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

<table>
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<tr>
<th>Agency</th>
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<td>a. Air</td>
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<td>Zinc oxide (dust and fume)</td>
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<td>STEL (15-minute TWA)</td>
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<td>Zinc chloride (fume)</td>
<td>2 mg/m³</td>
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<td>Zinc oxide (fume)</td>
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<td>Ceiling</td>
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<td>Zinc oxide (dust)</td>
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<td>Zinc oxide</td>
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<td>OSHA</td>
<td>PEL (8-hour TWA) for general industry</td>
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<td>Zinc chloride (fume)</td>
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<td>Zinc oxide (fume and respirable fraction of dust)</td>
<td>5 mg/m³</td>
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<td>15 mg/m³</td>
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<td>Zinc oxide (total dust)</td>
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<td>OSHA</td>
<td>PEL (8-hour TWA) for construction industry</td>
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<td>Zinc chloride (fume)</td>
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<td>29 CFR 1926.55, Appendix A</td>
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<td>PEL (8-hour TWA) for shipyard industry</td>
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<td>Zinc oxide (total dust)</td>
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Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds

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<td>1-day (10-kg child)</td>
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<td>10-day (10-kg child)</td>
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<td>DWEL&lt;sup&gt;a&lt;/sup&gt;</td>
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<td></td>
<td>Lifetime&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Zinc sulfate</td>
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<td>Hazardous substance in accordance with Section 311 of the Clean Water Act; reportable quantities</td>
<td>Zinc chloride</td>
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<td>Zinc sulfate</td>
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<td>National secondary drinking water regulations; secondary MCL for zinc</td>
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<td>Pollutants of initial focus in the Great Lakes Water Quality Initiative</td>
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<td>40 CFR 132, Table 6</td>
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<td>Toxic pollutant designation pursuant to Section 307(a)(1) of the Clean Water Act</td>
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<td><strong>c. Food</strong></td>
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<td>EPA</td>
<td>Tolerances for residues (ppm) of a fungicide (mancozeb), which contains 20% manganese, 2.5% zinc, and 77.5% ethylene-bisdithiocarbamate</td>
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Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds

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<td>Popcorn grain</td>
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<td>Squash, summer</td>
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<td>Tomato</td>
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<td>Wheat, straw</td>
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Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds

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<td>FDA</td>
<td>Bottled drinking water (allowable concentration of zinc); mineral water is exempt based on aesthetically allowable levels and do not relate to health concern</td>
<td>5.0 mg/L</td>
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<td>Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses; ingredients used in skin protectant drug products</td>
<td>Zinc chloride, Zinc oxide, Zinc sulfate</td>
<td>FDA 2003c 21 CFR 310.545</td>
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<td>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</td>
<td>15 mg</td>
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<td>Substances generally recognized as safe; trace minerals added to animal feeds as nutritional dietary supplements when added at levels consistent with good feeding practices</td>
<td>Zinc chloride, Zinc oxide, Zinc sulfate</td>
<td>FDA 2003d 21 CFR 582.80</td>
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<td>Substances generally recognized as safe when used in accordance with good manufacturing practices</td>
<td>Zinc oxide, Zinc sulfate</td>
<td>FDA 2003e 21 CFR 182.8991; 21 CFR 182.8997</td>
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<td>RfD</td>
<td>3x10⁻¹ mg/kg/day</td>
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<td>Community right-to-know; release reporting; effective date of reporting for zinc (fume and dust)</td>
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<td>1,000 pounds, 1,000 pounds</td>
<td>EPA 2003b 40 CFR 302.4</td>
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### Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds

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<td>d. Other</td>
<td>Hazardous constituent for municipal solid waste</td>
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<td>landfills</td>
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<td>Land disposal restrictions; universal treatment</td>
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<td>standards for zinc</td>
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<td>Waste water standard</td>
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<td>Non-waste water standard</td>
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<td>Standards for owners and operators of hazardous</td>
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<td>waste TSD facilities; groundwater monitoring</td>
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<td>drinking water equivalent level</td>
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<td>b. Water</td>
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<td>Drinking water guideline (zinc and zinc</td>
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<tr>
<td>d. Other</td>
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*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.

*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.

*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