Technical Factsheet on: CARBOFURAN

List of Contaminants

As part of the Drinking Water and Health pages, this fact sheet is part of a larger publication:
National Primary Drinking Water Regulations

Drinking Water Standards
MCLG: 0.04 mg/L
MCL: 0.04 mg/L
HAL(child): 1 day: 0.05 mg/L; Longer-term: 0.05 mg/L

Health Effects Summary

Acute: EPA has found carbofuran to potentially cause a variety of nervous system effects from acute exposures, including: headache, sweating, nausea, diarrhea, chest pains, blurred vision, anxiety and general muscular weakness. These effects are largely due to carbofuran's rapid inhibition of cholinesterase activity, and is generally reversible once exposure ceases.

Drinking water levels which are considered "safe" for short-term exposures: For a 10-kg (22 lb.) child consuming 1 liter of water per day, upto a 7-year exposure to 0.05 mg/L.

Chronic: Available data on chronic toxic effects from oral exposures to carbofuran have shown that low doses of carbofuran appear to have little or no adverse health effects. Higher doses have the potential to cause damage to the nervous and reproductive systems.

Cancer: There is no evidence that carbofuran has the potential to cause cancer from lifetime exposures in drinking water.

Usage Patterns

A 1984 report estimated that application on alfalfa and rice accounted for about 90% of carbofuran use, with turf and grapes making up most of the remainder. Earlier uses were primarily on corn crops. This broad spectrum insecticide is sprayed directly onto soil and plants just after emergence to control beetles, nematodes and rootworm.

After September 1994, carbofuran will be allowed for use on only five U.S. crops: bananas (in Hawaii); pumpkins, cucumbers, watermelons, cantaloupes and squash; dry harvested cranberries,; pine progeny tests; and spinach grown for seed. Carbofuran will soon be banned from use on corn and sorghum in California.

Release Patterns

Carbofuran enters surface water as a result of runoff from treated fields and enters ground water by leaching of treated crops.

EPA's 1990 National Pesticide Survey did not detect carbofuran levels above the MCL in rural domestic wells or Community Water System wells. EPA's Pesticides in Ground Water Database reports few detections of carbofuran in ground water between 1971 and 1991.

Environmental Fate

If released to soil, chemical hydrolysis and microbial degradation appear to be the important degradation processes. Chemical hydrolysis is expected to occur more rapidly in alkaline soil as compared to neutral or acidic soils. Soil biodegradation may be important, with the rate of degradation of carbofuran in soil greatly increased by pretreatment with carbofuran.

Experimentally measured Koc values ranging from 14 to 160 indicate that carbofuran may leach significantly in many soils, as has been seen in the detection of carbofuran in water table aquifers beneath sandy soils in NY and WI. Leaching may not occur, however, in very high organic content soils (65% carbon).

Volatilization from soil is not expected to be significant, although some evaporation from plants may occur. A review of literature reported the following half-lives for carbofuran disappearance in soil: 2-72 days in laboratory studies, 2-86 days for flooded soils and 26-110 days for field soil.

If released to water, carbofuran will be subject to significant hydrolysis under alkaline conditions. The hydrolysis half-lives in water at 25 deg C are 690, 8.2 and 1.0 weeks at pH 6.0, 7.0 and 8.0, respectively.

Direct photolysis and photooxidation (via hydroxyl radicals) may contribute to carbofuran's removal from natural water and may become increasingly important as the acidity of the water increases and the hydrolytic half-life increases.

Since carbofuran appears to be susceptible to degradation by soil microbes, aquatic microbes may also be able to degrade carbofuran. The half-lives for degradation of carbofuran in different waters ranges from several hours to a few weeks. Aquatic volatilization, adsorption, and bioconcentration are not expected to be important.

If released to air, carbofuran will react in the vapor-phase with photochemically produced hydroxyl radicals at an estimated half-life of 7.8 hr. Direct photolysis may be important removal process for carbofuran in the atmosphere.

Chemical/ Physical Properties

CAS Number: 1563-66-2

Color/ Form/Odor: White crystalline solid with a slightly phenolic odor. Available as a flowable paste or wettable powder.

M.P.: 153-154 C B.P.: N/A

Vapor Pressure: 3.4x10-6 mm Hg at 26.1 C

Octanol/Water Partition (Kow): Log Kow = 2.32

Density/Spec. Grav.: 1.18 at 20 C

Solubility: 0.7 g/L of water at 25 C; Slightly soluble in water

Soil sorption coefficient: mean Koc of 29.4; significant mobility in soil

Odor/Taste Thresholds: N/A

Bioconcentration Factor: 117 in one species of fish; not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: 1.02x10-10 atm-cu m/mole;

Trade Names/Synonyms: Niagara 10242, Furadan 4F or 3G, Brifur, Crisfuran, Chinufur, Curaterr, Yaltox, Pillarfuran, Kenofuran,

Other Regulatory Information

Monitoring For Ground/Surface Water Sources:

Initial Frequency- 4 quarterly samples every 3 years
Repeat Frequency- If no detections during initial round:
2 quarterly per year if serving >3300 persons;
1 sample per 3 years for smaller systems
Triggers - Return to Initial Freq. if detect at > 0.0009 mg/L

Analysis:

Reference Source	Method Numbers
EPA 600/4-88-039	531.1
Standard Methods	6610

Treatment- Best Available Technologies:
Granular Activated Charcoal

For Additional Information:

EPA can provide further regulatory and other general information:
EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:
Toxic Substance Control Act Information Line - 202/554-1404
Toxics Release Inventory, National Library of Medicine - 301/496-6531
Agency for Toxic Substances and Disease Registry - 404/639-6000
National Pesticide Hotline - 800/858-7378