

MIREX

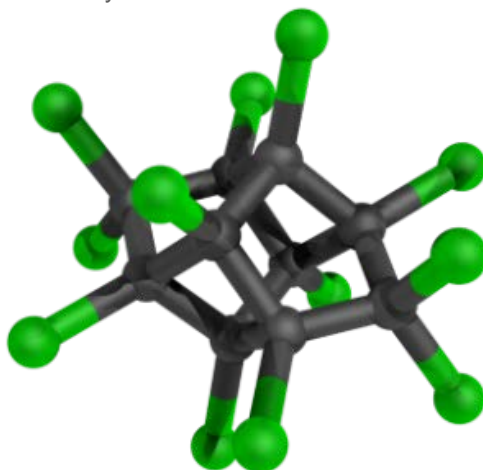
Overview

The insecticide mirex is a chlorinated hydrocarbon that was commercialized for 16 years (1962-1978) in the southeastern United States to control the imported fire ant. Mirex use became controversial when it was found to be highly toxic to a variety of marine crustaceans, including commercially important species of shrimps and crabs. In addition, mirex is lipophilic and therefore highly bioaccumulative. The United States [Environmental Protection Agency](#) targeted this chemical as a persistent, bioaccumulative, and toxic (PBT) pollutant. All uses of mirex were cancelled in 1978. The [Stockholm Convention](#) banned production and use of several persistent organic pollutants and mirex is one of the "**dirty dozen**".

Chemical Characteristics and Degradation

This chemical is usually seen as a snow-white crystalline, odorless solid and it does not burn easily. Mirex was first reported in 1946 but it was not used in pesticide formulations until 1955. It is a derivative of cyclopentadiene and was produced by the dimerization of hexachlorocyclopentadiene in the presence of aluminum chloride. Mirex does not burn easily; expected combustion products are carbon dioxide, carbon monoxide, hydrogen chloride, chlorine, phosgene, and other organochlorine species. Slow oxidation produces [chlordecone](#), which is also a banned insecticide in most of the western world.

Sunlight degrades mirex to photomirex, which can also have harmful effects. This chemical is highly resistant to microbiological degradation. It slowly dechlorinates to a monohydro derivative not only by anaerobic microbial action in sewage sludge, but also by enteric bacteria. However, degradation by soil microorganisms has not been described yet.



Sources and Uses

In the past, mirex was widely used for killing fire ants, and it was also commonly used as a fire retardant in plastics, rubber, paint, paper, and electrical goods. Although the sale, distribution, and use of mirex are prohibited in the United States, it still can be found in our environment. Potential sources are contaminated bottom sediments, contaminated surface water, and contaminated soil.

Environmental Fate

Mirex breaks down slowly in the environment and it does not evaporate to any great extent from surface water or surface soil. Therefore it is highly cumulative and it may remain on soil and water for years. Being very lipophilic, mirex is strongly adsorbed on sediments and it easily sticks to soil and sediment particles. There is evidence of harmful levels of accumulation of mirex in aquatic and terrestrial food chains.

Routes of Exposure

People can be exposed to mirex by eating contaminated fish or other animals living near hazardous waste sites or by touching or ingesting contaminated soil near hazardous waste sites. People are not likely to be exposed by drinking water or breathing air because mirex does not easily dissolve in water or evaporate. Infants may be exposed through breast milk of mothers living near hazardous waste sites. Mirex can enter the body via inhalation, ingestion, and via the skin.

Metabolism

Mirex passes from the stomach and intestines of animals into their blood. It is still unknown how much of this chemical passes from the stomach and intestines of people and enters the bloodstream. Once in the bloodstream, mirex is carried to many parts of the body where it is stored, mainly in fat. Mirex is not broken down in the body and it leaves the body unchanged, mainly in the feces. Very little leaves the body in the urine. Most of the mirex that is swallowed leaves the body in feces within two days. However, the mirex that is stored in fat leaves the body very slowly. This process can take from several weeks to months. Mirex can also enter breast milk from the bloodstream of nursing mothers who have been exposed.

Human Health Effects

Mirex is toxic for a range of aquatic organisms, with crustaceans being particularly sensitive. Mirex also induces pervasive chronic physiological and biochemical disorders in various vertebrates. Animal studies

have shown that ingesting high levels of mirex can harm the stomach, intestine, liver, kidneys, eyes, thyroid, and nervous and reproductive systems.

It is still unknown how mirex directly affects the health of people. However, animal studies have shown that eating mirex can cause harmful effects on the stomach, intestines, liver, and kidneys and it can also cause harmful effects on the eyes, thyroid, nervous system, and reproductive system. Since these effects occur in animals, it is a great likelihood can cause these effects in people as well. It was also shown that younger animals are more sensitive to toxic effects of mirex on the nervous system. Exposure to sufficient amounts of mirex may cause cataracts in animals if they are exposed before or soon after birth. It is not known whether human infants may also develop cataracts; however, it is not likely that mirex will cause cataracts in adults. Short-term, low-level exposure to mirex may harm reproduction and development in rodents. High-level exposures may result in miscarriage.

IARC (1979) evaluated that there is sufficient evidence of its carcinogenicity in mice and rats. Mirex can cause liver, adrenal gland, and kidney tumors. EPA classified mirex as an agent that probably can cause cancer in humans. No acceptable daily intake (ADI) for mirex has been advised by FAO/WHO.

Recommendations on Protecting Human Health

The EPA has set a limit of 1 part of mirex per trillion parts of surface water (1 ppt) to protect fish and other aquatic life from harmful effects. The EPA suggests that ingesting an amount of mirex equal to 200 picograms (pg) per kilogram (kg) of body weight per day is not likely to cause significant harmful health effects. The [Food and Drug Administration \(FDA\)](#) (FDA) suggests that eating fish and other foods with concentrations below 100 ppt of mirex will not cause harmful health effects in people.

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