Addendum to the Toxicological Profile for Bis(2-chloroethyl) Ether

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CONTENTS

Background Statement 1
3. HEALTH EFFECTS 2
3.2.2 Oral Exposure 2
3.2.2.2 Systemic Effects 2
3.3 GENOTOXICITY 2
3.4 TOXICOKINETICS 2
3.4.1.2 Oral Exposure 2
3.9 INTERACTIONS WITH OTHER CHEMICALS 2
4. CHEMICAL AND PHYSICAL INFORMATION 3
5. PRODUCTION, IMPORT, AND DISPOSAL 3
6. POTENTIAL FOR HUMAN EXPOSURE 3
6.3 ENVIRONMENTAL FATE 3
6.3.1 Transport and Partitioning 3
6.3.2.1 Air 3
6.3.2.3 Sediment and Soil 3
6.4 LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT 4
6.4.1 Air 4
6.4.4 Other Environmental Media 4
7. ANALYTICAL METHODS 4
8. REGULATIONS AND ADVISORIES 5
9. REFERENCES 6

ADDENDUM for Bis(2-chloroethyl) Ether
Supplement to the 1989 Toxicological Profile for Bis(2-chloroethyl) Ether

Background Statement

This addendum to the Toxicological Profile for Bis(2-chloroethyl) Ether supplements the profile that was released in 1989.

Toxicological profiles are developed in response to the Superfund Amendments and Reauthorization Act (SARA) of 1986 which amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund). CERCLA mandates that the Administrator of ATSDR prepare toxicological profiles on substances on the CERCLA Priority List of Hazardous Substances and that the profiles be revised "no less often than once every three years." CERCLA further states that the Administrator will "establish and maintain inventory of literature, research, and studies on the health effects of toxic substances" [Title 42, Chapter 103, Subchapter I, § 9604 (i)(1)(B)].

The purpose of this addendum is to provide to the public and other federal, state, and local agencies a non-peer reviewed supplement of the scientific data that were published in the open peer-reviewed literature since the release of the profile in 1989.

Chapter numbers in this addendum coincide with the Toxicological Profile for Bis(2-chloroethyl) Ether (1989). This document should be used in conjunction with the profile. It does not replace it.

3. HEALTH EFFECTS

3.2.2 Oral Exposure

3.2.2.2 Systemic Effects

The inhibitory concentration (IC_{50}) for BCEE based on a Weibit transformation is 1298 mg/L, and the IC_{50} based on a Quantitative Structure Activity Relationship (QSAR) transformation is 989 mg/L (Prakash et al., 1996).

3.3 GENOTOXICITY

Ballering et al. (1996) investigated the genetic toxic effects of Bis(2-chloroethyl) ether (BCEE) in both somatic (other than sex cells) and germ cells (sex cells) of *Drosophila Melanogaster*. Only marginal genotoxic activities were observed for BCEE. The authors found a weak increase in the frequency of mosaic spots for BCEE at lethal levels for 99% of the larvae examined.

3.4 TOXICOKINETICS

3.4.1.2 Oral Exposure

The chronic oral toxic dose (TD_{50}) for BCEE in mice was reported to be 8.19 mg/kg/day (Gold et al., 1989).

3.9 INTERACTIONS WITH OTHER CHEMICALS

Nirmalakhandan et al. (1994) assayed 50 organic chemicals to evaluate joint toxic effects on fish. The toxicity tests were run on a Comput-OX Respirometer and the assays were done on a surrogate microorganism, Polytox. Polytox is a blend of 12 streams of aerobic bacteria and has been recommended by US EPA as a culture in effluent toxicity evaluations. The authors found that the inhibitory concentration (IC_{50}) for BCEE was 1600 mg/l. They also found that the joint toxic effects of BCEE with 2 or more chemicals was additive.

4. CHEMICAL AND PHYSICAL INFORMATION

No updated data

5. PRODUCTION, IMPORT, AND DISPOSAL

No updated data

6. POTENTIAL FOR HUMAN EXPOSURE

No updated data

6.3 ENVIRONMENTAL FATE

6.3.1 Transport and Partitioning

Using data on the physico-chemical properties of BCEE, Duarte-Davidson and Jones (1996) showed that BCEE might accumulate in the food chain following the application of BCEE-containing sludge onto arable or pasture land. These authors classified BCEE as having translocation potential from the roots of the plant to the above-ground parts of the plant. Therefore, there exists the possibility of animal intake. Furthermore, this finding may have provided new information regarding the transport of BCEE in the environment. The classification of BCEE was accompanied by two caveats: concentrations of BCEE are low, and the information reported is limited and more data are required on the properties/environmental fate.

6.3.2.1 Air

Kelly et al. (1994) conducted a literature search for hazardous air pollutants and found that BCEE's atmospheric concentration decreased to about 37% of its original level in 1–5 days.

6.3.2.3 Sediment and Soil

McClay et al. (2007) isolated a new bacterium that biodegrades BCEE in the environment. The bacteria strain ENV481, a *Xanthobacter* sp. strain, was found to degrade BCEE in the absence of molecular oxygen.

Mutuc et al. (2008) found that BCEE is acceptable in the use of surface-catalyzed Fenton treatment to remediate soil and groundwater. A bench-scale experiment showed that the contamination of BCEE in soil and groundwater was reduced by 95% with treatment by hydrogen peroxide (H_2O_2). The greatest reductions were seen within the first 21 hours with minimal reductions thereafter.

Anaerobic treatment of landfill leachate has been reported to remove up to 70% of BCEE contamination (Alkalay et al., 1998).

6.4 LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT

6.4.1 Air

Shah and Singh (1988) developed a dataset of 122,820 data points representing 300 cities in 42 states from literature searches. The dates of the data sources were from 1975–1985. The data for outdoor air levels BCEE consisted of 142 data points. The exact sources and location of the data points are unknown. According to these investigators, daily concentrations of BCEE are at an average of 3.960 parts per billion by volume (ppbv); the median is 0.045 ppbv, and the lower and upper quartiles are at 0.017 ppbv and 0.087 ppbv, respectively.

6.4.4 Other Environmental Media

Studies conducted on bird eggs gathered in the Baikal Region (Selenga river estuary) revealed traces of BCEE. The original source of BCEE is unknown. The concentrations of BCEE detected in the bird eggs ranged from <10 milligrams/kilogram (mg/kg)(the assumed detection limit of the study) to 322.2 mg/kg, with a median of 34.9 mg/kg (Lebedev et al., 1998).

7. ANALYTICAL METHODS

No updated data

8. REGULATIONS AND ADVISORIES

Table 8-1: Regulations and Guidelines Applicable to BCEE

Agency	Description	Value	Reference
Guidelines			
a. Air			
NIOSH	Immediately Dangerous to Life or Health Level	100 ppm	NIOSH 2007
	Recommended Exposure Limit (REL) Time Weighted Average (TWA)	5 ppm (30 mg/m^3)	NIOSH 2007
	Recommended Exposure Limit (REL) Short-Term Exposure Limit (STEL)	10 ppm (60 mg/m^3)	NIOSH 2007

NIOSH = National Institute for Occupational Safety and Health

mg/m^3 = milligrams/cubic meter

ppm = parts per million

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