

## Hexabromobenzene; CASRN 87-82-1

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 Hexabromobenzene

**File First On-Line 03/31/1987**

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

\*A comprehensive review of toxicological studies was completed 01/07/05 - please see section I.A.6 for more information.

## I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

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

— Hexabromobenzene  
CASRN — 87-82-1  
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            |
|--|---|------|----|----------------|
| <b>Induced serum carboxylesterase activity</b> | NOAEL: 40 ppm diet (converted to 2 mg/kg/day) | 1000 | 1  | 2E-3 mg/kg/day |
| <b>Rat Dietary Subchronic Study</b>            |   |      |    |                |
| <b>Mendoza et al., 1977</b>                    |   |      |    |                |

**Increased liver-to-body weight ratio; increased liver porphyrins**

LOAEL: 80 ppm diet

**Rat Preweanling and Primiparous Studies (Dietary)**

\*Conversion Factors: Assumed rat food consumption = 5% bw/day

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

Mendoza, C.E., H.M. Vijay, J.B. Shields and G.W. Laver. 1977. Effects of hexabromobenzene on the male rat. *Toxicol. Appl. Pharmacol.* 41: 127-130.

Mendoza, C.E., B.T. Collins, J.B. Shields and G.W. Laver. 1978. Effects of hexachlorobenzene or hexabromobenzene on body and organ weights of preweanling rats after a reciprocal transfer between the treated and control dams. *J. Agric. Food Chem.* 26: 941-945.

Mendoza, C.E., J.B. Shields and G.W. Laver. 1979. Comparison of the porphyrinogenic activity of hexabromobenzene and hexachlorobenzene in primiparous Wistar rats. *Bull. Environ. Contam. Toxicol.* 21: 358-364.

Mendoza et al. (1977) found no significant differences among control and treated rats (adult male Wistar) in body or organ weights and for most hematologic measurements. Rats were dosed at 0, 10, 20, 40, 80 or 160 ppm hexabromobenzene (HBB) in the diet for 12 weeks. A statistically significant induction of serum carboxylesterase activity was found at 40 ppm HBB and higher. Although the study protocol apportioned eight rats to each treatment group, a table indicated only four rats in the high-dose group. No differences were found for liver esterase activity. Liver porphyrin levels were not significantly increased in the treatment animals. Histopathology was not performed.

Mendoza et al. (1978) reported increased liver-to-body weight ratios for preweanling rats (Wistar) nursing on dams fed 80 ppm HBB in the diet during the suckling period (17-21 days). This study used a cross-adoption design involving two groups of 4 dams and 10 pups each. Half of the pups were sacrificed at 17 days and the other half at 21 days. A complex statistical model was presented. The effect was noted in the 17-day group, but not in the 21-day group. Ten dams (including four in the preweanling study) were fed HBB at 80 ppm for a total of 101 days (Mendoza et al., 1979). A 1000-fold difference in the level of porphyrins in the liver and elevated liver esterase activity were found in the treated animals when compared to controls.

Liver/body weight ratio is an appropriate adverse effect since the liver is the primary target organ of bromobenzenes in general. The mechanism of action has been studied extensively, and involves conversion of the parent compound to a reactive intermediate by hepatic microsomal enzymes. An increase in serum carboxylesterase without concomitant liver enlargement or liver enzyme induction is not considered adverse.

The LOAEL is conservative because of the uncertainty of the effects and the probable higher food consumption of nursing dams (10% of body weight) compared with the reference value (default) for adult rats (5% of body weight/day).

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

UF — The uncertainty factor of 1000 reflects 10 for both intraspecies and interspecies variability to the toxicity of this chemical in lieu of specific data, and 10 for extrapolation of a subchronic

effect level to its chronic equivalent.

MF — None

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

None.

#### **I.A.5. Confidence in the Oral RfD**

Study — Low

Database — Low

RfD — Low

Although five dose levels were used in the critical study, the study was of short duration, only one sex was exposed, and few definitive parameters were examined. A question exists as to the number of animals/group as well. All supporting evidence is from the same laboratory. Other studies are mostly short-term and indicate a much higher toxicity threshold for HBB. Thus, confidence in the chosen study, database, and RfD are all considered low.

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

Source Document — U.S. EPA, 1984

The 1984 Health and Environmental Effects Profile for Bromobenzenes has received Agency Review with the help of two outside scientists.

Other EPA Documentation — None

Agency Work Group Review — 10/09/1985, 11/06/1985

Verification Date — 11/06/1985

A comprehensive review of toxicological studies published through 2004 was conducted. No new health effects data were identified that would be directly useful in the revision of the existing RfD for Hexabromobenzene and a change in the RfD is not warranted at this time. For more information, IRIS users may contact the IRIS Hotline at [hotline.iris@epa.gov](mailto: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](mailto:hotline.iris@epa.gov) (internet address).

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

Substance Name — Hexabromobenzene  
CASRN — 87-82-1

Not available at this time.

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## **II. Carcinogenicity Assessment for Lifetime Exposure**

Substance Name — Hexabromobenzene  
CASRN — 87-82-1

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

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**III. [reserved]**

**IV. [reserved]**

**V. [reserved]**

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## **VI. Bibliography**

Substance Name — Hexabromobenzene  
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### **VI.A. Oral RfD References**

Mendoza, C.E., H.M. Vijay, J.B. Shields and G.W. Laver. 1977. Effects of hexabromobenzene on the male rat. *Toxicol. Appl. Pharmacol.* 41: 127-130.

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Mendoza, C.E., B.T. Collins, J.B. Shields and G.W. Laver. 1978. Effects of hexachlorobenzene or hexabromobenzene on body and organ weights of prewean- ling rats after a reciprocal transfer between the treated and control dams. *J. Agric. Food Chem.* 26: 941-945.

Mendoza, C.E., J.B. Shields and G.W. Laver. 1979. Comparison of the por- phyrinogenic activity of hexabromobenzene and hexachlorobenzene in primipar- ous Wistar rats. *Bull. Environ. Contam. Toxicol.* 21: 358-364.

U.S. EPA. 1984. Health and Environmental Effects Profile for Bromobenzenes. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste, Washington, DC.

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### VI.B. Inhalation RfC References

None

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### VI.C. Carcinogenicity Assessment References

None

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## VII. Revision History

Substance Name — Hexabromobenzene  
CASRN — 87-82-1

| Date       | Section | Description  |
|------------|---------|--|
| 12/03/2002 | I.A.6.  | Screening-Level Literature Review Findings message has been added.   |
| 03/03/2005 | I.A.6.  | Screening-Level Literature Review Findings message has been removed and replaced by comprehensive literature review conclusions. |

## **VIII. Synonyms**

Substance Name — Hexabromobenzene

CASRN — 87-82-1

Last Revised — 03/31/1987

- 87-82-1
- AFR 1001
- Benzene hexabromide
- Benzene, hexabromo-
- HBB
- Hexabromobenzene
- Perbromobenzene