

Explanation for Removal of HEAST Toxicity Values

The Health Effects Assessment Summary Tables (HEAST) is a comprehensive list, established by the U.S. Environmental Protection Agency (EPA), of human health toxicity values relative to the oral and inhalation routes of chemicals. HEAST provides information to assist in human health risk assessments and decision making during the remediation process. The values listed include but are not limited to:

- Reference Dose (RfD): An estimate of oral exposure to the human population that is likely to be without an appreciable risk of negative health effects during a lifetime.
- Reference Concentration (RfC): An estimate of a continuous inhalation exposure to the human population that is likely to be without an appreciable risk of negative health effects during a lifetime.
- Oral Slope Factor (OSF): An estimate of the increased cancer risk from an oral exposure to a dose of 1 mg/kg-day over a lifetime.
- Inhalation Unit Risk (IUR): An estimate of the increased cancer risk from inhalation exposure to a concentration of 1 ug/m³ over a lifetime.

When performing human health risk assessments, toxicological information is drawn from various sources. In Volume I, Part A, Chapter 7.4.1 of Risk Assessment Guidance for Superfund, available at https://www.epa.gov/sites/default/files/2015-09/documents/rags_a.pdf, the EPA established a hierarchy of sources of human health toxicity information used in risk assessments. In December 05, 2003, the EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) revised the hierarchy of sources of human health toxicity values that generally should be used for human health risk assessments. See the EPA's "Human Health Toxicity Values in Superfund Risk Assessments" OWSER Directive 9285.7-53 memorandum, available at <https://www.epa.gov/sites/default/files/2015-11/documents/hhmemo.pdf>. The revised hierarchy is comprised of 3 tiers:

- I. EPA's Integrated Risk Information System (IRIS).
- II. Provisional Peer-Reviewed Toxicity Values (PPRTV) used in EPA's Superfund Program.
- III. Other (peer-reviewed) toxicity values, including:
 - Minimal Risk Levels produced by the Agency for Toxic Substances and Disease Registry (ATSDR),
 - California Environmental Protection Agency (CalEPA) values, and
 - EPA Health Effects Assessment Summary Table (HEAST) values.

IRIS is the first tier because IRIS values have been verified through a peer review and EPA consensus review. Tier II consists of the PPRTVs. PPRTVs are generated through reviews of toxicity values previously published in HEAST. Upon completion of the reviews, the new toxicity

values developed are entered into the PPRTV database and the previous toxicity values are to be removed from HEAST. The toxicity values listed in HEAST are generally considered to be provisional, which means the toxicity or cancer value has had some EPA review using all information available at the time of evaluation but are not considered verified and entered into IRIS. HEAST previously was updated with new compounds and toxicity values on a quarterly basis; however, HEAST has not been updated since 1997. In contrast, IRIS and PPRTVs continue to be updated as new information on compounds of interest becomes available. As per the 2003 EPA memo, priority should be given to Tier I and Tier II.

Based on that guidance the Department reviewed the Land Recycling Program Toxicity Database for toxicity values with HEAST as the source. Toxicity values for compounds for which an IRIS value or PPRTV was generated subsequent to the listing of the compound in HEAST were replaced with the toxicity values listed in IRIS or PPRTV for that compound. If the IRIS or PPRTV review of a compound indicated there was not sufficient information to derive the toxicity value previously listed in HEAST the toxicity value was removed from the Land Recycling Program Toxicity Database.

The following compounds have HEAST toxicity values proposed to be removed from the LRP Toxicity Database with PPRTV assessments subsequent to determination of HEAST toxicity value:

Ammonia (CAS 7664-41-7) HEAST Toxicity Value: RfDo = 0.85 mg/kg/day
(Provisional Peer Reviewed Toxicity Values for Ammonia; EPA/690/R-05/006F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Ammonia.pdf>)

- “Because adequate data are lacking for oral exposure to ammonia, previous determinations of toxicity reference values (U.S. EPA, 1981, 1987, 1997) have used organoleptic (taste) data to estimate acceptable ammonium levels in drinking water at 34-35 mg/L. However, organoleptic (taste) data are not reliable predictors of either toxicity or intake.”
- “Due to the high uncertainty associated with use of the organoleptic (taste) data for ammonia, no oral subchronic or chronic p-RfD is derived.”

Bis(2-chloroisopropyl)ether (CAS 108-60-1) HEAST Toxicity Values: CSFo = 0.07 (mg/kg/day)⁻¹; IUR = 1E-05 (ug/m3)⁻¹
(Provisional Peer Reviewed Toxicity Values for Bis(2-chloro-1-methylethyl)ether; EPA/690/R-11/012F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Bis2chloro1methylethylether.pdf>)

- “No published studies demonstrating carcinogenic effects of chronic-duration oral exposure to relatively pure BCMEE in humans or animals were identified. An obsolete oral slope factor (OSF), of 7×10^{-2} reported in the HEAST (U.S. EPA, 2010b), was derived from an NTP (1982) gavage study in mice. Existing studies showing a positive dose-response relationship between BCMEE exposure and tumor formation in mice (NTP, 1982)—but not in rats (NCI, 1979)—used a mixture of 69.4% BCMEE and 30% other

isomers and could not be used to derive an OSF for pure BCMEE. Consequently no p-OSF is developed.”

Carbazole (CAS 86-74-8) HEAST Toxicity Value: CSFo = 0.02 (mg/kg/day)⁻¹

(Provisional Peer Reviewed Toxicity Values for Carbazole; EPA/690/R-08/006F; Online:

<https://cfpub.epa.gov/ncea/pprtv/documents/Carbazole.pdf>)

- “Because of the lack of carcinogenic data in humans or animals, under the 2005 Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), this PPRTV document classifies carbazole as having “Inadequate Information to Assess Carcinogenic Potential.”
- “Neither a p-OSF nor a p-IUR could be derived for carbazole because of the lack of suitable oral or inhalation data in both humans and animals.”

2-Chloropropane (CAS 75-29-6) HEAST Toxicity Value: RfCi = 0.1 mg/m³

(Provisional Peer Reviewed Toxicity Values for 2-Chloropropane; EPA/690/R-05/012F; Online:

<https://cfpub.epa.gov/ncea/pprtv/documents/Chloropropane2.pdf>)

- “Dow Chemical (1958) found lesions in the liver of rats exposed to 1000 ppm of 2-chloropropane for 6 months, but also found lesions in the kidneys and lungs of some of the other species tested under the same conditions. This study examined only one dose level, rendering it inadequate for RfC derivation.”
- “The inhalation data for 2-chloropropane are inadequate to support derivation of an RfC.”

trans-Crotonaldehyde (CAS 123-73-9) HEAST Toxicity Value: CSFo = 1.9 (mg/kg/day)⁻¹

(Provisional Peer Reviewed Toxicity Values for trans-Crotonaldehyde; EPA/690/R-21/001F;

Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Crotonaldehydetrans.pdf>)

- “A provisional cancer assessment was not prepared for trans-crotonaldehyde. Although IRIS (U.S. EPA, 2005) conducted a cancer assessment for this compound (weight of evidence [WOE] = “C; possible human carcinogen”), the data were not adequate for deriving quantitative estimates of carcinogenic risk by oral or inhalation exposure.”

Dibromomethane (CAS 74-95-3) HEAST Toxicity Value: RfDo = 0.01 mg/kg/day

(Provisional Peer Reviewed Toxicity Values for Methylene bromide; EPA/690/R-09/031F;

Online: <https://cfpub.epa.gov/ncea/pprtv/documents/MethyleneBromide.pdf>)

- “No chronic oral toxicity studies of methylene bromide were located. The only adequate repeated-dose oral study is the 28-day drinking water study in rats (Komsta et al., 1988) used to derive the subchronic p-RfD. The short duration of this study precludes using it for derivation of a chronic p-RfD.”

1,1-Dichloroethane (CAS 75-34-3) HEAST Toxicity Value: RfCi = 0.5 mg/m³

(Provisional Peer Reviewed Toxicity Values for 1,1-Dichloroethane; EPA/690/R-06/012F; Online:

<https://cfpub.epa.gov/ncea/pprtv/documents/Dichloroethane11.pdf>)

- “The available inhalation toxicity data for 1,1-dichloroethane are inadequate for derivation of provisional subchronic or chronic RfC values.”

Ethyl Acrylate (CAS 140-88-5) HEAST Toxicity Value: CSFo = 0.048 (mg/kg/day)⁻¹
(Provisional Peer Reviewed Toxicity Values for Ethyl Acrylate; EPA/690/R-14/005F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/EthylAcrylate.pdf>)

- “The tumor incidence data from the high concentration gavage studies are not considered suitable for quantitative estimation of cancer risk for ethyl acrylate at the low doses likely to be encountered by humans. The lack of sufficient information about the potential carcinogenic activity of ethyl acrylate at lower doses that do not induce local irritation precludes derivation of a quantitative estimate of cancer risk for ethyl acrylate by oral exposure.”

Ethyl Methacrylate (CAS 97-63-2) HEAST Toxicity Value: RfDo = 0.09 mg/kg/day
(Provisional Peer Reviewed Toxicity Values for Ethyl Methacrylate; EPA/690/R-10/014F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/EthylMethacrylate.pdf>)

- “There are no chronic oral studies of ethyl methacrylate. A subchronic neurotoxicity study using only one species (rat) and sex (male) has been conducted, and this study did not identify a NOAEL. Data for evaluating systemic effects other than neurotoxicity and reproductive/developmental toxicity via i.p. exposure are not available nor are any oral toxicological data in another species or in female animals. Due to these database deficiencies, the data do not support the derivation of a chronic p-RfD.”

Fluorotrichloromethane (Freon 11) (CAS 75-69-4) HEAST: RfCi = 0.7 mg/m³
(Provisional Peer Reviewed Toxicity Values for Trichlorofluoromethane; EPA/690/R-09/066F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Trichlorofluoromethane.pdf>)

- “Due to the brevity of available studies and insufficient justifications for considering long-term effects, no chronic value is developed.”

Hexane (CAS 110-54-3) HEAST Toxicity Value: RfDo = 0.06 mg/kg/day
(Provisional Peer Reviewed Provisional Subchronic Toxicity Values for n-Hexane; EPA/690/R-09/025F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Hexanen.pdf>)

- “No epidemiology or case report studies examining health effects in humans or chronic laboratory studies evaluating potential health effects in animals following oral exposure to n-hexane are available. An RfD for n-hexane cannot be derived in the absence of a suitable oral study of sufficient duration that evaluates an array of endpoints.”

Methyl Acrylate (CAS 96-33-3) HEAST Toxicity Value: RfDo = 0.03 mg/kg/day
(Provisional Peer Reviewed Toxicity Values for Methyl Acrylate; EPA/690/R-12/021F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/MethylAcrylate.pdf>)

- “Neither a subchronic nor a chronic p-RfD can be derived because no published studies investigating the effects of subchronic or chronic oral toxicity of methyl acrylate in

humans or animals were obtained that are acceptable for use in dose-response assessment.”

Methyl Chloride (CAS 74-87-3) HEAST Toxicity Values: CSFo = 0.013 (mg/kg/day)⁻¹; IUR = 1.8E-06 (ug/m³)⁻¹

(Provisional Peer Reviewed Toxicity Values for Chloromethane; EPA/690/R-12/008F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/Chlormethane.pdf>)

- “The evaluation of chloromethane for IRIS determined that the human data are inadequate to judge the carcinogenic potential of methyl chloride and that the findings in the single animal study on carcinogenicity (CIIT, 1981) are equivocal. The lack of data on the carcinogenicity of chloromethane precludes the derivation of quantitative estimates for either oral (p-OSF) or inhalation (p-IUR) exposure.”

Monochloroacetic Acid (CAS 79-11-8)

HEAST Toxicity Value: RfDo = 0.002 mg/kg/day

(Provisional Peer Reviewed Toxicity Values for Chloroacetic Acid; EPA/690/R-04/004F; Online: <https://cfpub.epa.gov/ncea/pprtv/documents/ChloroaceticAcid.pdf>)

- “The data do not support derivation of a provisional chronic RfD for chloroacetic acid.”

The following compounds have HEAST toxicity values proposed to be removed from the LRP Toxicity Database with IRIS assessments subsequent to determination of HEAST toxicity value:

Barium and Compounds (CAS 7440-39-3) HEAST Toxicity Value: RfCi = 0.0005 mg/m³

(Integrated Risk Information System (IRIS) Chemical Assessment Summary; Online: https://iris.epa.gov/static/pdfs/0010_summary.pdf)

- “An RfC for barium is not recommended at this time. The human and animal inhalation and intratracheal studies suggest that the respiratory system is a target of barium toxicity. The data also suggest that systemic effects, such as hypertension, may occur following inhalation exposure. The human studies cannot be used to derive an RfC for barium because exposure concentrations were not reported.”

Boron and Compounds (CAS 7440-42-8) HEAST Toxicity Value: RfCi = 0.02 mg/m³

(Integrated Risk Information System (IRIS) Chemical Assessment Summary; Online: https://iris.epa.gov/static/pdfs/0410_summary.pdf)

- “An RfC for boron is not recommended at this time.”
- “These data are inadequate to support derivation of an RfC for boron because the data available do not include a well-conducted study that adequately evaluated the respiratory tract and no NOAEL or LOAEL could be established.”

Chloroprene (CAS 126-99-8) HEAST Toxicity Value: RfDo = 0.02 mg/kg/day

(Integrated Risk Information System (IRIS) Chemical Assessment Summary; Online: https://iris.epa.gov/static/pdfs/1021_summary.pdf)

- “There are no human data involving oral exposure to chloroprene. The only lifetime oral study in animals exposed rats to chloroprene at one dose (50 mg/kg/day) and only qualitatively reported noncancer effects (Ponomarkov and Tomatis, 1980).”

Cyanazine (CAS 21725-46-2) HEAST Toxicity Values: RfDo = 0.002 mg/kg/day; CSFo = 0.84 (mg/kg/day)⁻¹

(Integrated Risk Information System (IRIS Chemical Assessment Summary; Online:

https://iris.epa.gov/static/pdfs/0145_summary.pdf)

- “The Oral RfD for cyanazine has been withdrawn on 07/01/1992 as a result of further review. A new RfD summary is in preparation by the RfD/RfC Work Group.”
- Not assessed for quantitative estimate of carcinogenic risk from oral exposure under IRIS Program
- Status: The EPA announced in a 2004 Federal Register Notice that chemicals used as pesticides would not be re-assessed by the IRIS Program.

Methyl Isobutyl Ketone (CAS 108-10-1) HEAST Toxicity Value: RfDo = 0.08 mg/kg/day

(Integrated Risk Information System (IRIS Chemical Assessment Summary; Online:

https://iris.epa.gov/static/pdfs/0173_summary.pdf)

“An oral RfD for methyl isobutyl ketone (MIBK) was withdrawn on 03/01/91. The health effects data for MIBK were reviewed by EPA at that time and determined to be inadequate for derivation of an oral RfD.”