

## 8. REGULATIONS AND ADVISORIES

The international, national, and state regulations and guidelines regarding bromoform and dibromochloromethane in air, water, and other media are summarized in Table 8-1.

An acute-duration oral MRL of 0.7 mg/kg/day has been derived for bromoform. This MRL is based on a NOAEL of 72 mg/kg/day and a LOAEL of 145 mg/kg/day for centrilobular pallor in mice receiving gavage doses of bromoform for 14 days (Condie et al. 1983). The MRL was derived by dividing the NOAEL by an uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability).

An intermediate-duration oral MRL of 0.2 mg/kg/day has been derived for bromoform. This MRL is based on a NOAEL of 50 mg/kg for hepatocellular vacuolization in rats administered gavage doses of bromoform in corn oil 5 days/week for 13 weeks (NTP 1989a). The MRL was derived by dividing the duration adjusted NOAEL of 18 mg/kg/day by an uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability).

A chronic-duration oral MRL of 0.02 mg/kg/day has been derived for bromoform. This MRL is based on a LOAEL of 100 mg/kg for hepatocellular vacuolization in rats administered gavage doses of bromoform in corn oil 5 days/week for 2 years (NTP 1989a). The MRL was derived by dividing the duration adjusted LOAEL of 71 mg/kg/day by an uncertainty factor of 300 (3 for use of a minimal LOAEL, 10 for animal to human extrapolation, and 10 for human variability) and a modifying factor of 10 to account for the identification of a lower LOAEL in a 13-week study (NTP 1989a).

An acute-duration oral MRL of 0.1 mg/kg/day has been derived for dibromochloromethane. This MRL is based on a LOAEL of 37 mg/kg for hepatocellular vacuolization in mice administered gavage doses of dibromochloromethane in corn oil for 14 days (Condie et al. 1983). The MRL was derived by dividing the LOAEL by an uncertainty factor of 300 (3 for use of a minimal LOAEL, 10 for animal to human extrapolation, and 10 for human variability).

A chronic-duration oral MRL of 0.09 mg/kg/day has been derived for dibromochloromethane. This MRL is based on a LOAEL of 40 mg/kg for fatty changes in the liver of rats administered gavage doses of dibromochloromethane in corn oil for 2 years (NTP 1985). The MRL was derived by dividing the

## 8. REGULATIONS AND ADVISORIES

duration-adjusted LOAEL of 28 mg/kg/day by an uncertainty factor of 300 (3 for use of a minimal LOAEL, 10 for animal to human extrapolation, and 10 for human variability).

## 8. REGULATIONS AND ADVISORIES

**Table 8-1. Regulations and Guidelines Applicable to Bromoform and Dibromochloromethane**

Agency	Description	Information	Reference
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenicity classification Bromoform Dibromochloromethane	Group 3 <sup>a</sup> Group 3 <sup>a</sup>	IARC 1999a, 1999b
WHO	Drinking water guideline Bromoform Dibromochloromethane	100 mg/L 100 mg/L	WHO 1996
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air:			
ACGIH	TLV (8-hour TWA) Bromoform <sup>b</sup>	0.5 ppm	ACGIH 2003
NIOSH	REL (10-hour TWA) Bromoform <sup>c</sup> IDLH	0.5 ppm 850 ppm	NIOSH 2003
OSHA	PEL (8-hour TWA) for general industry Bromoform <sup>d</sup>	0.5 ppm	OSHA 2003a 29 CFR 1910.1000, Table Z-1
	PEL (8-hour TWA) for construction industry Bromoform <sup>d</sup>	0.5 ppm	OSHA 2003c 29 CFR 1926.55, Appendix A
	PEL (8-hour TWA) for shipyard industry Bromoform <sup>d</sup>	0.5 ppm	OSHA 2003b 29 CFR 1915.1000
USC	Hazardous air pollutant	Bromoform	USC 2003
b. Water			
EPA	Drinking water health advisories Bromoform		EPA 2002a, 2002b
	1-day (10-kg child)	5.0 mg/L	
	10-day (10-kg child)	2.0 mg/L	
	DWEL <sup>e</sup>	0.7 mg/L	
	10 <sup>-4</sup> Cancer risk <sup>f</sup>	0.4 mg/L	
	Dibromochloromethane		
	1-day (10-kg child)	6.0 mg/L	
	10-day (10-kg child)	6.0 mg/L	
	DWEL <sup>e</sup>	0.7 mg/L	
	Lifetime <sup>g</sup>	0.06 mg/L	
10 <sup>-4</sup> Cancer risk <sup>f</sup>	0.04 mg/L		
	Effluent guidelines and standards; toxic pollutants pursuant to Section 307 (a)(1) of the Clean Water Act	Bromoform	EPA 2003c 40 CFR 401.15

## 8. REGULATIONS AND ADVISORIES

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Agency	Description	Information	Reference
<b>NATIONAL (cont.)</b>			
EPA	National primary drinking water regulations MCL for total trihalomethanes <sup>h</sup>	0.10 mg/L	EPA 2003f 40 CFR 141.12
	Pollutants of initial focus in the Great Lakes Water Quality Initiative	Bromoform and dibromochloromethane	EPA 2003m 40 CFR 132, Table 6
<b>c. Food</b>			
FDA	Bottled drinking water allowable concentrations for total trihalomethanes <sup>i</sup>	0.10 mg/L	FDA 2003 21 CFR 165.110
<b>d. Other</b>			
ACGIH	Carcinogenicity classification	A3 <sup>j</sup>	ACGIH 2003
EPA	Carcinogenicity classification Bromoform Dibromochloromethane	B2 <sup>k</sup> C <sup>l</sup>	IRIS 2004a, 2004b
	RfC	No data	IRIS 2004a, 2004b
	RfD Bromoform Dibromochloromethane	2.0x10 <sup>-2</sup> mg/kg/day 2.0x10 <sup>-2</sup> mg/kg/day	IRIS 2004a, 2004b
	Community right-to-know; release report; effective date of reporting Bromoform	01/01/87	EPA 2003i 40 CFR 372.65
	Identification and listing of hazardous waste; hazardous waste number Bromoform	U225	EPA 2003d 40 CFR 261, Appendix VIII
	Land disposal restrictions; universal treatment standards Bromoform Dibromochloromethane	Waste water (mg/L) 0.63 0.57	Non-waste water (mg/kg) 15 15
	Municipal solid waste landfills; hazardous constituents Bromoform	Suggested method 8010 8021 8260	PQL (µg/L) 2 15 5
		Dibromochloromethane 8010 8021 8260	1 0.3 5
	Reportable quantity of hazardous substance in accordance with Section 307 (a) of the Clean Water Act, Section 112 of RCRA, and Section 112 of the Clean Air Act Bromoform	100 pounds	EPA 2003b 40 CFR 302.4

## 8. REGULATIONS AND ADVISORIES

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Agency	Description	Information	Reference
<u>NATIONAL (cont.)</u>			
EPA	Reportable quantity of hazardous substance in accordance with Section 112 of RCRA	100 pounds	EPA 2003b 40 CFR 302.4
	Dibromochloromethane		
	Standards for the management of specific hazardous waste and types of hazardous waste management facilities		EPA 2003g 40 CFR 266, Appendix V
	Bromoform	<u>Risk specific doses</u> $7.0 \times 10^{-1} \mu\text{g}/\text{m}^3$	
	Standards for owners or operators of hazardous waste TSD facilities; maximum concentration for groundwater protection	Suggested	EPA 2003h 40 CFR 264, Appendix IX
	Bromoform	<u>method</u> <u>PQL (<math>\mu\text{g}/\text{L}</math>)</u> 8010              2 8240              5	
	Dibromochloromethane	8010              1 8240              5	
	TSCA; chemical information rules	Effective      Sunset <u>date</u> <u>date</u>	EPA 2003k 40 CFR 712.30
	Bromoform	03/11/94      05/10/94	
	TSCA; health and safety data reporting	Effective      Sunset <u>date</u> <u>date</u>	EPA 2003j 40 CFR 716.120
	Bromoform	06/01/87      06/01/97	
	Dibromochloromethane	06/01/87      06/01/87	
TSCA; identification of specific chemical substance and mixture testing requirements for		EPA 2003i 40 CFR 799.5055	
Bromoform	Hydrolysis testing		
<u>STATE</u>			
a. Air	No data		
b. Water			
Arizona	Drinking water guideline		HSDB 2004a, 2004b
	Bromoform	0.19 $\mu\text{g}/\text{L}$	
Florida	Drinking water guideline		HSDB 2004a, 2004b
	Bromoform	4.0 $\mu\text{g}/\text{L}$	
Minnesota	Drinking water guideline		HSDB 2004a, 2004b
	Bromoform	40 $\mu\text{g}/\text{L}$	
New Hampshire	Drinking water guideline		HSDB 2004a
	Bromoform	4.0 $\mu\text{g}/\text{L}$	
Wisconsin	Drinking water guideline		HSDB 2004a, 2004b
	Bromoform	4.4 $\mu\text{g}/\text{L}$	
	Dibromochloromethane	60 $\mu\text{g}/\text{L}$	

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Agency	Description	Information	Reference
<u>STATE</u> ( <i>cont.</i> )			
c. Food	No data		
d. Other	No data		

<sup>a</sup>Group 3: not classifiable as to its carcinogenicity to humans

<sup>b</sup>Skin notation: refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance.

<sup>c</sup>Skin designation: indicates the potential for dermal absorption; skin exposure should be prevented as necessary through the use of good work practices and gloves, coveralls, goggles, and other appropriate equipment.

<sup>d</sup>Skin designation

<sup>e</sup>DWEL: a lifetime exposure concentration protection of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from drinking water.

<sup>f</sup>10<sup>-2</sup> Cancer risk: the concentration of a chemical in drinking water corresponding to an excess estimated lifetime cancer risk of 1 in 10,000.

<sup>g</sup>Lifetime: the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 L water/day.

<sup>h</sup>Total trihalomethanes (the sum of the concentrations of bromoform, dibromochloromethane, bromodichloromethane, and chloroform) applies to subpart H community water systems which serve a population of 10,000 people or more until December 31, 2001. This level applies to community water systems that use only groundwater not under the direct influence of surface water and serves a population of 10,000 people or more until December 31, 2003. Compliance with the MCL for total trihalomethanes is calculated pursuant to 40 CFR 141.30. After December 31, 2003, this section no longer applies.

<sup>i</sup>Total trihalomethanes: sum of the concentration in mg/L of the trihalomethane compounds (bromoform, dibromochloromethane, bromodichloromethane, and chloroform), rounded to two significant figures.

<sup>j</sup>A3: confirmed animal carcinogen with unknown relevance to humans

<sup>k</sup>B2: probable human carcinogen

<sup>l</sup>C: possible human carcinogen

ACGIH = American Conference of Governmental Industrial Hygienists; CFR = Code of Federal Regulations; DWEL = drinking water equivalent level; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; MCL = maximum contaminant level; NIOSH = National Institute for Occupational Safety and Health; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; PQL = practical quantitation level; RCRA = Resource Conservation and Recovery Act; REL = recommended exposure limit; RfC = inhalation reference concentration; RfD = oral reference dose; TLV = threshold limit values; TSCA = Toxic Substances Control Act; TSD = treatment, storage, and disposal; TWA = time-weighted average; USC = United States Code; WHO = World Health Organization