

Vanadium pentoxide; CASRN 1314-62-1

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 Vanadium pentoxide

File First On-Line 01/31/1987

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	yes	06/30/1988
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 — Vanadium pentoxide

CASRN — 1314-62-1

Last Revised — 06/30/1988

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
Decreased hair cystine	NOAEL: 17.85 ppm converted to 0.89 mg/kg/day	100	1	9E-3 mg/kg/day
Rat Chronic Oral Study	LOAEL: none			
Stokinger et al., 1953				

*Conversion Factors: Adult rat food consumption assumed to be 5% bw/day.

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

Stokinger, H.E., W.D. Wagner, J.T. Mountain, F.R. Stacksill, O.J. Dobrogorski and R.G. Keenan. 1953. Unpublished results. Division of Occupational Health, Cincinnati, OH. (Cited in Patty's Industrial Hygiene and Toxicology, 3rd ed., 1981)

In this chronic study, an unspecified number of rats were exposed to dietary levels of 10 or 100 ppm vanadium (about 17.9 or 179 ppm vanadium pentoxide) for 2.5 years. The results of this unpublished study were summarized by Stokinger et al. (1981). The criteria used to evaluate vanadium toxicity were growth rate, survival, and hair cystine content. The only significant change reported was a decrease in the amount of cystine in the hair of animals ingesting vanadium.

Of the subchronic and chronic animal studies available, the lower dose level (17.9 ppm vanadium pentoxide) reported in the Stokinger et al. (1953) study is the highest oral NOAEL upon which an RfD can be derived. An oral RfD of 0.009 mg/kg/day (0.62 mg/day for a 70-kg person) can be calculated by assuming that rats eat food equivalent to 5% of their body weight and by applying an uncertainty factor of 100.

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

UF — An uncertainty factor of 100 was applied, 10 for interspecies extrapolation and a factor of 10 to provide added protection for unusually sensitive individuals.

MF — None

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

In a subchronic feeding study (Mountain et al., 1953), groups of five male Wistar rats were fed vanadium pentoxide at levels of 0, 25, or 50 ppm for 35 days, after which dietary levels of vanadium were increased to 100 and 150 ppm and continued for 68 days. There was a decrease in the amount of cystine in the hair of the high-dosed (50-150 ppm or 2.5-7.5 mg/kg/day, based on food consumption of 5% bw) rats. A significant decrease was also reported in erythrocyte and hemoglobin levels of the high-dosed rats. In an abstract of a subchronic inhalation study (Sugira, 1978), mice and rats exposed to 1 to 3 mg/cu.m vanadium pentoxide for 3 months, 6 hours/day developed histopathologic changes in their lungs and had a decrease in growth rate. Adverse effects were not detected in either species similarly exposed at 0.1 to 0.4 mg/cu.m.

Although several epidemiologic studies have been conducted on factory workers exposed to vanadium pentoxide for several years, the air concentration levels of vanadium pentoxide were measured only at scattered intervals, making it impossible to determine a minimum effective dose. Also, in cases of humans exposed to relatively high atmospheric concentrations of vanadium pentoxide for short periods of time, all individuals developed respiratory symptoms that usually subsided within 7-14 days.

I.A.5. Confidence in the Oral RfD

Study — Low
Database — Low
RfD — Low

Because of the lack of details in the reference study and the scarcity of data available on vanadium pentoxide, low confidence is assigned to both the study and the database. Low confidence in the RfD follows.

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 — None

Agency Work Group Review — 02/26/1986

Verification Date — 02/26/1986

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 Vanadium pentoxide conducted in September 2002 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 — Vanadium pentoxide
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Not available at this time.

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — Vanadium pentoxide
CASRN — 1314-62-1

The NTP (1985) has approved vanadium pentoxide for carcinogenicity testing; however, the route of administration has not been determined (i.e., oral, inhalation).

III. [reserved]

IV. [reserved]

V. [reserved]

VI. Bibliography

Substance Name — Vanadium pentoxide
CASRN — 1314-62-1

VI.A. Oral RfD References

Mountain, J.T., L.L. Delker and H.E. Stokinger. 1953. Studies in vanadium toxicology. Arch. Ind. Hyg. Occup. Med. 8: 406-411.

Stokinger, H.E. 1981. The metals: Vanadium. In: Patty's Industrial Hygiene and Toxicology, 3rd revised ed., Vol. 2A, G.D. Clayton and F.E. Clayton, Eds. John Wiley and Sons, Inc., New York. p. 2013-2033.

Stokinger, H.E., W.D. Wagner, J.T. Mountain, F.R. Stocksill, O.J. Dobrogorski and R.G. Keenan. 1953. No title given. Unpublished results. Division of Occupational Health, Cincinnati, OH. (Cited in: Patty's Industrial Hygiene and Toxicology, 3rd ed., 1981).

Sugiura, S. 1978. Inhalation toxicity of vanadium pentoxide dust in rats and mice. Shikoku Igaku Zasshi. 34(5): 209-219.

VI.B. Inhalation RfC References

None

VI.C. Carcinogenicity Assessment References

None

VII. Revision History

Substance Name — Vanadium pentoxide

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Date	Section	Description
06/30/1988	I.A.1., II.	NOAEL and RfD corrected, message added to cancer assessment
12/03/2002	I.A.6.	Screening-Level Literature Review Findings message has been added.

VIII. Synonyms

Substance Name — Vanadium pentoxide

CASRN — 1314-62-1

Last Revised — 01/31/1987

- 1314-62-1
- CI 77938
- Divanadium Pentaoxide
- Divanadium Pentoxide
- Vanadic Anhydride
- Vanadium Oxide
- Vanadium Pentaoxide
- Vanadium Pentoxide