

## 8. REGULATIONS AND ADVISORIES

Zinc (fume and dust) and its compounds are 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" (EPA 2003j).

The national and state regulations and guidelines pertaining to zinc and compounds in air, water, food, and other media are summarized in Table 8-1. No international regulations or guidelines applicable to zinc or its compounds were found.

ATSDR has derived an intermediate-duration oral MRL of 0.3 mg Zn/kg/day for zinc based on decreased erythrocyte superoxide dismutase, a sensitive indicator of body copper status, and changes in serum ferritin in women given supplements containing zinc gluconate for 10 weeks (Yadrick et al. 1989). It should be noted that the MRL is calculated based on the assumption of healthy dietary levels of zinc (and copper), and represents the level of exposure above and beyond the normal diet that is believed to be without an appreciable risk of toxic response. The MRL is based on soluble zinc salts; it is less likely that nonsoluble zinc compounds would have these effects at similar exposure levels. The intermediate oral MRL has been adopted as the chronic oral MRL.

EPA has derived an oral reference dose (RfD) of 0.3 mg/kg/day for zinc (IRIS 2005). EPA has not derived an inhalation reference concentration (RfC) for zinc.

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**Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds**

Agency	Description	Information	Reference
<b>INTERNATIONAL</b>			
Guidelines:			
IARC	Carcinogenicity classification	No data	
WHO	Drinking water and air quality guidelines	No data	
<b>NATIONAL</b>			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV (8-hour TWA)	No data	
EPA	Hazardous air pollutant pursuant to Section 112 of the Clean Air Act	Zinc and zinc oxide	EPA 2003e 40 CFR 61.01
NIOSH	REL (10-hour TWA)		NIOSH 2003a, 2003b
	Zinc chloride (fume)	1 mg/m <sup>3</sup>	
	Zinc oxide (dust and fume)	5 mg/m <sup>3</sup>	
	STEL (15-minute TWA)		
	Zinc chloride (fume)	2 mg/m <sup>3</sup>	
	Zinc oxide (fume)	10 mg/m <sup>3</sup>	
	Ceiling		
	Zinc oxide (dust)	15 mg/m <sup>3</sup>	
	IDLH		
	Zinc chloride (fume)	50 mg/m <sup>3</sup>	
Zinc oxide	500 mg/m <sup>3</sup>		
OSHA	PEL (8-hour TWA) for general industry		OSHA 2003a 29 CFR 1910.1000, Table Z-1
	Zinc chloride (fume)	1 mg/m <sup>3</sup>	
	Zinc oxide (fume and respirable fraction of dust)	5 mg/m <sup>3</sup>	
	Zinc oxide (total dust)	15 mg/m <sup>3</sup>	
	PEL (8-hour TWA) for construction industry		
	Zinc chloride (fume)	1 mg/m <sup>3</sup>	
	Zinc oxide (fume and respirable fraction of dust)	5 mg/m <sup>3</sup>	
	Zinc oxide (total dust)	15 mg/m <sup>3</sup>	
	PEL (8-hour TWA) for shipyard industry		OSHA 2003b 29 CFR 1915.1000
	Zinc chloride (fume)	1 mg/m <sup>3</sup>	
	Zinc oxide (fume and respirable fraction of dust)	5 mg/m <sup>3</sup>	
	Zinc oxide (total dust)	15 mg/m <sup>3</sup>	

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Agency	Description	Information	Reference
<u>NATIONAL (cont.)</u>			
b. Water			
EPA	Drinking water health advisories		EPA 2002
	1-day (10-kg child)	6 mg/L	
	10-day (10-kg child)	6 mg/L	
	DWEL <sup>a</sup>	10 mg/L	
	Lifetime <sup>b</sup>	2 mg/L	
EPA	Hazardous substance in accordance with Section 311 (b)(2)(A) of the Clean Water Act	Zinc chloride Zinc sulfate	EPA 2003k 40 CFR 116.4
	Hazardous substance in accordance with Section 311 of the Clean Water Act; reportable quantities		EPA 2003g 40 CFR 117.3
	Zinc chloride	1,000 pounds	
	Zinc sulfate	1,000 pounds	
	National secondary drinking water regulations; secondary MCL for zinc	5 mg/L	EPA 2003f 40 CFR 143.3
	Pollutants of initial focus in the Great Lakes Water Quality Initiative	Zinc	EPA 2003i 40 CFR 132, Table 6
	Reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act		
	Zinc chloride	1,000 pounds	
	Zinc sulfate	1,000 pounds	
	Toxic pollutant designation pursuant to Section 307(a)(1) of the Clean Water Act	Zinc and compounds	EPA 2003c 40 CFR 401.15
c. Food			
EPA	Tolerances for residues (ppm) of a fungicide (mancozeb), which contains 20% manganese, 2.5% zinc, and 77.5% ethylene-bisdithiocarbamate		EPA 2003i 40 CFR 180.176

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Agency	Description	Information	Reference
<b>NATIONAL (cont.)</b>			
EPA			
	Apple	7	EPA 2003i
	Asparagus	0.1	40 CFR 180.176
	Banana	4	
	Banana, pulp (no peel)	0.5	
	Barley, grain	5	
	Barley, milled feed fractions	20	
	Barley, straw	25	
	Beet, sugar	2	
	Beet, sugar tops	65	
	Carrots	2	
	Celery	5	
	Corn, fodder and forage	5	
	Corn, grain	0.1	
	Cottonseed	0.5	
	Crabapple	10	
	Cranberry	7	
	Cucumber	4	
	Fennel	10	
	Tolerances for residues (cont.)	0.5	EPA 2003i
	Fresh Corn	7	40 CFR 180.176
	Grape	0.5	
	Kidney	0.5	
	Liver	4	
	Melon	20	
	Oat, bran and milled feed fractions	5	
	Oat, grain	25	
	Oat, straw	0.5	
	Onion, dry bulb	10	
	Papaya	0.5	
	Peanut	65	
	Peanut vine hay	10	
	Pear	0.5	
	Popcorn grain	10	
	Quince	5	
	Rye, grain	20	
	Rye, milled feed fractions	25	
	Rye, straw	4	
	Squash, summer	4	
	Tomato	5	
	Wheat, grain	20	
	Wheat, milled feed fractions	25	
	Wheat, straw		

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Agency	Description	Information	Reference
<b>NATIONAL (cont.)</b>			
FDA	Bottled drinking water (allowable concentration of zinc); mineral water is exempt based on aesthetically allowable levels and do not relate to health concern	5.0 mg/L	FDA 2003a 21 CFR 165.110
	Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses; ingredients used in skin protectant drug products	Zinc chloride Zinc oxide Zinc sulfate	FDA 2003c 21 CFR 310.545
	Nutrition labeling of food; statement of the amount per serving of zinc calculated as a percent of the RDI and expressed as percent of Daily Value	15 mg	FDA 2003b 21 CFR 101.9
	Substances generally recognized as safe; trace minerals added to animal feeds as nutritional dietary supplements when added at levels consistent with good feeding practices	Zinc chloride Zinc oxide Zinc sulfate	FDA 2003d 21 CFR 582.80
	Substances generally recognized as safe when used in accordance with good manufacturing practices	Zinc oxide and zinc sulfate	FDA 2003e 21 CFR 182.8991; 21 CFR 182.8997
d. Other			
EPA	Carcinogenicity classification	D <sup>c</sup>	IRIS 2003
	RfC	No data	IRIS 2003
	RfD	3x10 <sup>-1</sup> mg/kg/day	IRIS 2003
	Community right-to-know; release reporting; effective date of reporting for zinc (fume and dust)	01/01/87	EPA 2003j 40 CFR 372.65
	Designated as a hazardous substance pursuant to Section 311(b)(2) of the Clean Water Act; reportable quantity Zinc and compounds	Not assigned	EPA 2003b 40 CFR 302.4
	Designated as a hazardous substance pursuant to Section 307(a) of the Clean Water Act; reportable quantities		EPA 2003b 40 CFR 302.4
	Zinc chloride	1,000 pounds	
	Zinc sulfate	1,000 pounds	

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Agency	Description	Information	Reference
<u>NATIONAL (cont.)</u>			
d. Other			
EPA	Hazardous constituent for municipal solid waste landfills	Zinc	EPA 2003a 40 CFR 258, Appendix II
	Land disposal restrictions; universal treatment standards for zinc		EPA 2003d 40 CFR 268.48
	Waste water standard	2.61 mg/L	
	Non-waste water standard	4.3 mg/L TCLP	
	Standards for owners and operators of hazardous waste TSD facilities; groundwater monitoring for zinc	Suggested method	EPA 2003h 40 CFR 264, Appendix IX
		6010	PQL 20 µg/L
		7950 7951	50 µg/L 0.5 µg/L
<u>STATE</u>			
a. Air	No data		
b. Water			
Arizona	Drinking water guideline (zinc and zinc compounds)	5 mg/L	HSDB 2003
Illinois	Drinking water standard (zinc and zinc compounds)	5 mg/L	HSDB 2003
Minnesota	Drinking water guideline (zinc and zinc compounds)	2 mg/L	HSDB 2003
c. Food	No data		
d. Other	No data		

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

<sup>b</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>c</sup>D: not classifiable as to human carcinogenicity

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; HA = health advisory; 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; OTC = over-the-counter; PEL = permissible exposure limit; PQL = practical quantitation level; RDI = recommended daily intake; REL = recommended exposure limit; RfC = inhalation reference concentration; RfD = oral reference dose; STEL = short-term exposure limit; TCLP = toxicity characteristic leachate procedure; TLV = threshold limit values; TSD = treatment, storage, and disposal; TWA = time-weighted average; WHO = World Health Organization