

Zinc phosphide; CASRN 1314-84-7

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the [IRIS assessment development process](#). Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the [guidance documents located on the IRIS website](#).

STATUS OF DATA FOR Zinc phosphide

File First On-Line 03/31/1987

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	yes	03/31/1987
Inhalation RfC (I.B.)	not evaluated	
Carcinogenicity Assessment (II.)	not evaluated	

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — Zinc phosphide

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Last Revised — 03/31/1987

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of

information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

I.A.1. Oral RfD Summary

Critical Effect	Experimental Doses*	UF	MF	RfD
Reduction of food intake and body weight	NOAEL: none LOAEL: 50 ppm diet (3.48 mg/kg/day)	10,000	1	3E-4 mg/kg/day
Rat Subchronic Oral Study				
Bai et al., 1980				

* Dose Conversion Factors and Assumptions — Dose conversion based on authors' estimated intake of 317 mg/kg bw/day divided by 91 days.

I.A.2. Principal and Supporting Studies (Oral RfD)

Bai, K.M., M.K. Krishnakumari, H.P. Ramesh, T. Shivanandappa and S.K. Majunder. 1980. Short-term toxicity study of zinc phosphide in albino rats. *Indian J. Exptl. Biol.* 18: 854-857.

The only available subchronic oral study with zinc phosphide was the 13-week study by Bai et al. (1980). In this study, groups of 12 female weanling rats were fed diets containing 0, 50, 100, 200 and 500 ppm zinc phosphide. Data from this study include several clinical, biochemical and histopathological parameters. In rats dosed at 200 or 500 ppm, there was approximately 8 and 83% mortality. Food intake and body weight significantly decreased in all exposed rats, indicating a dose-response susceptibility to zinc phosphide toxicity. Histopathological lesions accompanied with increased liver, kidney and brain weights were only observed in rats exposed with 200 or 500 ppm of zinc phosphide. Although histopathological or hematological examinations revealed no deleterious effects in 50 or 100 ppm dosed groups, body hair loss was extensive in all exposed rats, except that the hair growth returned to normal within a few weeks after week 6 in rats exposed to 50 ppm zinc phosphide. Bai et al. (1980), therefore, concluded that zinc phosphide at the 50 ppm level was less toxic to the albino rats. Because of significant dose- response trends in decreased food intake and body weights, the 50 ppm dose of zinc

phosphide or 3.48 mg/kg/day (based on authors' estimated intake of 317 mg/kg bw during 91 days) is considered a LOAEL. By applying an uncertainty factor of 10,000 to this dose, an RfD of 0.0003 mg/kg/day or 24 ug/day for a 70-kg person is derived.

I.A.3. Uncertainty and Modifying Factors (Oral RfD)

UF — An uncertainty factor of 10,000 was applied; 10 for interspecies extrapolation, 10 for providing added protection to unusually sensitive individuals, 10 for expanding subchronic to chronic exposure, and 10 for the lack of a NOAEL.

MF — None

I.A.4. Additional Studies/Comments (Oral RfD)

Zinc phosphide is a rodenticide (Worthing, 1983) that is insoluble in water, but reacts with HCL and sulfuric acid with the evolution of spontaneously flammable phosphine (Windholz, 1983). The toxicity of ingested zinc phosphide is due to the formation of phosphine gas in the acid environment of the stomach (U.S. EPA, 1983; Bai et al., 1980). Chronic data for phosphine do not suggest a lower RfD for zinc phosphide. An RfD of 0.0003 mg/kg/day can be derived for zinc phosphide based on analogy to phosphine (assuming the release of two equivalents of phosphine for each molecule of zinc phosphide in stomach acid). Information on the toxicity of phosphine can be found in the IRIS file for phosphine.

I.A.5. Confidence in the Oral RfD

Study — Medium

Database — Low

RfD — Low

The referenced study was well-designed and incorporated several biological and biochemical endpoints, however, only females were tested; thus, the study was given a medium level of confidence. The database did not provide supportive chronic studies and was given a low confidence rating. The RfD was assigned a low level of confidence because of the poor database and lack of a NOAEL.

I.A.6. EPA Documentation and Review of the Oral RfD

Source Document — This assessment is not presented in any existing U.S. EPA document.

Other EPA Documentation — U.S. EPA, 1983

Agency Work Group Review — 02/26/1986, 05/14/1986

Verification Date — 05/14/1986

Screening-Level Literature Review Findings — A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the RfD for Zinc phosphide conducted in November 2001 identified one or more significant new studies. IRIS users may request the references for those studies from the IRIS Hotline at hotline.iris@epa.gov or (202)566-1676.

I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — Zinc phosphide
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Not available at this time.

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — Zinc phosphide
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This substance/agent has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential.

III. [reserved]

IV. [reserved]

V. [reserved]

VI. Bibliography

Substance Name — Zinc phosphide

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VI.A. Oral RfD References

Bai, K.M., M.K. Krishnakumari, H.P. Ramesh, T. Shivanandappa and S.K. Majunder. 1980. Short-term toxicity study of zinc phosphide in albino rats. *Ind. J. Exptl. Biol.* 18: 854-857.

U.S. EPA. 1983. Reportable Quantity for Zinc Phosphide. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

Windholz, M. 1983. *The Merck Index*. Merck and Company, Inc., Rahway, NJ.

Worthing, C.R. 1983. *The Pesticide Manual*, 7th ed. British Crop Protection Council. p. 563.

VI.B. Inhalation RfC References

None

VI.C. Carcinogenicity Assessment References

None

VII. Revision History

Substance Name — Zinc phosphide

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Date	Section	Description
12/03/2002	I.A.6.	Screening-Level Literature Review Findings message has been added.

VIII. Synonyms

Zinc phosphide

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- 1314-84-7
- BLUE-OX
- KILRAT
- MOUS-CON
- PHOSPHURE DE ZINC
- PHOSVIN
- RCRA WASTE NUMBER P122
- RUMETAN
- UN 1714
- ZINCO(FOSFURO DI)
- Zinc phosphide
- ZINC(PHOSPHURE DE)
- ZINC-TOX
- ZINKFOSFIDE
- ZINKPHOSPHID
- ZP