making other chemicals, in the waste streams of chloralkali and wood-preserving plants, and when burning municipal waste.

What happens to hexachlorobenzene it enters the environment?

- Hexachlorobenzene can remain in the environment for a long time.
- It breaks down very slowly.
- It does not dissolve in water very well, so most of it will remain in particles on the bottom of lakes and rivers.
- Hexachlorobenzene sticks strongly to soil.
- High levels can build up in fish, marine mammals, birds, lichens, and animals that eat lichens (like caribou) or fish.
- It can also build up in wheat, grasses, some vegetables, and other plants.

How might I be exposed to hexachlorobenzene?

- Eating low levels in contaminated food.
- Eating contaminated fish.
- Drinking milk or eating dairy products or meat from cattle grazing on contaminated pastures.
- Drinking small amounts in contaminated water.
- Breathing low levels in contaminated air.
- Eating or touching contaminated soil.
- For babies, drinking contaminated breast milk from exposed mothers.
- Working at a factory that uses or produces it unintentionally.

How can hexachlorobenzene affect my health?

A study of people in Turkey who ate bread accidentally contaminated with hexachlorobenzene showed that the young children of mothers who it ate it or young children who ate it themselves can have lower survival rates.

Nursing infants can be exposed to hexachlorobenzene through breast milk if their mothers have been exposed. Unborn children may also be affected if their mother have been exposed.

The people in Turkey who ate the contaminated bread suffered from a liver disease called porphyria cutanea tarda. This disease can cause red-colored urine, skin sores, change in skin color, arthritis, and problems of the liver, nervous system, and stomach.

Studies in animals show that eating hexachlorobenzene for a long time can damage the liver, thyroid, nervous system, bones, kidneys, blood, and immune and endocrine systems.

The immune system of rats that breathed hexachlorobenzene for a few weeks was harmed.

How likely is hexachlorobenzene to cause cancer?

The U.S. Department of Health and Human Services (DHHS) has determined that hexachlorobenzene may reasonably be expected to be a carcinogen.

Animals that ate hexachlorobenzene for months or years developed cancer of the liver, kidneys, and thyroid. There is no strong evidence that it causes cancer in people.

A factory worker who breathed air for several years that contained many chemicals, but mostly hexachlorobenzene, developed liver cancer. However, because the factory worker breathed other chemicals at the same time that could cause cancer, it is not known if the liver cancer was caused by hexachlorobenzene alone or by a mixture of chemicals.

Is there a medical test to show whether I've been exposed to hexachlorobenzene?

Blood, fat, and tissue samples can be tested to show if you have ever been exposed to hexachlorobenzene. However, these tests cannot tell you when you were exposed or to how much, or whether health effects will occur. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has recommended that drinking water should not contain more than 0.05 milligrams of hexachlorobenzene per liter of water (0.05 mg/L) in water that children drink, and should not contain more than 0.2 mg/L in water that adults drink for longer periods (about 7 years). The EPA has set a maximum contaminant level of 0.001 mg/L in drinking water.

The EPA requires that spills or accidental releases into the environment of 10 pounds or more of hexachlorobenzene be reported to the EPA.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Soluble: Dissolves easily in water.

Source of Information

This ToxFAQs information is taken from the 1996 Toxicological Profile for Hexachlorobenzene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

BENZENE
CAS # 71-43-2

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn′zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

Source of Information

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

BROMODICHLOROMETHANE

CAS # 75-27-4

Agency for Toxic Substances and Disease Registry ToxFAQs **July 1999**

This fact sheet answers the most frequently asked health questions (FAQs) about bromodichloromethane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Most bromodichloromethane is formed as a by-product when chlorine is added to water-supply systems. Bromodichloromethane is not known to cause adverse health effects in people, but animal studies show that high concentrations can damage the liver and kidneys and affect the brain. Bromodichloromethane has been found at 5 of the 1,518 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is bromodichloromethane?

(Pronounced brō′mō dī-klôr′ō měth′ān′)

Bromodichloromethane is a colorless, nonflammable liquid. Small amounts are formed naturally by algae in the oceans. Some of it will dissolve in water, but it readily evaporates into air.

Only small quantities of bromodichloromethane are produced in the United States. The small quantities that are produced are used in laboratories or to make other chemicals. However, most bromodichloromethane is formed as a by-product when chlorine is added to drinking water to kill bacteria.

What happens to bromodichloromethane when it enters the environment?

- Bromodichloromethane released to air is slowly broken down by reactions with other chemicals and sunlight or it can be removed by rain.
- In water, it will evaporate to the air and/or be broken down slowly by bacteria.
- When released to soil, most will evaporate to the air but some of it will be broken down by bacteria.
- Some bromodichloromethane may filter into the groundwater.
- Bromodichloromethane does not build up in the food chain.

How might I be exposed to bromodichloromethane?

- The most likely way people are exposed to bromodichloromethane is by drinking chlorinated water.
- You may breathe vapors released from chlorinated water in a swimming pool or in the home (cooking, washing dishes, bathing, etc.).
- Some bromodichloromethane may enter your body directly through your skin when bathing or swimming.
- People who live near a waste site containing bromodichloromethane could be exposed by drinking contaminated groundwater or breathing vapors released to the air.
- People who work at or live near a laboratory or factory that makes or uses this chemical could be exposed by breathing bromodichloromethane in the air.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

How can bromodichloromethane affect my health?

No studies are available regarding health effects in people exposed to bromodichloromethane.

Animal studies indicate that the liver, kidney, and central nervous system are affected by exposure to bromodichloromethane. The effects of high doses on the central nervous system include sleepiness and incoordination. Longer exposure to lower doses causes damage to the liver and kidneys. There is some evidence from animal studies that bromodichloromethane may cause birth defects at doses high enough to make the mother sick. It is not known if lower doses would cause birth defects.

How likely is bromodichloromethane to cause cancer?

There is evidence that eating or drinking bromodichloromethane causes liver, kidney, and intestinal cancer in rats and mice. The Department of Health and Human Services (DHHS) has determined that bromodichloromethane is reasonably anticipated to be a human carcinogen.

Is there a medical test to show whether I've been exposed to bromodichloromethane?

Methods are available to measure low levels of bromodichloromethane in human blood, breath, urine, and fat, but not enough information is available to use such tests to predict if any health effects might occur. Because special equipment is needed, these tests are not usually done in the doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a Maximum Contaminant Level (MCL) of 0.1 parts per million (ppm) for the combination of bromodichloromethane and a group of similar compounds (called trihalomethanes) that occur in chlorinated water. The EPA recommends that levels of halomethanes in lakes and streams should be limited to 0.19 ppm to prevent possible health effects from drinking water or eating fish contaminated with this group of chemicals.

Any release to the environment greater than 5,000 pounds of bromodichloromethane must be reported to the EPA.

The federal recommendations have been updated as of July 1999.

Glossary

Carcinogen: A substance that can cause cancer.
CAS: Chemical Abstracts Service.
Evaporate: To change into a vapor or a gas.
National Priorities List: A list of the nation's worst hazardous waste sites.
ppm: Parts per million.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological profile for bromodichloromethane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CHLOROBENZENE
CAS # 108-90-7

This fact sheet answers the most frequently asked health questions (FAQs) about chlorobenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Chlorobenzene is used as a solvent for some pesticide formulations, as a degreaser, and to make other chemicals. High levels of chlorobenzene can damage the liver and kidneys and affect the brain. It has been found at 97 of the 1,177 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chlorobenzene?

(Pronounced klôr′ō-bĕn′zēn)

Chlorobenzene is a colorless, flammable liquid with an aromatic, almond-like odor. Some of it will dissolve in water, but it readily evaporates into air. It does not occur naturally in the environment.

Chlorobenzene production in the United States has declined by more than 60% from its peak in 1960. It was used in the past to make other chemicals, such as phenol and DDT. Now chlorobenzene is used as a solvent for some pesticide formulations, to degrease automobile parts, and as a chemical intermediate to make several other chemicals.

What happens to chlorobenzene when it enters the environment?

- Chlorobenzene released to air is slowly broken down by reactions with other chemicals and sunlight or can be removed by rain.
- In water, chlorobenzene will rapidly evaporate to the air and/or be broken down by bacteria.
- When released to soil, it is broken down rapidly by bacteria, but some will evaporate to the air and some may filter into the groundwater.
- Chlorobenzene does not build up in the food chain.

How might I be exposed to chlorobenzene?

- If you work where chlorobenzene is made or used you could be exposed by breathing air with chlorobenzene vapors or by spilling or splashing chlorobenzene on your skin.
- People that live near a waste site containing chlorobenzene could be exposed by drinking contaminated groundwater, breathing vapors released to the air, or getting contaminated soil on their skin.
- You could be exposed by eating food contaminated with chlorobenzene but there is not enough information to determine how often this occurs.

How can chlorobenzene affect my health?

Workers exposed to high levels of chlorobenzene in the air complained of headaches, nausea, sleepiness, numbness, and vomiting. We cannot be certain that all of these effects were due to chlorobenzene exposure because the workers may have been exposed to other chemicals.

Animal studies indicate that the liver, kidney, and central nervous system are affected by exposure to chlorobenzene.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

Effects on the central nervous system from breathing chlorobenzene include unconsciousness, tremors, restlessness, and death. Longer exposure has caused liver and kidney damage. The limited data available indicate that chlorobenzene does not cause birth defects or infertility.

How likely is chlorobenzene to cause cancer?

It is not known whether chlorobenzene causes cancer in people. Although chlorobenzene did not produce cancer in animal studies with rats and mice, liver nodules which can lead to cancer were produced in male rats. The EPA has determined that chlorobenzene is not classifiable as to human carcinogenicity based on inadequate evidence in both humans and animals.

Is there a medical test to show whether I've been exposed to chlorobenzene?

Exposure to chlorobenzene can be determined by measuring it or its metabolites in urine, exhaled air, blood, and body fat, but these tests cannot be used to predict whether harmful health effects will occur. These tests are not usually done in the doctors' office because special equipment is needed.

Has the federal government made recommendations to protect human health?

The EPA has set a Maximum Contaminant Level (MCL) of 0.1 parts per million (0.1 ppm) for chlorobenzene in drinking water. Concentrations in drinking water for short-term exposures (up to 10 days) should not exceed 2 ppm. The EPA recommends that levels of chlorinated benzenes (a group of chemicals that includes chlorobenzene) in lakes and streams should be limited to 0.488 ppm to prevent possible health effects from drinking water or eating fish contaminated with this group of chemicals. Any release to the environment greater than 100 pounds of chlorobenzene must be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a workplace air concentration limit of 75 ppm over an 8-hour workday, 40-hour workweek.

The federal recomendations have been updated as of July 1999.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

National Priorities List: A list of the nation's worst hazardous waste sites.

Pesticide: A substance that kills pests.

ppm: Parts per million.

Solvent: A substance that dissolves another substance.

Tremor: Trembling or shaking caused by disease or stress.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for chlorobenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CHLOROFORM
CAS # 67-66-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1997**

This fact sheet answers the most frequently asked health questions (FAQs) about chloroform. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chloroform can occur when breathing contaminated air or when drinking or touching the substance or water containing it. Breathing chloroform can cause dizziness, fatigue, and headaches. Breathing chloroform or ingesting chloroform over long periods of time may damage your liver and kidneys. It can cause sores if large amounts touch your skin. This substance has been found in at least 717 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chloroform?

(Pronounced klôr′ə-fôrm′)

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures.

In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water.

Other names for chloroform are trichloromethane and methyl trichloride.

What happens to chloroform when it enters the environment?

- Chloroform evaporates easily into the air.
- Most of the chloroform in air breaks down eventually, but it is a slow process.
- The breakdown products in air include phosgene and hydrogen chloride, which are both toxic.
- It doesn't stick to soil very well and can travel through soil to groundwater.
- Chloroform dissolves easily in water and some of it may break down to other chemicals.
- Chloroform lasts a long time in groundwater.
- Chloroform doesn't appear to build up in great amounts in plants and animals.

How might I be exposed to chloroform?

- Drinking water or beverages made using water containing chloroform.
- Breathing indoor or outdoor air containing it, especially in the workplace.
- Eating food that contains it.
- Skin contact with chloroform or water that contains it, such as in swimming pools.

How can chloroform affect my health?

Breathing about 900 parts of chloroform per million parts air (900 ppm) for a short time can cause dizziness, fatigue, and headache. Breathing air, eating food, or drinking water containing high levels of chloroform for long periods of time may damage your liver and kidneys. Large amounts of chloroform can cause sores when chloroform touches your skin.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

It isn't known whether chloroform causes reproductive effects or birth defects in people.

Animal studies have shown that miscarriages occurred in rats and mice that breathed air containing 30 to 300 ppm chloroform during pregnancy and also in rats that ate chloroform during pregnancy. Offspring of rats and mice that breathed chloroform during pregnancy had birth defects. Abnormal sperm were found in mice that breathed air containing 400 ppm chloroform for a few days.

How likely is chloroform to cause cancer?

The Department of Health and Human Services (DHHS) has determined that chloroform may reasonably be anticipated to be a carcinogen.

Rats and mice that ate food or drank water with chloroform developed cancer of the liver and kidneys.

Is there a medical test to show whether I've been exposed to chloroform?

Although the amounts of chloroform in the air that you exhale and in blood, urine, and body tissues can be measured, there is no reliable test to determine how much chloroform you have been exposed to or whether you will experience any harmful effects.

The measurement of chloroform in body fluids and tissues may help to determine if you have come into contact with large amounts of chloroform, but these tests are useful for only a short time after you are exposed. Chloroform in your body might also indicate that you have come into contact with other chemicals.

Has the federal government made recommendations to protect human health?

The EPA drinking water limit for total trihalomethanes, a class of chemicals that includes chloroform, is 100 micrograms per liter of water (100 µg/L).

The EPA requires that spills or accidental releases of 10 pounds or more of chloroform into the environment be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set the maximum allowable concentration of chloroform in workroom air during an 8-hour workday in a 40-hour workweek at 50 ppm.

Glossary

Carcinogenicity: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Ingesting: Taking food or drink into your body.

Microgram (µg): One millionth of a gram.

Miscarriage: Pregnancy loss.

ppm: Parts per million.

Source of Information

This ToxFAQs information is taken from the 1997 Toxicological Profile for Chloroform (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

METHYLENE CHLORIDE
CAS # 75-09-2

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about methylene chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Breathing in large amounts of methylene chloride can damage the central nervous system. Contact of eyes or skin with methylene chloride can result in burns. Methylene chloride has been found in at least 882 of 1,569 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methylene chloride?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane. Methylene chloride does not occur naturally in the environment.

Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be found in some aerosol and pesticide products and is used in the manufacture of photographic film.

What happens to methylene chloride when it enters the environment?

❑ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.

❑ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.

❑ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

❑ The most likely way to be exposed to methylene chloride is by breathing contaminated air.

❑ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin.

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice

breathing large amounts of methylene chloride for a long time.

The World Health Organization (WHO) has determined that methylene chloride may cause cancer in humans.

The Department of Health and Human Services (DHHS) has determined that methylene chloride can be reasonably anticipated to be a cancer-causing chemical.

The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

How can methylene chloride affect children?

It is likely that health effects seen in children exposed to high amounts of methylene chloride will be similar to the effects seen in adults. We do not know if methylene chloride can affect the ability of people to have children or if it causes birth defects. Some birth defects have been seen in animals inhaling very high levels of methylene chloride.

How can families reduce the risk of exposure to methylene chloride?

❏ Families may be exposed to methylene chloride while using products such as paint removers. Such products should always be used in well-ventilated areas and skin contact should be avoided.
❏ Children should not be allowed to remain near indoor paint removal activities.

Is there a medical test to show whether I've been exposed to methylene chloride?

❏ Several tests can measure exposure to methylene chloride. These tests are not routinely available in your doctor's office.
❏ Methylene chloride can be detected in the air you breathe out and in your blood. These tests are only useful for detecting exposures that have occurred within a few days.
❏ It is also possible to measure carboxyhemoglobin (a chemical formed in the blood as methylene chloride breaks down in the body) in the blood or formic acid (a breakdown product of methylene chloride) in the urine. These tests are not specific for methylene chloride.

Has the federal government made recommendations to protect human health?

❏ The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government.
❏ The EPA recommends that exposure of children to methylene chloride be limited to less than 10 milligrams per liter of drinking water (10 mg/L) for 1 day or 2 mg/L for 10 days.
❏ The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee.
❏ The Occupational Safety and Health Administration (OSHA) has set limits of 25 parts methylene chloride per million parts of workplace air (25 ppm) for 8-hour shifts and 40-hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

XYLENE
CAS # 1330-20-7

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī′lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.