

Carbaryl

63-25-2

Hazard Summary

Carbaryl is an insecticide used on a variety of crops. Acute (short-term) and chronic (long-term) occupational exposure of humans to carbaryl has been observed to cause cholinesterase inhibition, and reduced levels of this enzyme in the blood cause neurological effects. These effects appear to be reversible upon discontinuation of exposure. Headaches, memory loss, muscle weakness and cramps, and anorexia are caused by prolonged low-level exposure to carbaryl resulting from cholinesterase inhibition. EPA has classified carbaryl as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's [Health and Environmental Effects Profile for Carbaryl \(2\)](#) and [Integrated Risk Information System \(IRIS\) \(6\)](#), which contains information on oral chronic toxicity and the RfD.

Uses

- Carbaryl is used as an insecticide on corn, soybean, cotton, fruit, nut, and vegetable crops, as well as in home yards and gardens. Carbaryl is sold under the trade name Sevin. (1,2)

Sources and Potential Exposure

- Individuals are most likely to be exposed to carbaryl dermally or by inhalation during the manufacture, formulation, and application of this pesticide. (1)
- The general public may be exposed to carbaryl from spray drift in regions surrounding agricultural areas. (1)
- Carbaryl has been detected at low levels in surface water and in food. (2)

Assessing Personal Exposure

- No information was located concerning the measurement of personal exposure to carbaryl.

Health Hazard Information

Acute Effects:

- Acute occupational exposure of humans to carbaryl has been observed to cause cholinesterase inhibition (which impairs central nervous system (CNS) function), resulting in nausea, vomiting, bronchoconstriction, blurred vision, convulsions, coma, and respiratory failure. (1,3,4)
- Acute carbaryl exposure in humans may also cause eye and skin irritation. (1)
- Tests involving acute exposure of rats, mice, rabbits, and guinea pigs have demonstrated carbaryl to have moderate to high acute toxicity from ingestion and moderate acute toxicity from dermal exposure. (5)

Chronic Effects (Noncancer):

- Chronic exposure to carbaryl results in cholinesterase inhibition, which is reversible upon discontinuation of exposure. Headaches, memory loss, muscle weakness and cramps, and anorexia are caused by prolonged low-level exposure of humans to carbaryl resulting from cholinesterase inhibition. (4)

- Kidney and liver effects have been observed in rats chronically exposed to carbaryl by ingestion. (2,6)
- EPA has not established a Reference Concentration (RfC) for carbaryl. (6)
- The Reference Dose (RfD) for carbaryl is 0.1 milligrams per kilogram body weight per day (mg/kg/d) based on kidney and liver toxicity in rats. 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. (6)
- EPA has medium confidence in the RfD based on: high confidence in the critical study because it was well designed and clearly reported with unequivocal effects levels established; and medium confidence in the database because it is moderately supportive of the nature of the critical effect. (6)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of carbaryl in humans.
- Two studies produced teratogenic effects in dogs fed carbaryl, but dogs were judged inappropriate for human health risk assessment because of differences in metabolism. Other studies demonstrating teratogenic effects also caused maternal toxicity. (2,6)
- Reduced fertility and litter size and increased mortality in offspring have been observed in rats exposed to carbaryl in their diet over three generations. (2)

Cancer Risk:

- No information is available on the carcinogenic effects of carbaryl in humans.
- No significant increase in tumor incidence was found among exposed animals in several studies. (4)
- EPA has not classified carbaryl for carcinogenicity. (6)

Physical Properties

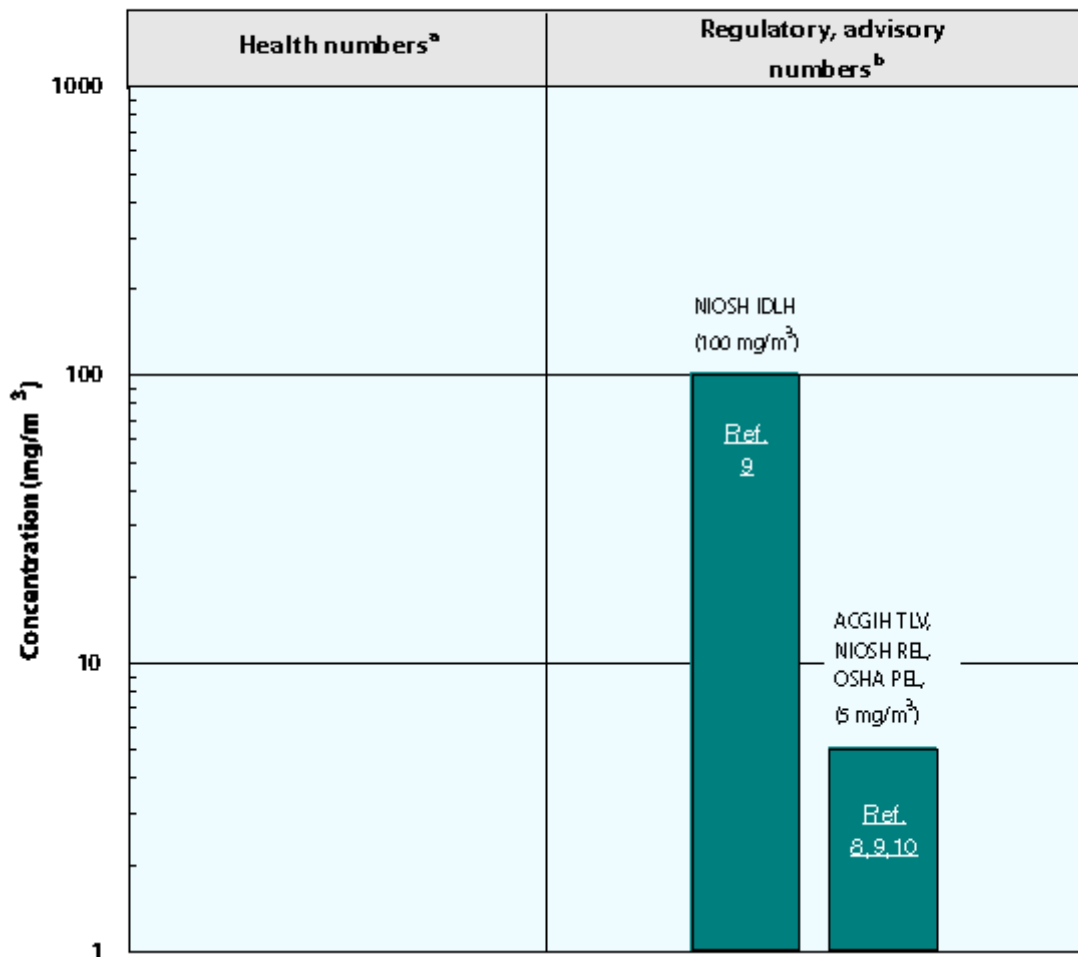
- The chemical formula for carbaryl is $C_{12}H_{11}NO_2$, and its molecular weight is 201.2 g/mol. (2,3)
 - Carbaryl is a white crystalline solid that is slightly soluble in water. (2,7)
 - Carbaryl is essentially odorless and its odor threshold has not been established. (2)
 - The vapor pressure for carbaryl is 0.000041 mm Hg at 25 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is 2.36. (4)
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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 carbaryl: $1 \text{ ppm} = 8.23 \text{ mg}/m^3$. 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

Carbaryl



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.

NIOSH IDLH-- National Institute of Occupational Safety and Health'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.

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.

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.

Summary created in April 1992, updated in January 2000.

References

1. M. Sittig. Handbook of Toxic and Hazardous Chemicals and Carcinogens. 2nd ed. Noyes Publications, Park

Ridge, NJ. 1985.

2. U.S. Environmental Protection Agency. Health and Environmental Effects Profile for Carbaryl. EPA/600/x-84/155. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1984.
 3. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
 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 Carbaryl](#). National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
 7. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Carbamates, Thiocarbamates and Carbazides. Volume 12. World Health Organization, Lyon. 1976.
 8. 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.
 9. 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.
 10. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998.
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