8. REGULATIONS, ADVISORIES, AND GUIDELINES

MRLs are substance specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites.

ATSDR has derived an intermediate-duration inhalation MRL of 20 ng/m^3 for parathion based on a NOAEL of 0.01 mg/m^3 for neurological effects in rats (NIOSH 1974). The MRL was derived by dividing the duration-adjusted NOAEL by an uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability).

ATSDR has derived an intermediate-duration oral MRL of 0.009 mg/kg/day for parathion based on a NOAEL of 0.09 mg/kg/day for neurological effects in humans (Rider et al. 1969). The MRL was derived by dividing the NOAEL by an uncertainty factor of 10 (for human variability).

IARC has classified parathion as a Group 3 carcinogen (*not classifiable as to its carcinogenicity to humans*) (IARC 2013). The World Health Organization (WHO) has not established any air quality guidelines for parathion (WHO 2010). A water quality guideline value was not established for parathion because it occurs in drinking water at concentrations well below those of health concern (WHO 2011).

OSHA has established an enforceable permissible exposure limit (PEL) of 0.1 mg/m^3 for parathion (OSHA 2013b). OSHA has required employers of workers who are occupationally exposed to parathion to institute engineering controls and work practices to reduce and maintain employee exposure at or below the PEL. NIOSH has established a recommended exposure limit (REL) of 0.05 mg/m^3 and an immediately dangerous to life or health (IDLH) value of 10 mg/m^3 (NIOSH 2013). The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a threshold limit value (TLV) of 0.05 mg/m^3 for an 8-hour workday (ACGIH 2012).

The Department of Energy (DOE) has established protective action criteria (PAC-1, -2, and -3) values of 0.15, 1.5, and 2.0 mg/m^3, respectively, for airborne parathion when responding to potential releases for use in community emergency planning (DOE 2016b). These values represent increasing severity of effects (mild, irreversible, and life-threatening) for a 1-hour exposure.

EPA has classified parathion as a Group C carcinogen (*possible human carcinogen*) (IRIS 2003) and ACGIH (2012) has classified parathion as an A4 carcinogen (*not classified as to human carcinogenicity*). The National Toxicology Program (NTP) has not classified parathion as a human carcinogen (NTP 2011). EPA has not derived an oral reference dose (RfD) or a chronic inhalation reference concentration (RfC) for parathion (IRIS 2003).

EPA has designated parathion as a hazardous air pollutant (HAP) under the Clean Air Act (CAA) (EPA 2013b). Parathion is on the list of chemicals appearing in "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986" and has been assigned a reportable quantity (RQ) limit of 10 pounds (EPA 2012f). Parathion is also considered to be an extremely hazardous substance (EPA 2012g). The RQ represents the amount of a designated hazardous substance which, when released to the environment, must be reported to the appropriate authority.

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

Table 8-1. Regulations, Advisories, and Guidelines Applicable to Parathion

Agency	Description	Information	Reference
INTERNATIONAL			
Guidelines:			
IARC	Carcinogenicity classification	Group 3[a]	IARC 2013
WHO	Air quality guidelines	No data	WHO 2010
	Drinking water quality guidelines	No data[b]	WHO 2011
NATIONAL			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV (8-hour TWA)[c,d]	0.05 mg/m^3	ACGIH 2012
AIHA	ERPG-1, -2, -3	No data	AIHA 2011
DOE	PAC-1[e]	0.15 mg/m^3	DOE 2016b
	PAC-2	1.5 mg/m^3	
	PAC-3	2.0 mg/m^3	
EPA	AEGL-1[f]	Not recommended due to insufficient data	EPA 2013a
	AEGL-2		
	10-minutes	2.8 mg/m^3	
	30-minutes	1.9 mg/m^3	
	60-minutes	1.5 mg/m^3	
	4-hours	0.96 mg/m^3	
	8-hours	0.48 mg/m^3	
	AEGL-3		
	10-minutes	3.6 mg/m^3	
	30-minutes	2.5 mg/m^3	
	60-minutes	2.0 mg/m^3	
	4-hours	1.3 mg/m^3	
	8-hours	0.63 mg/m^3	
	Hazardous air pollutant	Yes	EPA 2013b 42 USC 7412
	NAAQS	No data	EPA 2013e
NIOSH	REL (10-hour TWA)[g]	0.05 mg/m^3	NIOSH 2011
	IDLH	10 mg/m^3	
OSHA	PEL (8-hour TWA) for general industry[h]	0.1 mg/m^3	OSHA 2013b 29 CFR 1910.1000, Table Z-1
	Highly hazardous chemicals	No data	OSHA 2013a 29 CFR 1910.119, Appendix A

Table 8-1. Regulations, Advisories, and Guidelines Applicable to Parathion

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
b. Water			
EPA	Designated as hazardous substances in accordance with Section 311(b)(2)(A) of the Clean Water Act	Yes	EPA 2012a 40 CFR 116.4
EPA	Drinking water contaminant candidate list	No data	EPA 2009a 74 FR 51850
	Drinking water standards and health advisories	No data	EPA 2012b
	National primary drinking water standards	No data	EPA 2009b
	National recommended water quality criteria for freshwater		EPA 2009c
	Criteria maximum concentration (acute)	0.065 µg/L	
	Criterion continuous concentration (chronic)	0.013 µg/L	
	Reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act	10 pounds	EPA 2012d 40 CFR 117.3
c. Food			
FDA	EAFUS[i]	No	FDA 2013
d. Other			
ACGIH	Carcinogenicity classification	A4[j]	ACGIH 2012
	BEI		
	Total p-nitrophenol in urine (end of shift end)	0.5 mg/g creatinine	
	Cholinesterase activity in red blood cells (discretionary)	70% of individual's baseline	
EPA	Carcinogenicity classification	Group C[k]	IRIS 2003
	RfC	No data	
	RfD	No data	
	Identification and listing of hazardous waste	P089	EPA 2012c 40 CFR 261, Appendix VIII
	Inert pesticide ingredients in pesticide products approved for nonfood use only	No data	EPA 2013c
	Master Testing List	No data	EPA 2013d
	RCRA waste minimization PBT priority chemical list	No data	EPA 1998 63 FR 60332
	Standards for owners and operators of hazardous waste TSD facilities; groundwater monitoring list	Yes	EPA 2012e 40 CFR 264, Appendix IX

Table 8-1. Regulations, Advisories, and Guidelines Applicable to Parathion

Agency	Description	Information	Reference
NATIONAL *(cont.)*			
EPA	Superfund, emergency planning, and community right-to-know		
	Designated CERCLA hazardous substance and reportable quantity pursuant to Section 311(b)(2) of the Clean Water Act, Section 112 of the Clean Air Act, and Section 3001 of RCRA	10 pounds	EPA 2012f 40 CFR 302.4
	Effective date of toxic chemical release reporting	01/01/1987	EPA 2012h 40 CFR 372.65
	Extremely hazardous substances and its threshold planning quantity		EPA 2012g 40 CFR 355, Appendix A
	Reportable quantity	10 pounds	
	Threshold planning quantity	100 pounds	
	TSCA chemical lists and reporting periods	No data	EPA 2012i 40 CFR 712.30
	TSCA health and safety data reporting	No data	EPA 2012j 40 CFR 716.120
NTP	Carcinogenicity classification	No data	NTP 2011

[a]Group 3: Unclassifiable as to carcinogenicity to humans.
[b]A guideline value was not established for parathion because it occurs in drinking-water at concentrations well below those of health concern (WHO 2011).
[c]Inhalable fraction and vapor; material exerts sufficient vapor pressure such that it may be present in both particles and vapor phases, with each contributing a significant portion of the dose at the TLV-TWA concentration (ACGIH 2012).
[d]Skin designation: refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, by contact with vapors, liquids, and solids (ACGIH 2012).
[e]PAC-1: mild, transient health effects; PAC-2: irreversible or other serious health effects that could impair the ability to take protective action; PAC-3: life-threatening health effects (DOE 2016a).
[f]AEGL-1: the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, nonsensory effects; however, these effects are not disabling and are transient and reversible upon cessation of exposure; AEGL-2: the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting, adverse health effects or an impaired ability to escape; AEGL-3: is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening adverse health effects or death (EPA 2013a).
[g]Skin designation indicates the potential for dermal absorption; skin exposure should be prevented as necessary through the use of good work practices, gloves, coveralls, goggles, and other appropriate equipment (NIOSH 2011).
[h]Skin designation.
[i]The EAFUS list of substances contains ingredients added directly to food that FDA has either approved as food additives or listed or affirmed as GRAS.
[j]A4: Not classified as a human carcinogen.
[k]Group C: possible human carcinogen.

ACGIH = American Conference of Governmental Industrial Hygienists; AEGL = acute exposure guideline levels; AIHA = American Industrial Hygiene Association; BEI = biological exposure indices; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; DOE = Department of Energy; EAFUS = Everything Added to Food in the United States; EPA = Environmental Protection Agency; ERPG = emergency response planning guidelines; FDA = Food and Drug Administration; FR = Federal Register;

Table 8-1. Regulations, Advisories, and Guidelines Applicable to Parathion

Agency	Description	Information	Reference

GRAS = generally recognized as safe; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; NAAQS = National Ambient Air Quality Standards; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PAC = protective action criteria; PBT = persistent, bioaccumulative, and toxic; PEL = permissible exposure limit; 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