ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

HEXACHLOROCYCLOHEXANE

CAS # 608-73-1

Division of Toxicology ToxFAQs™ **August 2005**

This fact sheet answers the most frequently asked health questions (FAQs) about hexachlorocyclohexane. 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 is 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 hexachlorocyclohexane (HCH) happens mostly from eating contaminated food or by breathing contaminated air in the workplace. Exposure to high levels of HCH can cause blood disorders, dizziness, headaches, seizures, and changes in the levels of sex hormones. HCH has caused cancer in animals. α-, β-, γ-, and δ-HCH have been found in at least 146, 159, 189, and 126, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is hexachlorocyclohexane?

Hexachlorocyclohexane (HCH) is a manufactured chemical that exists in eight chemical forms called isomers. One of these forms, gamma-HCH (or γ-HCH, commonly called lindane) is produced and used as an insecticide on fruit, vegetables, and forest crops. It is a white solid that may evaporate into the air as a colorless vapor with a slightly musty odor. It is also available as a prescription (lotion, cream, or shampoo) to treat head and body lice, and scabies. Lindane has not been produced in the United States since 1976, but is imported for insecticide use.

Technical-grade HCH was used as an insecticide in the United States and typically contained 10-15% γ-HCH as well as the alpha (α), beta (β), delta (δ), and epsilon (ε) forms of HCH. Virtually all the insecticidal properties resided in γ-HCH. Technical-grade HCH has not been produced or used in the United States in over 20 years.

What happens to hexachlorocyclohexane when it enters the environment?

- ❏ The components of technical-grade HCH have been found in soil and surface waters near hazardous waste sites.
- ❏ In the air, the different forms of HCH can exist as a vapor or attached to small particles such as soil and dust. The particles may be removed from the air by rain or degraded by other compounds in the atmosphere.
- ❏ HCH can remain in the air for long periods of time and travel great distances.
- ❏ In soil, sediments, and water, HCH is broken down to less toxic substances by algae, fungi, and bacteria, but this process can take a long time.
- ❏ HCH can accumulate in the fatty tissue of fish.

How might I be exposed to hexachlorocyclohexane?

- ❏ Eating food or drinking water contaminated with HCH.
- ❏ Breathing air contaminated with HCH in or near factories where products using γ-HCH are made.
- ❏ Through the skin when applied as a lotion or shampoo to treat lice or scabies.
- ❏ Workers involved in the formulation or application of products containing γ-HCH may be exposed to higher concentrations.

How can hexachlorocyclohexane affect my health?

Some people who breathed contaminated workplace air during manufacturing of pesticides, including γ-HCH, 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 γ- and α-HCH have had convulsions, and animals fed β-HCH have become comatose. All isomers can produce liver and kidney effects. Reduced ability to fight infection was reported in animals fed γ-HCH, and injury to the ovaries and testes was reported in animals given γ-HCH or β-HCH.

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How likely is hexachlorocyclohexane to cause cancer?

Long-term oral administration of α-HCH, β-HCH, γ-HCH, or technical-grade HCH to laboratory rodents produced liver cancer. The Department of Health and Human Services (DHHS) has determined that HCH (all isomers) may reasonably be anticipated to cause cancer in humans. The International Agency for Research on Cancer (IARC) has classified HCH (all isomers) as possibly carcinogenic to humans. The EPA has determined that there is suggestive evidence that lindane (γ-HCH) is carcinogenic, but the evidence is not sufficient to assess its human carcinogenic potential. The EPA has additionally classified technical HCH and α-HCH as probable human carcinogens, β-HCH as a possible human carcinogen, and δ- and ε-HCH as not classifiable as to human carcinogenicity.

How can hexachlorocyclohexane affect children?

Health effects observed in adults should also be of potential concern in children. Children can experience convulsions from exposure to γ-HCH. Accidentally eating high amounts of γ-HCH can kill a child. We do not know whether children are more susceptible than adults to health effects from exposure to γ-HCH. However, a study performed on rabbits showed that young animals had higher death rates and greater sensitivity than adults when γ-HCH was applied to the skin.

We do not know whether HCH causes birth defects in humans. Technical grade and γ-HCH do not cause serious birth defects in animals. HCH has been shown to cross the placenta in pregnant women. HCH has been detected in human breast milk, suggesting that it can be transferred to infants from women who nurse.

How can families reduce the risks of exposure to hexachlorocyclohexane?

❑ γ-HCH is a restricted use pesticide, it can be applied only by persons licensed and certified.

❑ If you work with HCH, take the necessary precautions to avoid bringing the dust home in your clothing or tools.

❑ If you use products containing γ-HCH, such as shampoos or lotions to treat lice, follow the directions for use carefully. There are alternatives that do not involve γ-HCH.

❑ Make sure you keep products containing γ-HCH in tightly covered containers stored in the original container, and out of the reach of children.

Is there a medical test to determine whether I've been exposed to hexachlorocyclohexane?

HCH isomers can be measured in blood, urine, body fat, breast milk, and semen of exposed persons. Samples of blood, urine, and semen can be collected at the doctor's office and sent to a laboratory that has the special equipment needed to measure the levels of HCH. These tests cannot tell the levels you were exposed to or whether you will experience adverse health effects. The urine of potentially exposed persons can be tested for breakdown products of HCH formed in the body to determine whether a person was exposed to HCH or to a group of chemicals similar to HCH.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water that children consume for up to 10 days should not contain more than 1.2 mg of γ-HCH per liter of water (1 mg/L) and that drinking water for children consumed for lifetime should not contain more than 0.0002 mg/L.

The Occupational Safety and Health Administration (OSHA) has set a limit for γ-HCH in the workplace air of 0.5 mg per cubic meter of air (0.5 mg/m^3) during an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane. (Update). Atlanta, GA: U.S. Department of Public 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 F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. 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.