8. REGULATIONS AND ADVISORIES

No international regulations pertaining to fluorides were found. The national and state regulations and guidelines regarding fluorides, hydrogen fluoride, and fluorine in air, water, and other media are summarized in Table 8-1.

A chronic-duration oral MRL of 0.05 mg fluoride/kg/day has been derived for fluoride. This MRL is based on a NOAEL of 0.15 mg fluoride/kg/day and a LOAEL of 0.25 mg fluoride/kg/day for skeletal effects (increased fracture rate) (Li et al. 2001). The MRL was derived by dividing the NOAEL by an uncertainty factor of 3 to account for human variability.

An acute-duration inhalation MRL of 0.02 ppm fluoride has been derived for hydrogen fluoride. This MRL is based on a minimal LOAEL of 0.5 ppm for upper respiratory tract inflammation in humans exposed to hydrogen fluoride for 1 hour (Lund et al. 1997, 1999). The MRL was derived by dividing the unadjusted LOAEL by an uncertainty factor of 30 (3 for a use of a minimal LOAEL and 10 to account for human variability).

An acute-duration inhalation MRL of 0.01 ppm has been derived for fluorine. This MRL is based on a NOAEL of 10 ppm for respiratory irritation in humans exposed to fluorine for 15 minutes (Keplinger and Suissa 1968). The MRL was derived by dividing the 24-hour adjusted NOAEL of 0.1 ppm by an uncertainty factor of 10 to account for human variability.

EPA (IRIS 2003) derived an oral reference dose (RfD) of 0.06 mg/kg/day for fluorine (soluble fluoride). The RfD was based on a NOAEL of 0.06 mg/kg/day and a LOAEL of 0.12 mg/kg/day for the cosmetic effect of dental fluorosis in children (Hodge 1950). The NOAEL was divided by an uncertainty factor of 1 to derive the RfD.

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
INTERNATIONAL			
Guidelines:			
IARC	Carcinogenicity classification		IARC 1987
	Fluoride and sodium fluoride	Group 3[a]	
WHO	Drinking water guideline		WHO 2001
	Fluoride	1.5 mg/L	
NATIONAL			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV-TWA		ACGIH 2000
	Fluoride	2.5 mg/m^3	
	Fluorine	1.0 ppm	
	STEL (ceiling)		
	Fluorine	2.0 ppm	
	Hydrogen fluoride	3.0 ppm	
EPA	Accidental release prevention		EPA 2001b
	Threshold quantity		40CFR68.130
	Fluorine	1,000 pounds	Table 1
	Hydrogen fluoride	1,000 pounds	
	Accidental release prevention		EPA 2001a
	Toxic end point		40CFR68
	Fluorine	0.0039 mg/L	Appendix A
	Hydrogen fluoride	0.0160 mg/L	
OSHA	PEL (8-hour TWA)		OSHA 2001c
	General industry		29CFR1910.1000
	Fluoride	2.5 mg/m^3	Table Z-1
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	2.0 mg/m^3	
	PEL (8-hour TWA)		OSHA 2001f
	Construction industry		29CFR1926.55
	Fluoride	2.5 mg/m^3	Appendix A
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	2.0 mg/m^3	
	PEL (8-hour TWA)		OSHA 2001a
	Shipyards		29CFR1915.1000
	Fluoride	2.5 mg/m^3	Table Z
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	2.0 mg/m^3	
	Highly hazardous chemicals		OSHA 2001d
	Threshold quantity		29CFR1910.119
	Fluorine	1,000 pounds	Appendix A
	Highly hazardous chemicals		OSHA 2001e
	Threshold quantity		29CFR1926.64
	Hydrogen fluoride	1,000 pounds	Appendix A

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
OSHA	Brazing and gas welding fluxes shall have a cautionary wording to indicate that they contain fluorine compounds		OSHA 2001b 29CFR1910.252(c)(1)
NIOSH	REL (TWA)		NIOSH 2001a
	Fluorine	0.2 mg/m^3	NIOSH 2001b
	Hydrogen fluoride	2.5 mg/m^3	NIOSH 2001c
	Sodium fluoride	2.5 mg/m^3	
	IDLH		NIOSH 2001a
	Fluorine	25 ppm	NIOSH 2001b
	Hydrogen fluoride	30 ppm	NIOSH 2001c
	Sodium fluoride	250 ppm	
USC	HAP		USC 2001 42USC7412
b. Water			
EPA	BPT effluent limitation—fluoride		EPA 2001c
	Maximum for 1 day	6.1 kg/kkg	40CFR415.82
	Average of daily values for 30 consecutive days	2.9 kg/kkg	
	Effluent limitation—fluoride		EPA 2001e
	Maximum for 1 day	75 mg/L	40CFR422.42
	Average of daily values for 30 consecutive days	25 mg/L	
	Groundwater protection standards at inactive uranium processing sites—listed constituents include fluorine and hydrogen fluoride		EPA 2001f 40CFR192 Appendix I
	MCLG—fluoride	4.0 mg/L	EPA 2001j 40CFR141.51(b)
	MCL—fluoride	4.0 mg/L	EPA 2001k 40CFR141.62(b)
	Secondary MCL—fluoride	2.0 mg/L	EPA 2001l 40CFR143.3
	Water pollution—hazardous substance designation	Hydrogen fluoride Sodium fluoride	EPA 2001r 40CFR116.4
c. Food			
EPA	Pesticides—fluorine compounds; residue tolerances		EPA 2001n 40CFR180.145
	Apricots, beets, blackberries, blueberries, boysenberries, broccoli, brussels sprouts, cabbage, cauliflower, citrus fruits, collards, cranberries	7 ppm	

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
EPA	Pesticides—fluorine compounds; residue tolerances		EPA 2001n 40CFR180.145
	Cucumbers, dewberries, eggplant, grapes, kale, kohlrabi, lettuce, loganberries, melons, nectarines, peaches, peppers, plums, pumpkins, radish, raspberries, rutabaga, squash, strawberries, tomatoes, turnip, youngberries	7 ppm	
	Potatoes	2 ppm	
	Potatoes, processing waste	22 ppm	
	Kiwifruit	15 ppm	
FDA	Adhesive component, indirect food additive—for use only as bonding agent for aluminum foil, stabilizer, or preservative Hydrogen fluoride Sodium fluoride	Total fluoride from all sources not to exceed 1% by weight of the finished adhesive	FDA 2000e 21CFR175.105(c)(5)
	Bottled water—no fluoride added	Temperature[b] / mg/L 53.7–below / 2.4 53.8–58.3 / 2.2 58.4–63.8 / 2.0 63.9–70.6 / 1.8 70.7–79.2 / 1.6 79.3–90.5 / 1.4	FDA 2000g 21CFR165.110
	Bottled water—fluoride added	Temperature[b] / mg/L 53.7–below / 1.7 53.8–58.3 / 1.5 58.4–63.8 / 1.3 63.9–70.6 / 1.2 70.7–79.2 / 1.0 79.3–90.5 / 0.8	
	Over-the-counter drug products Labeling—fluoride, fluorine, and sodium fluoride		FDA 2000b 21CFR355.50 FDA 2000c 21CFR355.60
	Over-the-counter drug products Testing—fluoride		FDA 2000d 21CFR355.70
	Over-the-counter drug products Active ingredient—fluorine, hydrogen fluoride, and sodium fluoride		FDA 2000a 21CFR355.10 FDA 2000f 21CFR310.545(a)(2)

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
FDA	Surface component, food contact—sodium fluoride for use as preservative only		FDA 2000h 21CFR177.2800 (d)(5)
d. Other			
ACGIH	Carcinogenicity classification		ACGIH 2000
	Fluoride	A4[c]	
	BEI		
	Fluorides in urine		
	Prior to shift	3 mg/g creatinine	
	End of shift	10 mg/g creatinine	
CPSC	Requirements for child-resistant packaging for household products containing elemental fluoride	More than 50 mg and more than 0.5%	CPSC 2001 16CFR1700
DOT	Hazardous materials		DOT 2001 40CFR172.101
	Reportable quantity		Appendix A
	Fluorine	10 pounds	
	Hydrogen fluoride	100 pounds	
	Sodium fluoride	1,000 pounds	
EPA	RfD—fluorine	$6x10^{-2}$ mg/kg/day	IRIS 2003
	Toxic chemical release reporting; Community Right-to-Know—effective date		EPA 2001q 40CFR372.65
	Fluorine	01/01/95	
	Hydrogen fluoride	01/01/87	
	Contaminated soil—fluoride	Concentrations greater than 10 times UTS	EPA 2001d 40CFR268.49(f)
	Hazardous waste—health based limits for exclusion of waste-derived-residue		EPA 2001g 40CFR266 Appendix VII
	Fluorine residue concentration limit	4.0 mg/kg	
	Hazardous waste—identification and listing		EPA 2001h 40CFR261.33(e)
	Fluorine	P056	EPA 2001i
	Hydrogen fluoride	U134	40CFR261.33(f)
	Pesticides—residue tolerances	Not more than 25% of	EPA 2001m
	Sodium fluoride	pesticide formulation	40CFR180.1001(d)
	Superfund—reportable quantity		EPA 2001o
	Fluorine	1 pound	40CFR302.4
	Hydrogen fluoride	5,000 pounds	Appendix A
	Sodium fluoride	5,000 pounds	

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
EPA	Superfund—extremely hazardous		EPA 2001p
	Reportable quantity		40CFR355
	Fluorine	10 pounds	Appendix A
	Hydrogen fluoride	100 pounds	
	Threshold planning quantity		
	Fluorine	500 pounds	
	Hydrogen fluoride	100 pounds	
STATE			
a. Air			
Connecticut	HAP—fluoride, fluorine, and hydrogen fluoride		BNA 2001
Hawaii	Air contaminant—hydrogen fluoride		BNA 2001
Idaho	Toxic air pollutants		BNA 2001
	Fluoride		
	OEL	2.5 mg/m^3	
	EL	0.167 pounds/hour	
	AAC	0.125 mg/m^3	
	Fluorine		
	OEL	2.0 mg/m^3	
	EL	0.133 pounds/hour	
	AAC	0.1 mg/m^3	
Michigan	PEL (TWA)		BNA 2001
	Fluoride	2.5 mg/m^3	
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	3.0 ppm	
Montana	Air contaminant (TWA)		BNA 2001
	Fluoride	2.5 mg/m^3	
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	2.0 mg/m^3	
New Mexico	Toxic air pollutant		BNA 2001
	Fluorides		
	OEL	2.5 mg/m^3	
	Emissions	0.167 pounds/hour	
	Fluorine		
	OEL	2.0 mg/m^3	
	Emissions	0.133 pounds/hour	
New York	Air contaminant (TLV)		BNA 2001
	Fluoride	2.5 mg/m^3	
	Fluorine	0.2 mg/m^3	
	Hydrogen fluoride	2.0 mg/m^3	

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information		Reference
STATE *(cont.)*				
Washington	Toxic air pollutant—ASIL			BNA 2001
	Fluoride	8.3 µg/m^3		
	Fluorine	5.3 µg/m^3		
	Hydrogen fluoride	8.7 µg/m^3		
	PEL			BNA 2001
	Fluoride	2.5 mg/m^3		
	Fluorine	0.2 mg/m^3		
	Hydrogen fluoride (STEL)	3.0 ppm		
Wisconsin	Emission rate (pounds/hour)	<25 feet	>25 feet	BNA 2001
	Fluoride	0.2088	0.8640	
	Fluorine	0.1656	0.6720	
	Hydrogen fluoride	0.1272	0.4800	
b. Water				
Alaska	MCL—fluoride	4.0 mg/L		BNA 2001
	Secondary MCL—fluoride	2.0 mg/L		
Arizona	Drinking water guideline—fluoride	4.0 mg/L		HSDB 2003
	Reporting limit—fluoride	2.0 mg/L		BNA 2001
California	Drinking water standards—fluoride	2.0 mg/L		HSDB 2003
Connecticut	MCL—fluoride	4.0 mg/L		BNA 2001
Delaware	Drinking water standards—fluoride	1.8 mg/L		HSDB 2003
Georgia	MCL—fluoride	4.0 mg/L		BNA 2001
Hawaii	Drinking water standards—fluoride	1.4–2.4 mg/L		HSDB 2003
Idaho	Groundwater quality standards—fluoride	4.0 mg/L		BNA 2001
Kansas	Agriculture—fluoride			BNA 2001
	Livestock	2.0 mg/L		
	Irrigation	1.0 mg/L		
	Public health food—fluoride			
	Domestic water supply	2.0 mg/L		
Maine	Drinking water guideline—fluoride	2.4 mg/L		HSDB 2003
	Maximum exposure guideline	2.4 mg/L		BNA 2001
	Action level	1.2 mg/L		
Mississippi	Groundwater standards—fluoride	4.0 ppm		BNA 2001
Nebraska	MCL—fluoride	4.0 mg/L		BNA 2001

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
STATE *(cont.)*			
New Jersey	Groundwater quality criteria—fluoride	2.0 mg/L	BNA 2001
	PQL—fluoride	0.5 mg/L	
New York	Groundwater effluent limitations—fluoride	3.0 mg/L	BNA 2001
	MCL—fluoride	2.2 mg/L	BNA 2001
North Carolina	Drinking water standards—fluoride	4.0 mg/L	HSDB 2003
North Dakota	MCL—fluoride	4.0 mg/L	BNA 2001
Oklahoma	MCL—fluoride	4.0 mg/L	BNA 2001
Pennsylvania	Drinking water standards—fluoride	2.0 mg/L	HSDB 2003
Rhode Island	MCLG—fluoride	4.0 ppm	BNA 2001
	MCL—fluoride	4.0 ppm	
South Dakota	Groundwater quality standards—fluoride	2.4 mg/L	BNA 2001
Tennessee	MCL—fluoride	4.0 ppm	BNA 2001
Texas	MCL—fluoride	4.0 mg/L	BNA 2001
Utah	Groundwater standards	4.0 mg/L	BNA 2001
	MCL—fluoride	4.0 mg/L	BNA 2001
Vermont	Groundwater quality standards—fluoride		BNA 2001
	Enforcement standard	4.0 mg/L	
	Preventive action level	2.0 mg/L	
	MCL—fluoride	4.0 mg/L	BNA 2001
Washington	MCL—fluoride	4.0 mg/L	BNA 2001
West Virginia	Groundwater standards	Not to exceed 4.0 mg/L	BNA 2001
Wisconsin	MCLG—fluoride	4.0 mg/L	BNA 2001
	MCL—fluoride	4.0 mg/L	
	Groundwater standards—fluoride		BNA 2001
	Enforcement standard	4.0 mg/L	
	Preventive action limit	0.8 mg/L	
c. Food		No data	
d. Other			
Connecticut	Use of pesticides; control of registrations and uses—sodium fluoride	For use as a wood preservative	BNA 2001

Table 8-1. Regulations and Guidelines Applicable to Fluoride, Sodium Fluoride, Hydrogen Fluoride, and Fluorine

Agency	Description	Information	Reference
STATE *(cont.)*			
Minnesota	Hazardous substance—fluoride (as F, as dust), fluorides (inorganic), fluorine, and hydrogen fluorine		BNA 2001
New Jersey	Hazardous substance—fluorine and hydrogen fluoride		BNA 2001

[a]Group 3: not classifiable as to its carcinogenicity to humans
[b]Temperature: annual average of maximum daily air temperatures (EF)
[c]A4: not classifiable as a human carcinogen

AAC = acceptable ambient concentrations; ACGIH = American Conference of Governmental Industrial Hygienists; ASIL = acceptable source impact levels; BEI = biological exposure indices; BNA = Bureau of National Affairs; BPT = best practicable control technology; CFR = Code of Federal Regulations; CPSC = Consumer Product Safety Commission; DOT = Department of Transportation; EL = emissions levels; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; HAP = hazardous air pollutant; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life and health; IRIS = Integrated Risk Information System; MCL = maximum contaminant level; MCLG = maximum contaminant level goal; NIOSH = National Institute for Occupational Safety and Health; OEL = occupational exposure limit; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; PQL = practical quantitation level; REL = recommended exposure limit; RfD = reference dose; STEL = short term exposure limit; TLV = threshold limit values; TWA = time-weighted average; USC = United States Code; UTS = universal treatment standards; WHO = World Health Organization