

Toxaphene

8001-35-2

Hazard Summary

Toxaphene was a widely used pesticide on cotton, other crops, and in livestock and poultry. In 1982, most of its uses were cancelled and in 1990, all uses were cancelled in the United States. The major effect of toxaphene is central nervous system (CNS) stimulation, which results in convulsive seizures. No studies are available on acute (short-term) inhalation exposure to toxaphene in humans or animals. Chronic (long-term) inhalation exposure to toxaphene in humans results in reversible respiratory toxicity, while chronic, oral exposure in animals has resulted in effects on the liver, kidney, spleen, adrenal and thyroid glands, CNS, and the immune system. Animal studies have reported an increased incidence of thyroid gland tumors and liver tumors via ingestion. EPA has classified toxaphene as a Group B2, probable human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (6), which contains information on the carcinogenic effects of toxaphene including the unit cancer risk for inhalation exposure, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Toxaphene. (1)

Uses

- The principal use of toxaphene in the past was for pest control on cotton crops. It was also used to control pests in livestock and poultry, and on other field crops. (1)
- In 1982, EPA cancelled the registration of toxaphene for use as a pesticide, except for use on livestock, in emergency situations, and for controlling insects on banana and pineapple crops in Puerto Rico and the Virgin Islands. In 1990, all uses of toxaphene were cancelled. (1)

Sources and Potential Exposure

- Low levels (approximately 1 part per billion [ppb]) of toxaphene have been measured in outdoor air. However, these levels were measured before its use as a pesticide was restricted in 1982, and current levels would be expected to be lower. (1)
- Toxaphene has also been detected in soil and food. Fish and other seafood from contaminated water usually contain the highest levels of the pesticide. (1,2)
- Toxaphene has been detected very rarely in drinking water supplies. (2)

Assessing Personal Exposure

- Toxaphene and its breakdown products can be detected in blood, urine, breast milk, and body tissues if a person has been exposed to high levels. Because toxaphene is removed from the body fairly quickly, these methods are only useful for detecting exposures that have occurred within the past several days. (1)

Health Hazard Information

Acute Effects:

- No studies are available on the effects of acute inhalation exposure to toxaphene in humans or animals. (1)

Acute oral exposure to toxaphene in humans results in CNS stimulation, with the major effect being

- Acute oral exposure to toxaphene in humans results in CNS stimulation, with the major effect being convulsive seizures. The dose necessary to induce nonfatal convulsions in humans is approximately 10 milligrams per kilogram body weight per day (mg/kg/day). (1)
- Animal studies have reported effects on the liver, kidney, and CNS from acute oral exposure to toxaphene.(1)
- Toxaphene is considered to have high acute toxicity based on short-term oral tests in rats. (1,5)

Chronic Effects (Noncancer):

- Chronic inhalation exposure to toxaphene in humans has been reported to cause reversible respiratory toxicity. (1,4)
- In animals, chronic oral exposure to toxaphene has resulted in effects on the liver (induction of microsomal enzymes and histological changes in liver cells), kidney, spleen, adrenal and thyroid glands, CNS, and immune system (immunosuppressive effects). (1)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for toxaphene. (6)
- ATSDR has calculated an oral intermediate minimal risk level (MRL) of 0.001 mg/kg/d based on no adverse liver effects in rats. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. Exposure to a level above the MRL does not mean that adverse health effects will occur. The MRL is intended to serve as a screening tool. (1)

Reproductive/Developmental Effects:

- No information is available on the developmental or reproductive effects of toxaphene in humans following inhalation or oral exposure. (1)
- Animal studies have reported developmental effects, including behavioral effects and immunosuppression, in the offspring of rats exposed orally to toxaphene. Several studies have reported no reproductive effects from oral exposure to toxaphene in animals. (1)

Cancer Risk:

- Several human studies examined the incidence of cancer associated with inhalation exposure to a number of pesticides, including toxaphene. However, these studies were inconclusive due to lack of information on exposure levels and concurrent exposure to other pesticides. (1)
- A study by the National Toxicology Program (NTP) reported an increase in liver tumors in male and female mice and an increase in thyroid tumors in male and female rats when fed toxaphene in the diet. (3)
- EPA considers toxaphene to be a probable human carcinogen (cancer-causing agent) and has classified it as a Group B2 carcinogen. (6)
- EPA uses mathematical models, based on animal studies, to estimate the probability of a person developing cancer from breathing air containing a specified concentration of a chemical. EPA calculated an inhalation unit risk estimate of $3.2 \times 10^{-4} \text{ (}\mu\text{g}/\text{m}^3\text{)}^{-1}$. EPA estimates that, if an individual were to continuously breathe air containing toxaphene at $0.003 \mu\text{g}/\text{m}^3$ ($3.0 \times 10^{-6} \text{ mg}/\text{m}^3$) over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of breathing air containing this chemical. Similarly, EPA estimates that breathing air containing $0.03 \mu\text{g}/\text{m}^3$ ($3.0 \times 10^{-5} \text{ mg}/\text{m}^3$) would result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and air containing $0.3 \mu\text{g}/\text{m}^3$ ($3.0 \times 10^{-4} \text{ mg}/\text{m}^3$) would result in not greater than a one-in-ten thousand increased chance of developing cancer. For a detailed discussion of confidence in the potency factors, please see IRIS. (6)
- EPA has calculated an oral cancer slope factor of $1.1 \text{ (mg}/\text{kg}/\text{d)}^{-1}$. (6)

Physical Properties

- Toxaphene is a mixture of over 670 chemicals, including chlorinated camphene. (1)

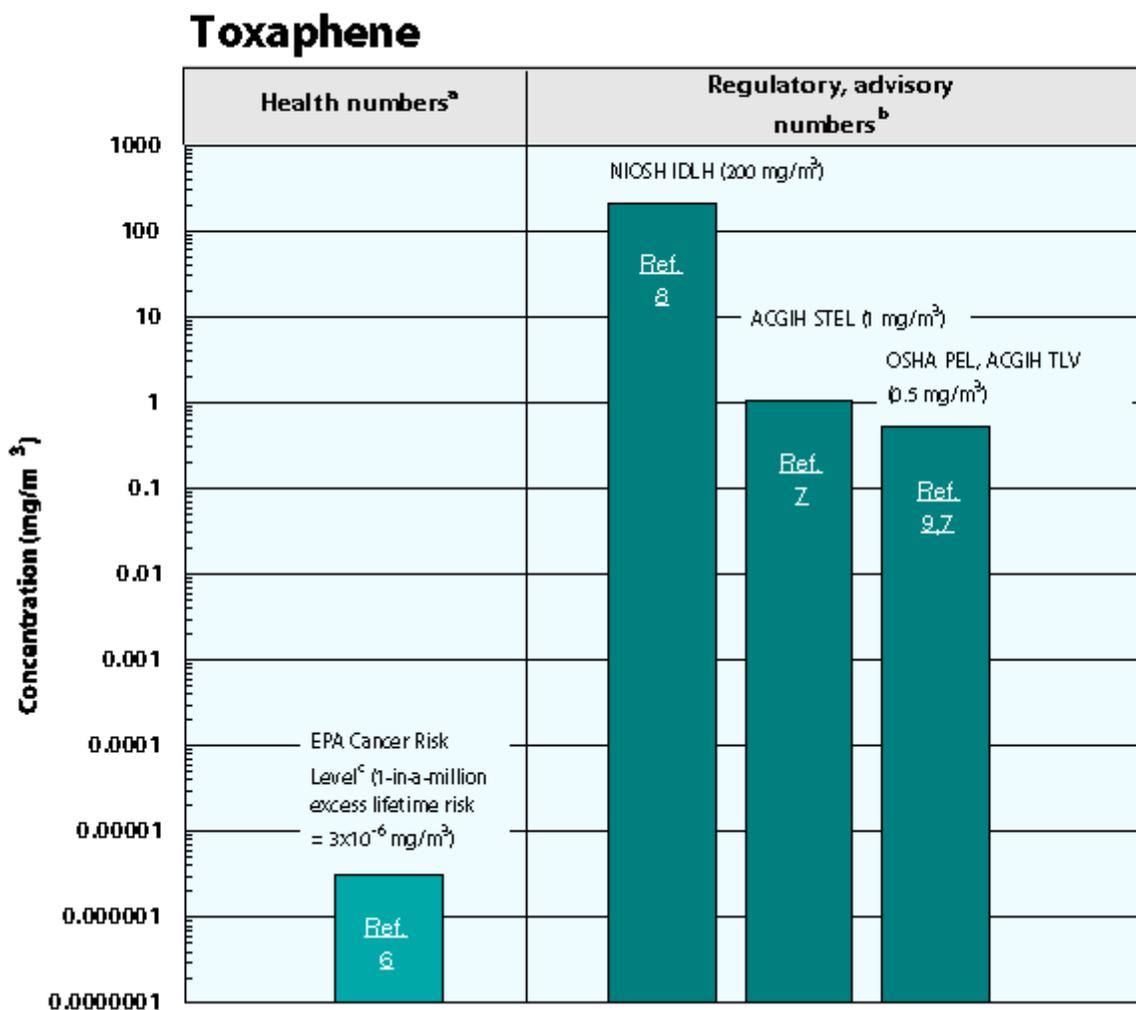
Toxaphene is a yellow-to-amber, waxy solid that smells like turpentine. The odor threshold for toxaphene

- Toxaphene is a yellow-to-amber, waxy solid that smells like turpentine. The odor threshold for toxaphene is 0.14 parts per million (ppm). (1)
- The chemical formula (average) for toxaphene is $C_{10}H_{10}Cl_8$, and it has a molecular weight (average) of 414 g/mol. (1)
- The vapor pressure for toxaphene is 0.2 to 0.4 mm Hg at 20 °C, and it has a log octanol/water partition coefficient ($\log K_{ow}$) of 2.474. (1)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $mg/m^3 = (ppm) \times (\text{molecular weight of the compound}) / (24.45)$. For toxaphene: 1 ppm = 16.9 mg/m^3 . To convert concentrations in air from $\mu g/m^3$ to mg/m^3 : $mg/m^3 = (\mu g/m^3) \times (1 \text{ mg} / 1,000 \mu g)$.

Health Data from Inhalation Exposure



ACGIH STEL --American Conference of Governmental and Industrial Hygienist's threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.
 ACGIH TLV --ACGIH's threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
 NIOSH IDLH --National Institute of Occupational Safety and Health immediately dangerous to life and health; NIOSH concentration representing the maximum level of a pollutant from which an individual could escape within 30 minutes without escape-impairing symptoms or irreversible health effects.
 OSHA PEL --Occupational Safety and Health Administration's permissible exposure limit expressed as a time-

weighted average; the concentration of a substance to which most workers can be exposed without adverse effects averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

^c These cancer risk numbers were derived from oral data and converted to provide the estimated inhalation risk.

References

Summary created in April 1992, updated in January 2000

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Toxaphene. (Update). U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1996.
 2. U.S. Environmental Protection Agency. Health Advisory on Toxaphene. Office of Drinking Water, Washington, DC. 1987.
 3. National Toxicology Program (NTP). Bioassay of Toxaphene for Possible Carcinogenicity (CAS No. 8001-35-2). TR-37. 1979.
 4. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
 5. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
 6. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Toxaphene. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
 7. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
 8. National Institute for Occupational Safety and Health (NIOSH). [Pocket Guide to Chemical Hazards](#). U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
 9. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998.
1. *These cancer risk numbers were derived from oral data and converted to provide the estimated inhalation risk.