

Parathion

56-38-2

Hazard Summary

Exposure may occur from the use of parathion as an insecticide on agricultural crops. Parathion is extremely toxic from acute (short-term) inhalation, oral, and dermal exposures. The central nervous system, blood, respiratory system, eyes, and skin are the organs most affected by acute exposure of humans to parathion. Chronic (long-term) inhalation and oral exposure of humans and animals to parathion have been observed to result in depressed red blood cell cholinesterase activity, nausea, and headache. No information is available on reproductive, developmental, or carcinogenic effects of parathion in humans. Limited data on animals are available; increased adrenal cortical tumors were observed in rats orally exposed to parathion. EPA has classified parathion as a Group C, possible human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (5), which contains information on the carcinogenic effects of parathion, EPA's Health Effects Assessment for Parathion (7), and International Agency for Research on Cancer (IARC) monographs on carcinogenic risk of parathion to humans. (2)

Uses

- Parathion is primarily used as an insecticide on fruit, cotton, wheat, vegetables, and nut crops. (1,3)

Sources and Potential Exposure

- Humans are exposed to parathion primarily during field application and formulation; the general public may be exposed by dermal and inhalation exposure from spray drift in areas adjacent to agricultural fields.(1)
- Exposure to parathion may occur in the workplace during its manufacture. (1)
- Individuals may also be exposed by ingesting food containing parathion residues. (1)

Assessing Personal Exposure

- The occurrence of the urinary metabolites of parathion, para-nitrophenol, and alkyl phosphates has been used to monitor worker exposure to parathion. (2)

Health Hazard Information

Acute Effects:

- Acute exposure of humans to parathion may result in nausea, vomiting, abdominal cramps, diarrhea, excessive salivation, headache, weakness, difficult breathing, blurring or dimness of vision, convulsions, central nervous system depression, paralysis, coma, and respiratory failure. (1,3,5)
- The central nervous system, blood, respiratory system, eyes, and skin are the organs expected to be affected by acute exposure to parathion. (1)
- Acute animal exposure tests in rats, mice, rabbits, and guinea pigs have demonstrated that parathion has **extreme** acute toxicity from inhalation, oral, and dermal exposure. (6)

Chronic Effects (Noncancer):

- Chronic inhalation exposure of humans to parathion has been observed to result in depressed red blood cell cholinesterase activity, nausea, and headaches. (1)
- Decreased red blood cell cholinesterase activity has also been reported in animal inhalation and ingestion studies. (1,8)
- Depressed plasma and red blood cell cholinesterase activity has also been observed in humans chronically exposed to parathion by ingestion. (1,2,8)
- In one study, degenerative changes in the liver were observed in dogs chronically orally exposed to parathion. (1)
- EPA has not established a Reference Concentration (RfC) for parathion. (5)
- EPA has calculated a provisional Reference Dose (RfD) of 0.006 milligram per kilogram body weight per day (mg/kg/d) for parathion based on erythrocyte cholinesterase inhibition in humans. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. The provisional RfD is a value that has had some form of Agency review, but it does not appear on the IRIS. (7)

Reproductive/Developmental Effects:

- No information is available on reproductive effects of parathion in humans; however, methyl parathion, a closely related compound, has been linked with human birth defects. (1)
- A reduced number of offspring and decreased fetal weight have been reported in rats exposed to parathion by injection, but no malformations were observed. High postnatal mortality was also observed in an animal study. (1,2)

Cancer Risk:

- No information is available on the carcinogenic effects of parathion in humans. (5,8)
- Limited data on animals are available; increased adrenal cortical tumors in male and female rats and thyroid follicular adenomas and pancreatic islet-cell carcinomas in male rats were observed in rats orally exposed to parathion. (1,2,5,8)
- EPA has classified parathion as a Group C possible human carcinogen. (5,8)

Physical Properties

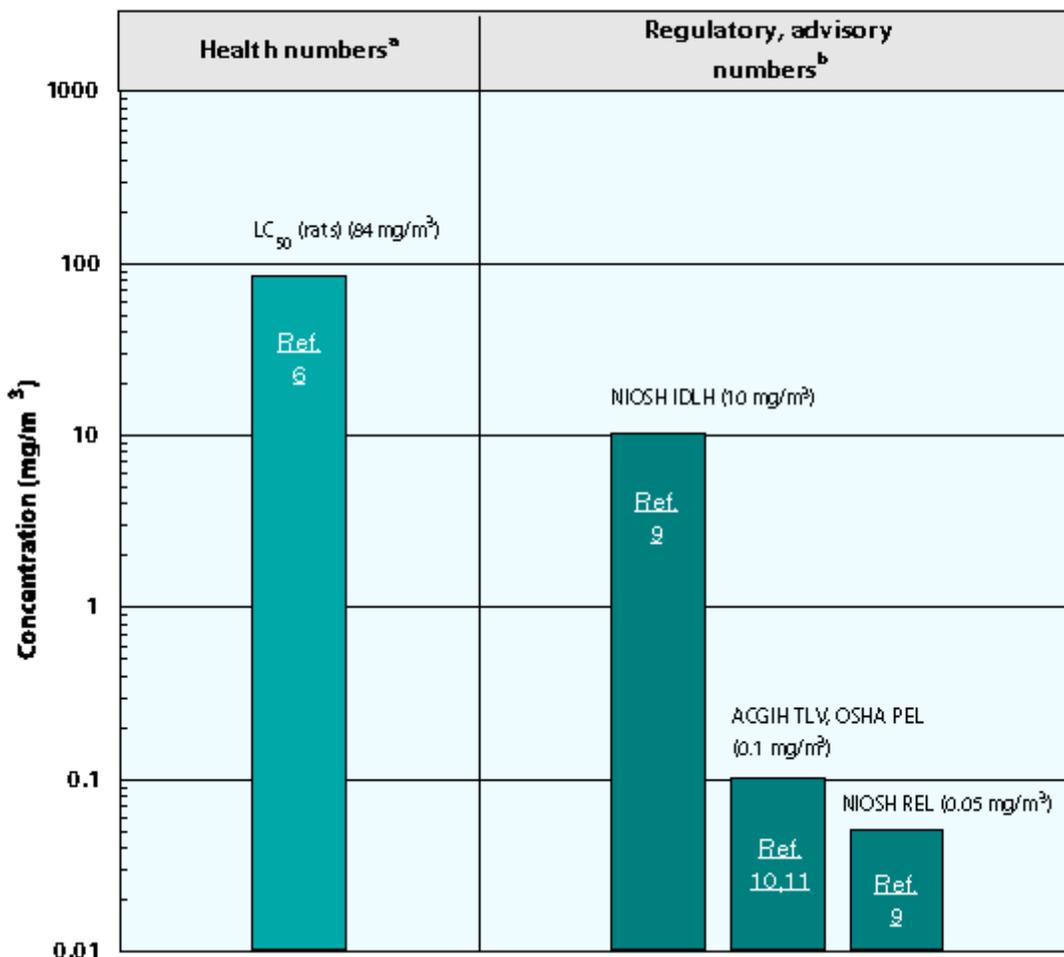
- The chemical formula for parathion is $C_8H_{10}NO_5PS$, and its molecular weight is 291.27 g/mol. (3,8) Pure parathion is a pale yellow liquid, while the technical grades are brown. (3,5)
- Parathion is practically insoluble in water. (3,5)
- Parathion has a garlic-like odor, with an odor threshold of 0.47 milligrams per cubic meter (mg/m^3). (1,5)
- The vapor pressure for parathion is 3.78×10^{-5} mm Hg at 20 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is 3.83. (8)

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 parathion: 1 ppm = 11.91 mg/m^3 .

Health Data from Inhalation Exposure

Parathion



ACGIH TLV --American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

NIOSH IDLH -- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

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 effect 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.

References

Summary created in April 1992, updated in January 2000

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