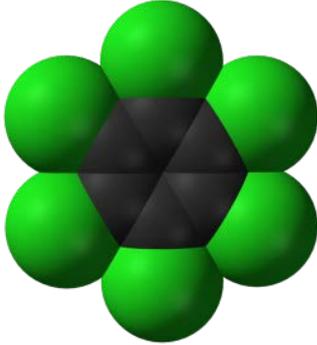


HEXACHLOROBENZENE

Overview



Hexachlorobenzene (HCB) is a fully chlorinated industrial hydrocarbon chemical. It is insoluble in water, but is very soluble in fat, oils, and organic solvents. Hexachlorobenzene is one of the most persistent environmental pollutants, and bioaccumulates in the environment, in animals, and in humans. It is not currently manufactured as a commercial product in the United States, and virtually all commercial production ended in the late 1970s. However, some hexachlorobenzene is produced as a byproduct or impurity in the manufacture of chlorinated solvents and other chlorinated compounds, including several pesticides currently in use (pentachloronitrobenzene, chlorothalonil, picloram, pentachlorophenol, atrazine, simazine, and lindane). It is estimated that 3,500-11,500 kg of hexachlorobenzene were inadvertently produced in the manufacture of chlorinated solvents in 1984. There are no current commercial uses of hexachlorobenzene in the United States, although hexachlorobenzene was used as a fungicide on the seeds of onions, sorghum, wheat, and other grains until 1984, when its registration as a pesticide was voluntarily canceled (#ATSDR-Toxicological profile for Hexachlorobenzene).

Due to HCB's persistence in the environment, it has been banned globally under the Stockholm Convention.

Uses

Although HCB is no longer directly used, it is still found in our environment as a by-product of certain activities and because of past use.

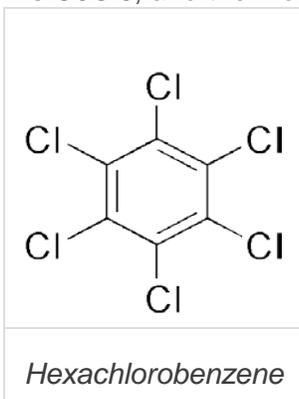
Past uses:

- ♣ Used to make fireworks and ammunition
- ♣ Used to manufacture synthetic rubber

- ♣ Used as a fungicide to protect wheat and other seeds
- Potential Sources to our Environment:*
- ♣ By-product when making other chlorine-containing compounds
- ♣ Found in water sediments
- ♣ By-product when manufacturing some pesticides
- ♣ Use of HCB-contaminated pesticides
- ♣ Found in chlorination treatment of process water and wastewater
- ♣ Incineration of municipal and hazardous wastes
- ♣ By-product when making chemical solvents (chemicals used to dissolve other chemicals) (#EPA).

Chemical Description

Hexachlorobenzene is a white crystalline solid which is not very soluble in water. The odor threshold for hexachlorobenzene is not available. The chemical formula for hexachlorobenzene is C₆Cl₆, and the molecular weight is 284.8 g/mol (#EPA).



At ambient temperature, HCB is a white crystalline solid. Technical grade HCB is available as a wettable powder, liquid or dust. It is virtually insoluble in water, but is soluble in ether, benzene, chloroform and hot ethanol. HCB has a high octanol/water partition coefficient, low vapour pressure and low flammability. Technical grade HCB contains up to 2% impurities, about half of which is pentachlorobenzene, the remainder including hepta- and octachlorodibenzofurans, octachlorodibenzo- p-dioxin, and decachlorobiphenyl (#IPCS INCHM) . HCB has been sold under the following synonyms and trade names: Amatin, Anticarie, Bunt-cure, Bunt-no-more, Co-op hexa, Granox NM, HCB, Julin's carbon chloride, No Bunt, No Bunt 40, No Bunt 80, No Bunt liquid, Pentachlorophenyl chloride, perchlorobenzene, Sanocide and Snieciotox (#Eurochlor).

Routes of Exposure and Metabolism

Hexachlorobenzene can enter your body when you eat food contaminated with it, when you breathe particles of it in the air, or when it gets on your skin. After it enters your body, it rapidly spreads through your blood to many tissues in the body, especially to fat. This probably happens within a few hours. Based on the results of a survey of this substance in people's tissues, it will remain in your body, especially in fat, for years. A large portion of hexachlorobenzene in the fat of a mother can be transferred to her baby in breast milk. During pregnancy, this substance can transfer to the unborn child through the mother's blood. Most of it leaves your body in the feces; smaller amounts are found in urine (#ATSDR-Public Health Statement for Hexachlorobenzene).

The principal metabolites in mammals are pentachlorophenol, tetrachlorohydroquinone and pentachlorothiophenol, with lesser amounts of tetrachlorobenzene, pentachlorobenzene, 2,4,5- and 2,4,6- trichlorophenols and 2,3,4,6- and 2,3,5,6-tetrachlorophenols (#FAO/UNEP Programme).

Health Effects

Acute Health Effects

Hexachlorobenzene is listed as "extremely hazardous" by the World Health Organization (WHO) Acute Hazard Rankings (#WHO). "Extremely hazardous" means that its LD50 (the lethal dose-in milligrams of substance per kilogram of body weight- that kills 50% of the test animals in a standard assay) is

- ♣ < 5 (for solids-oral exposure)
- ♣ < 20 (for liquid-oral exposure)
- ♣ < 10 (for solids-dermal exposure)
- ♣ < 40 (for liquids-dermal exposure).

On the U.S. EPA's Acute Toxicity Rankings hexachlorobenzene is listed as "Not Acutely Toxic to Slightly Toxic" ("Slightly Toxic" means it has effects on eye-irritation and corneal involvement, clearing takes 7 days or less; and effects on skin-moderate irritation at 72 hours of exposure) (#PANNA).

Chronic Health Effects

Hexachlorobenzene is listed as a "possible carcinogen" by the IARC (International Agency for Research on Cancer). On the U.S. National Toxicology Program's (NTP) Carcinogen List, it is ranked as "Reasonably Anticipated to Be a Carcinogen," and the U.S. EPA lists it as a "probable carcinogen."

It is listed as an endocrine disruptor by the EU (European Union Prioritization List for Endocrine Disrupting Compounds) and as a "probable" endocrine disruptor by the Illinois EPA.

Hexachlorobenzene also has reproductive/developmental effects: it is listed on the State of California's Proposition 65 List (a list of chemicals "known to the State to cause reproductive and developmental toxicity" that is maintained by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)).

Chronic exposure to hexachlorobenzene has shown to cause liver damage in rats and one incident of overexposure in Turkey (in the 1950s) showed that infants who ingested a large amount may have lower survival rates (#ATSDR).

Health studies from accidental ingestion of HCB-treated seed grain in Turkey:

- ♣ Hexachlorobenzene episode in Turkey
- ♣ Evaluation of reproductive outcomes in women inadvertently exposed to hexachlorobenzene in southeastern Turkey in the 1950s
- ♣ Epidemiology of hexachlorobenzene-induced porphyria in Turkey: clinical and laboratory follow-up after 25 years

Environmental Effects

Hexachlorobenzene tends to remain in the environment for a long time. If it is released to the soil, it has a half-life of 3-6 years. This means that half of the total amount will disappear after 3-6 years, half of the remaining amount will disappear in another 3-6 years, and this process will continue each 3-6 years thereafter. If it is released to surface waters such as lakes, rivers, and streams, the half-life is 2.7-5.7 years, and if it is released to groundwater, the half-life is 5.3-11.4 years. Since hexachlorobenzene does not dissolve in water very well, most of it will remain in particles on the bottom of lakes, rivers, or streams. The evaporation of hexachlorobenzene into the air is not significant under ordinary conditions. Once in the air, it can be carried over wide geographic areas. Its half-life in air ranges from 0.63 to 6.28 years (#ATSDR-Public Health Statement for Hexachlorobenzene).

Hexachlorobenzene is a highly persistent compound and it is slightly or moderately toxic to birds, fish, and nontoxic to bees (#EXTOXNET).

Regulation

EPA has proposed that drinking water should not contain more than 0.05 parts of hexachlorobenzene per million parts of water (ppm) in water that children drink, and should not exceed 0.2 ppm in water that adults drink for longer periods (approximately 7 years) (#ATSDR-Public Health Statement for Hexachlorobenzene).

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Ways to Reduce Exposure

The primary way most people are exposed is through food. Fatty food may be higher in hexachlorobenzene than less fatty food. Additionally, when hexachlorobenzene is present in food, more may be absorbed when the food is fatty than when the food is less fatty. Therefore, eating less fatty food may reduce the risk of exposure to hexachlorobenzene (#ATSDR-Public Health Statement for Hexachlorobenzene).

If you live near an industrial site where hexachlorobenzene was produced or is produced as an unintentional by-product or you live near a hazardous waste site where it has been discarded, there may be high levels of hexachlorobenzene in the water and soil. Substituting cleaner sources of water and limiting contact with soil (for example, through use of a dense ground cover or thick lawn) would reduce family exposure to hexachlorobenzene. Produce grown in contaminated soil should not be eaten. By paying careful attention to dust and dirt control in the home (air filters, frequent cleaning), you can reduce family exposure to contaminated dirt

Source : <http://www.toxipedia.org/display/toxipedia/Hexachlorobenzene>