HEPTACHLOR

Overview

Heptachlor is a nonsytemic stomach and contact organochlorine insecticide first synthesized in 1946 and banned in 1988 (#EXTOXNET and #ATSDR Public Health Statement). It was used extensively in the 1960s and 1970s in household and agricultural settings. Studies link heptachlor to cancer, endocrine disruption, and developmental toxicity, but the full extent of heptachlor's health effects are currently unknown. Heptachlor is extremely persistent and is found throughout the United States nearly twenty years after its cancellation. Heptachlor is readily converted to more potent heptachlor epoxide once it enters the environment or the body (#EXTOXNET).

Chemical Description

Technical-grade heptachlor, its insecticidal form, is a tan powder and has a lower level of purity than pure heptachlor. Both technical-grade and pure heptachlor smell generally of mothballs or camphor (#ATSDR Public Health Statementand #ATSDR Heptachlor).

Heptachlor is not highly flammable, combustible, or soluble (#ATSDR Public Health Statement).

Heptachlor is not naturally occurring and it was marketed under the following trade names:

* Aahepta
* Agroceres
* Hepta
* Heptachlordane
* Heptagran
* Heptamul
* Heptox
* Gold Crest H-60
* Rhodiachlor
* Velsicol 104
* Basaklor
* Soleptax
* Termide

Uses

Heptachlor is an insecticide used heavily in the 1960s and 1970s in household and agricultural settings (#Caudle, et al., 2005). It was used extensively to control termites and pests on corn crops (#ATSDR Public health Statement and#Heptachlor). It was also used against spittlebugs, weevils, wireworms, cornborers, root worms, boll weevils, leaf hoppers, cutworms, thrips, Japanese beetles, grasshoppers, mosquitoes, and plum curculio (#INTOX, 1975).

Heptachlor and heptachlor epoxide (what it converts to after spraying) can still be found in soil around some homes because of its extensive use, mostly between 1953-1974, to kill termites and agricultural insect pests (#ATSDR). It can also be found near hazardous waste sites. Heptachlor's use was canceled in 1988, though it is still registered for use to kill fire ants in power transformers and in underground cable television and telephone cable boxes (#ATSDRand #EPA). (See #Regulation below for more information.)

Routes of Exposure and Metabolism

Heptachlor can enter the body through absorption from contaminated soil, from eating or drinking contaminated products, and through inhalation by breathing air contaminated with heptachlor (#ATSDR Heptachlor). Nursing mothers also can pass heptachlor on to their children.

In both the environment and the body, heptachlor is readily converted into its oxygenated metabolite, heptachlor epoxide (#NRDC). Once it is converted, the heptachlor epoxide works to block the $GABA_A$ receptors, causing an inhibition of the chloride ion flux through the $GABA_A$ receptor and overstimulation of the nervous system (#Caudle, et al., 2005).

Both heptachlor and heptachlor epoxide are highly persistent in the environment and in the body. Heptachlor and heptachlor epoxide are readily stored in fatty, liver, and kidney tissues in mammals (#EXTOXNET). Heptachlor also passes the placenta and is found in breast milk (#EXTOXNET).

Human Health Effects

Chronic (Long-term) Health Effects

According to the U.S. Agency for Toxic Substances and Disease Registry, no study to date has shown that heptachlor exposure conclusively harms human health (#ATSDR Public Health Statement). Animal studies, though, have shown serious negative effects on animal health after chronic exposure to heptachlor. The problems expressed a dose-response relationship: the more of the substance or the longer one is exposed to the substance, the more negative the effects. Animals subjected to chronic heptachlor exposure showed the following negative effects:

- Liver damage; animals that were fed heptachlor throughout their lives had elevated liver tumor levels.
- Excitability.
- Decreased fertility.
- Developmental problems were observed in animals who were exposed to heptachlor during gestation and infancy.

These effects have yet to be observed in human populations, but the results of the animal studies are a serious enough concern for the EPA to list haptachlor as a probable cancer-causing agent (#ATSDR Heptachlor).

The International Agency for Research on Cancer has listed heptachlor as a possible carcinogen, and the State of California has listed heptachlor as a known carcinogen and a known developmental toxicant (#PANNA Pesticide Database). The State of Illinois Environmental Protection Agency has listed heptachlor as a probable endocrine disruptor (#PANNA Pesticide Database).

Acute (Short-term) Health Effects

According to the U.S. Agency for Toxic Substances and Disease Registry, there is very little evidence of acute effects to humans due to exposure to heptachlor. However, animals exposed to high levels of heptachlor experienced violent convulsions and tremors (#ATSDR Heptachlor).

To see heptachlor's International Chemical Safety Card, which lists acute hazards/symptoms and preventive measures for workers, click here.

According to the U.S. Environmental Protection Agency, symptoms of poisoning to organochlorine pesticides include (#EPA Pesticide Poisoning Handbook):

- Hypersensitive to stimulation, sensation of prickling, tingling or creeping on skin.
- Headache, dizziness, nausea, vomiting, incoordination, tremor, mental confusion, hyperexcitable state.
- In severe cases: convulsions, seizures, coma and respiratory depression.

Environmental Health Effects

Heptachlor and heptachlor epoxide are both highly persistent in the environment, with a half-life of around 250 days depending on the soil type. Both bond strongly to soil and tend not to leach into groundwater (#ATSDR Public Health Statement and #EXTOXNET). Heptachlor is practically insoluble in water (heptachlor epoxide is more soluble) and neither heptachlor nor heptachlor epoxide readily evaporate from water. Additionally, heptachlor, because of its high use and its ability to bond to soil, was often unintentionally carried away by the wind. (#ATSDR Public Health Statement).

Toxicity to Organisms

Heptachlor is highly toxic to birds with a reported acute oral LD 50 for mallard ducks of 2080 mg/kg and a reported five-day dietary LC 50 in Japanese quail of 99 ppm. Eight-day dietary LC_{50} values for heptachlor

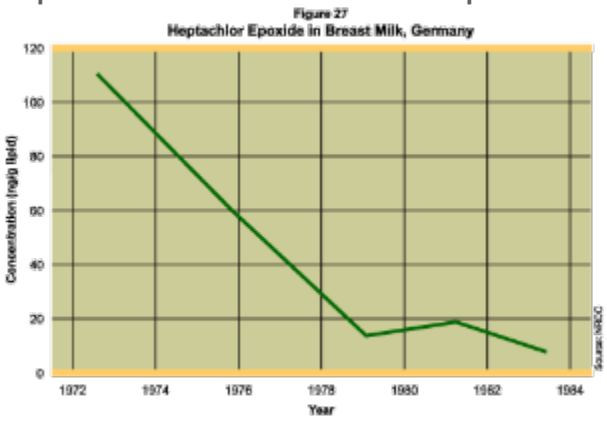
are 450 to 700 ppm in bobwhite quail and 250 to 275 ppm in pheasants (#EXTOXNET). Heptachlor and heptachlor epoxide are highly toxic to most aquatic organisms, with young and developing organisms being the most sensitive. Due to itsinsecticidal qualities, it is highly toxic to bees (#EXTOXNET).

Precautions

Exposure to heptachlor occurs most commonly from eating contaminated food. Exposure can result from handling contaminated soil, and people who live in areas where heptachlor was applied in the past may be exposed to contaminated soil. (#ATSDR Public Health Statement).

Regulation

Heptachlor Levels in People Decreased During the Phase-Out Years



Graph Retrieved from NRDC

Heptachlor began to be phased out in the late 1970s and concern about its health effects first arose when residents of Hawaii consumed contaminated dairy milk. The dairy cows had been fed pineapple green chop contaminated with high levels of heptachlor, which passed to people through the milk. Concern was mostly focused on the developmental effects of heptachlor and effects on children who had been breastfed by mothers who had consumed the milk (#Caudle, et al., 2005).

Heptachlor began to be phased out in the late 1970s but its use was not banned until 1988 (#ATSDR Public Health Statement). Its only legal use today is to kill fire ants in power transformers and in underground cable television and telephone cable boxes (#ATSDR Heptachlor and #EPA).

The EPA also has several regulations regarding heptachlor levels in drinking water:

- EPA recommends that a child weighing 22 pounds or less not drink water containing levels of heptachlor or heptachlor epoxide exceeding 0.01 mg per liter of water (0.01 mg/L or 0.01 ppm)
- EPA requires that drinking water not contain more than 0.0004 mg/L (0.004 ppm) heptachlor and 0.0002 mg/L (0.0002 ppm) of heptachlor epoxide.

Source : http://www.toxipedia.org/display/toxipedia/Heptachlor