Technical Factsheet on: EPICHLOROHYDRIN

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: zero mg/L
MCL: Treatment technique
HAL(child): 1- to 10-day: 0.1 mg/L; Longer-term: 0.07 mg/L

Health Effects Summary

Acute: EPA has found epichlorohydrin to potentially cause the following health effects from acute exposures at levels above the MCL: skin irritation; detrimental effects on liver, kidneys, central nervous system.

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: a one- or ten-day exposure to 0.1 mg/L; upto a 7-year exposure to 0.07 mg/L.

Chronic: Epichlorohydrin has the potential to cause the following health effects from long-term exposures at levels above the MCL: stomach, eye and skin irritation; chromosome aberrations; adverse changes in blood.

Cancer: There is some evidence that epichlorohydrin may have the potential to cause cancer from a lifetime exposure at levels above the MCL.

Usage Patterns

Production and imports of epichlorohydrin increased from the late 1970s to the mid-1980s: from 294 million lbs. to 511 million lbs. In 1984 it was estimated that industries consumed epichlorohydrin as follows: Epoxy resins, 65%; glycerine, 25%; epichlorohydrin elastomers, 5%; miscellaneous, 5%

The greatest use of epichlorohydrin is as a monomer for epoxy resins, elastomers and other polymers.

Other uses include: a polymer coating material in water supply systems; an intermediate in organic synthesis, particularly glycerine; solvent for cellulose esters and ethers; high wet-strength resins for paper industry; in preparation of ion exchange resins; in the manufacture of pharmaceuticals; an insect fumigant.

Release Patterns

Epichlorohydrin may be released to the atmosphere and in wastewater during its production and use in epoxy resins, glycerin manufacture, as a chemical intermediate in the manufacture of other chemicals, and other uses. Other uses which may lead to its release include textile treatment, coatings, solvent, surface active agent, stabilizer in insecticide, and elastomer manufacture.

From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, epichlorohydrin releases to land and water totalled over 65,000 lbs., of which about two-thirds was to water. These releases were primarily from industrial organic chemical industries. The largest releases occurred in Alabama.

Environmental Fate

Epichlorohydrin is relatively volatile and would therefore readily evaporate from near-surface soils and other solid surfaces. If released into water it will be lost primarily by evaporation (half-life 29 hr in a typical river) and hydrolysis (half-life 8.2 days). It will not adsorb appreciably to sediment. If spilled on land, it will evaporate and leach into the groundwater where it will hydrolyze. The Koc for epichlorohydrin, calculated from its water solubility, is 123 which indicates that it is not appreciably adsorbed. After a spill of 20,000 gal following a train accident, water in wells closest to the spill were highly contaminated.

Biodegradation and chemical reactions with ions and reactive species may accelerate its loss in soil and water but data from field studies are lacking. In the atmosphere, epichlorohydrin will degrade by reaction with photochemically produced hydroxyl radicals (est half-life 4 days). It will not bioconcentrate appreciably in aquatic organisms. The log BCF has been estimated to be 0.66.

There is a lack of monitoring data for epichlorohydrin in all but occupational settings. Humans will primarily be exposed to epichlorohydrin in occupational settings.

Chemical/Physical Properties

CAS Number: 106-89-8

Color/ Form/Odor: A colorless liquid with a pungent, garlic-like odor.

M.P.: -48 C B.P.: 116.5 C

Vapor Pressure: 10 mm Hg at 16.6 C

Density/Spec. Grav.: 1.18 at 20 C

Octanol/Water Partition (Kow): Log Kow = 0.26

Solubility: 6.5% miscible in water at 10 C; Moderately soluble in water

Soil sorption coefficient: Koc estimated at 123; high mobility in soil

Odor/Taste Thresholds: Odor threshold in water is 0.5 to 1.0 mg/L.

Bioconcentration Factor: log BCF of 0.66 (species not reported); not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: N/A

Trade Names/Synonyms: (Chloromethyl)ethylene oxide, 1,2-Epoxy-3-chloropropane, Chloromethyloxirane, Glycerol epichlorhydrin, Glycidyl chloride

Other Regulatory Information

Monitoring and Analysis:
No analytical methods are available so monitoring is not required. This contaminant is being regulated by requiring use of a treatment technique to limit its use by drinking water systems.

Treatment/Best Available Technology:

Treatment technique: When acrylamide is used in drinking water systems, the combination of dose and monomer level may not exceed the following level: 0.01 % dosed at 20 mg/L

Toxic Release Inventory - Releases to Water and Land, 1987 to 1993 (in pounds):

		Water	Land
TOTALS (in pounds)		**42,705**	**22,849**
Top Five States			
AL	29,385	18,476	
LA	6,924	2,663	
NJ	2,164	16	
TX	200	1,396	
AR	1,594	0	
Major Industries			
Industrial organics		25,137	14,941
Plastics and resins		6,392	2,509
Industrial inorganics		4,200	1,600
Agricultural chemicals		2,207	1,532
Alkalis, chlorine		2,100	1,033

For Additional Information

EPA can provide further regulatory or 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