Pentafluoroethane; CASRN 354-33-6

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 Pentafluoroethane

File First On-Line 12/01/1993

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	not evaluated	
Inhalation RfC (I.B.)	qualitative discussion	12/01/1993
Carcinogenicity Assessment (II.)	not evaluated	

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

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

Substance Name — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125

Not available at this time.

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

Substance Name — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125

The health effects data for pentafluoroethane were reviewed by the U.S. EPA RfD/RfC Work Group and determined to be inadequate for the derivation of an inhalation RfC. The verification status for this chemical is currently NOT VERIFIABLE. For additional information on the health effects of this chemical, interested parties are referred to the documentation listed below.

NOT VERIFIABLE status indicates that the U.S. EPA RfD/RfC Work Group deemed the database at the time of review to be insufficient to derive an inhalation RfC according to the Interim Methods for Development of Inhalation Reference Concentrations (U.S. EPA, 1990). This status does not preclude the use of information in cited references for assessment by others.

No information is available on the health effects of inhalation exposure to pentafluoroethane in humans and no adequate long-term inhalation or oral studies have been conducted in laboratory animals. Pentafluoroethane has very low toxicity following acute inhalation exposure in rats. No mortality was observed in groups of rats exposed for 4 hours to 50,000 or 100,000 ppm pentafluoroethane (Nick, 1964). Animals exhibited inactivity during exposure, but recovered immediately after exposure was terminated. No adverse exposure- related effects were noted at necropsy.

The 4-hour LC50 of pentafluoroethane was determined to be greater than 709,000 ppm in rats (Panepinto, 1990). Two groups of six male Crl:CD rats were exposed to either 503,000 or 709,000 ppm pentafluoroethane for 4 hours and observed for 14 days. No animals died at either exposure level, no clinical signs of toxicity were observed either during exposure or afterwards, and no exposure-related effects were noted at necropsy. Transient weight losses were noted the first day after exposure, and mild weight loss persisted in two of the rats until later in the recovery period. However, all exposed rats gained weight over the 14-day recovery period.

In a study designed to assess the clastogenic potential of pentafluoroethane using the micronucleus test, male rats were exposed for 6 hours to 24,000, 120,000, or 600,000 ppm pentafluoroethane while restrained (Edwards, 1992). Rats exposed to 600,000 ppm exhibited transient hunched posture, tremors, and hypoactivity after exposure, but there were no deaths. Rats sacrificed after 24 hours had lost weight, but animals from a preliminary range-finding test that survived longer than 2 days regained their preexposure weights.

The cardiac sensitization potential of pentafluoroethane (75,000-300,000 ppm) following a challenge injection of epinephrine also was assessed in beagle dogs (Hardy et al., 1992). Arrhythmias were elicited following exposure to concentrations greater than or equal to 100,000 ppm pentafluoroethane. The calculated EC50 for cardiac sensitization was 139,000 ppm. Because normal human plasma concentration of epinephrine is less than 140 pg/mL, the relevance of these studies using exogenous epinephrine concentrations well above physiologic range is not clear, and the significance of such finding is difficult to evaluate.

The developmental toxicity of pentafluoroethane was assessed in both rats and rabbits. Pregnant female rats were exposed to 0, 5000, 15,000, or 50,000 ppm pentafluoroethane on gestation days 6-15 and were sacrificed on day 20. Clinical signs indicative of the anesthetic effects of this compound (e.g., unsteady gait) were observed in the females only during exposure to 50,000 ppm. No other signs of maternal toxicity were evident, and body weight gain was comparable to that of the control group. No exposure-related effects were observed on any of the parameters of developmental toxicity measured (Masters et al., 1992).

Pregnant rabbits were also exposed to 0, 5000, 15,000, or 50,000 ppm pentafluoroethane on gestation days 6-18 and were sacrificed on day 29. Food consumption was slightly depressed in the 50,000-ppm females prior to exposure and during the first 4 days of exposure. This was accompanied by slight decreases in body weight gain. Body weight was comparable across all groups by study termination. No other clinical signs of toxicity were noted in the does. No statistically significant exposure-related effects were observed on any of the parameters of developmental toxicity measured (Brooker et al., 1992).

Derivation of an inhalation RfC for pentafluoroethane is not recommended at this time. No adequate long-term studies examining the effects of repeated inhalation of or oral exposure to pentafluoroethane exist. There are no data available regarding the pharmacokinetics of pentafluoroethane. Furthermore, there are no reproductive toxicity data available on this compound. The requirements for a minimum database for RfC development have not been met. The toxicity of pentafluoroethane appears to be less than or comparable to that of two other pentahaloethanes. Transient CNS effects were observed during exposure to 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124) and 1,1- dichloro-2,2,2-trifluoroethane (HCFC-123) at exposure concentrations of 50,000 and 5000 ppm, respectively, and other systemic effects were observed in animals exposed to HCFC-123. These effects were seen with exposure of pregnant rats to 50,000 ppm pentafluoroethane (Masters et al., 1992) and at much higher exposure concentrations in nonpregnant rats (Edwards, 1992; Panepinto, 1990). This comparison suggests that pentafluoroethane might have lower toxic potency than closely related chlorinated pentahaloethanes, but this conclusion is limited by the paucity of information available on this compound. Despite the lack of toxicity information available for RfC derivation, the concern for

toxicity for this chemical is low due to the lack of effects at extremely high levels in the acute inhalation study.

Brooker, A.J., R.J. Brown, D.M. John, T.J. Kenny, and D.W. Coombs. 1992. The effects of HFC 125 on pregnancy in the rabbit. Huntingdon Research Centre. Report No. ALS 10/920856.

Edwards, C.N. 1992. HCFC 125: Assessment of clastogenic action on bone marrow erythrocytes in the micronucleus test. Final Report. Life Science Research Limited. LSR Report No. 92/PAR004/0148.

Hardy, C.J., P.C. Kiernan, I.J. Sharman, and G.C. Clark. 1992. Assessment of cardiac sensitisation potential in dogs. Comparison of HFC 125 and Halon 13B1. Huntingdon Research Centre. Report No. ALS 11/920116.

Masters, R.E., R.J. Brown, D.M. John, and D.W. Coombs. 1992. A study of the effect of HFC 125 on pregnancy of the rat (inhalation exposure). Huntingdon Research Centre. Report No. ALS 9/920434.

Nick, S. 1964. Pentafluoroethane. Acute inhalation toxicity. E.I. Du Pont de Nemours and Company. Haskell Laboratory Report No. 54-64.

Panepinto, A.S. 1990. Four-hour inhalation approximate lethal concentration (ALC) of HFC-125 in rats. E.I. Du Pont de Nemours and Company. Haskell Laboratory Report No. 582-90.

U.S. EPA. 1990. Interim Methods for Development of Inhalation Reference Concentrations (External Review Draft). Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA/600/8-90/066A.

Agency Work Group Review — 09/24/1993

Screening-Level Literature Review Findings — A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the RfC for Pentafluoroethane 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.

EPA Contacts:

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).

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125

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 — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125

VI.A. Oral RfD References

None

VI.B. Inhalation RfC References

Brooker, A.J., R.J. Brown, D.M. John, T.J. Kenny, and D.W. Coombs. 1992. The effects of HFC 125 on pregnancy in the rabbit. Huntingdon Research Centre. Report No. ALS 10/920856.

Edwards, C.N. 1992. HCFC 125: Assessment of clastogenic action on bone marrow erythrocytes in the micronucleus test. Final Report. Life Science Research Limited. LSR Report No. 92/PAR004/0148.

Hardy, C.J., P.C. Kiernan, I.J. Sharman, and G.C. Clark. 1992. Assessment of cardiac sensitisation potential in dogs. Comparison of HFC 125 and Halon 13B1. Huntingdon Research Centre. Report No. ALS 11/920116.

Masters, R.E., R.J. Brown, D.M. John, and D.W. Coombs. 1992. A study of the effect of HFC 125 on pregnancy of the rat (inhalation exposure). Huntingdon Research Centre. Report No. ALS 9/920434.

Nick, S. 1964. Pentafluoroethane. Acute inhalation toxicity. E.I. Du Pont de Nemours and Company. Haskell Laboratory Report No. 54-64.

Panepinto, A.S. 1990. Four-hour inhalation approximate lethal concentration (ALC) of HFC-125 in rats. E.I. Du Pont de Nemours and Company. Haskell Laboratory Report No. 582-90.

U.S. EPA. 1990. Interim Methods for Development of Inhalation Reference Concentrations (External Review Draft). Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA/600/8-90/066A.

VI.C. Carcinogenicity Assessment References

None

VII. Revision History

Substance Name — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125

Date	Section	Description
12/01/1993	I.B.	Inhalation RfC discussion on-line
12/03/2002	I.B.	Screening-Level Literature Review Findings message has been added.

VIII. Synonyms

Substance Name — Pentafluoroethane
CASRN — 354-33-6
Primary Synonym — HFC-125
Last Revised — 11/01/1993

- 354-33-6
- Ethane, pentafluoro-
- HFC 125
- Pentafluoroethane
- HSDB 6755
- R 125