FOREWORD INTRODUCTION

# *1,1-DICHLORO-1FLUOROETHANE (HCFC)*

## *CAS N°: 1717-00-6*

# SIDS Initial Assessment Report for

# 12th SIAM

(Paris, France June 27- 29, 2001)

**Chemical Name:** **1,1-dichloro-1-fluoroethane (HCFC 141b)**

**CAS No.:** **1717-00-6**

**Sponsor Country:** **United States/ICCA**

**National SIDS Contact Point in Sponsor County:**

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Washington, D.C. 20460

**History:** HCFC 141b was presented at SIAM 12 were the recommendation of low priority for further work was agreed.

Comments:

Deadline for Circulation:

Date of Circulation: 5/18/2001

# SIDS INITIAL ASSESSMENT PROFILE

| | |
|---|---|
| **CAS No.** | 1717-00-6 |
| **Chemical Name** | 1,1-dichloro-1-fluoroethane (HCFC 141b) |
| **Structural Formula** | $Cl_2FC - CH_3$ |

## RECOMMENDATION

The chemical is currently of low priority for further work as it is subject to withdrawal under international activity (Montreal protocol).

## SUMMARY CONCLUSIONS OF THE SIAR

### Human Health

The acute toxicity of HCFC 141b is low. No mortality was observed in rats receiving oral doses of 5,000 mg/kg. Dermal exposure of rats or rabbits to 2,000 mg/kg caused no mortality and no signs of toxicity. Single exposures of mice for 30 minutes indicated that the $LC_{50}$ was between 296,640 and 494,400 mg/m$^3$ (61,800 ppm to 103,000 ppm) and the 4-hr $LC_{50}$ in rats was 62,000 ppm (approximately 297,600 mg/m$^3$). Also, a 6-hr exposure of mice at 41,000 ppm (approximately 196,800 mg/m$^3$) caused narcosis but not lethality. In a controlled-exposure study, exposure of humans to levels up to 1,000 ppm (4800 mg/m$^3$) for periods of 3 or 4 hours produced no reports of any adverse effects. HCFC 141b is considered non-irritating to rabbit's skin and a mild eye irritant. A skin sensitization test in guinea pigs was negative.

In repeat inhalation exposure studies of 6 hr/d, 5d/wk for periods from 2 to 13 weeks, the NOEL was judged to be 8,000 ppm (approximately 38,400 mg/m$^3$). The next highest exposure level, 20,000 ppm (96,000 mg/m$^3$), induced only reduced bodyweight gain and slightly increased levels of cholesterol, triglycerides and glucose. No treatment-related hematological or histopathological changes were noted in any exposure level group.

There was no evidence of teratogenic or embryotoxic effects in pregnant rabbits exposed to 1,400, 4,200 or 12,600 ppm (6720 mg/m$^3$, 20,000 mg/m$^3$, and 60,480 mg/m$^3$, respectively) or in pregnant rats exposed to 3,200 or 7,900 ppm (15,360 or 38,000 mg/m$^3$) of HCFC 141b although signs of maternal toxicity were observed at and above 3,200 ppm (15,360 mg/m$^3$) in rats and 4,200 ppm (20,000 mg/m$^3$)in rabbits. A two- generation inhalation study in rats demonstrated a NOEL of 8,000 ppm (38,400 mg/m$^3$) for reproductive parameters. At a higher concentration, 20,000 ppm (96,000 mg/m$^3$) a non-reproducible decrease in the number of litters, in the number of pups per litter and also some retardation of sexual maturation of male pups, which may have been caused by the slight body weight growth retardation, was observed.

In *in vitro* studies, negative results were obtained in bacterial reverse mutation assay and both negative and positive results were obtained in cytogenetic assays. *In vivo*, negative results were obtained in two mouse micronucleus assays. Consequently, the data indicates that the genotoxicity occasionally observed *in vitro* is not expressed *in vivo*. Rats were exposed by inhalation in a lifetime study to concentrations of 1,500, 5,000 and 20,000 ppm (7200; 24,000; and 96,000 mg/m$^3$,

respectively). No significant evidence of toxicity was seen, however, at the highest exposure concentration reduced body weight gain was observed. HCFC 141b did not produce neoplastic changes in female rats at any test concentration. In male rats no neoplastic changes were noted at 1,500 ppm but increased incidences of testicular interstitial cell (Leydig cells) hyperplasia and adenoma were observed at 5,000 ppm (24,000 mg/$m^3$) and 20,000 ppm (96,000 mg/$m^3$). These changes appeared late in life and were not correlated with increased mortality. Because of the genotoxicity profile of HCFC 141b these effects on the rat Leydig cells are considered as to be of epigenetic origin and associated with senile endocrine disturbances, and therefore of no relevance to tumourigenic hazard for man.

**Environment**

The low octanol/water partition coefficient (log $P_{ow}$ = 2.3) indicates a low potential for bioaccumulation. HCFC 141b is not readily biodegradable. The predominant degradation of HCFC 141b will occur in the air, but at a very slow rate. Acute ecotoxicity studies are available for algae, daphnia, and fish. The 96-hr $LC_{50}$ for zebra fish was 126 mg/L and the 48-hr $EC_{50}$ for daphnia was 31.2 mg/L. The 72-hr NOEC for both growth rate and biomass for algae was > 44 mg/L. Applying an uncertainty factor of 100 to the 48-hr EC50 value of 31.2 mg/L for daphnia, a PNEC of 0.31 mg/L was derived.

**Exposure**

HCFC 141b is produced and used as a substitute for fully halogenated chlorofluorocarbons with comparable physical properties since it has less unfavorable environmental properties. Production for 1999 was 127 thousand tonnes most of which was for foam blowing. The remainder was for a variety of uses such as precision cleaning. Based on its use pattern, releases of HCFC 141b are anticipated to be to the air compartment. It was estimated, using a level III fugacity model, that when primary releases occur to the air compartment that 99.9% of HCFC 141b will remain in that compartment. The global atmospheric lifetime is 10.8 years, which is supported by a trophospheric half-life of 4.9 years due to removal by reaction with OH radicals. Based on this lifetime, the stratospheric ozone depletion potential (ODP) is 0.11 and the global warming potential calculated by IPPC 1995 for an integration horizon of 100 years is 0.12. Both are low compared to CFC 11 which is 1.0. The majority of HCFC 141b released into the environment degrades in the lower atmosphere forming carbon dioxide and inorganic chlorides and fluorides.

Because of its ODP, the production and consumption of HCFC 141b are covered by the Montreal Protocol. In the case of developed countries, a phase-out of HCFC 141b and other hydrochlorofluorocarbons (HCFCs) is scheduled as follows: 35% in 2004, 65% in 2010, 90% in 2015, 99.5% in 2020. A total phase-out is scheduled in 2030. For developing countries, a freeze of the production is scheduled in 2016 and a total phase-out in 2040.

In the European Union, the phase-out of ozone depleting substances is scheduled more rapidly than that required by the Montreal Protocol. The total ban of hydrochlorofluorocarbons is required on January 1, 2010, the use as blowing agent for expanded polystyrene being prohibited from January 1, 2002. In the U.S., HCFC 141b production is scheduled for phase-out in 2003

**NATURE OF FURTHER WORK RECOMMENDED**

No further work is recommended. Due to be phased out under the Montreal Protocol

# FULL SIDS SUMMARY

| CAS NO: 1717-00-6 | | SPECIES | PROTOCOL | RESULTS |
|---|---|---|---|---|
| **PHYSICAL-CHEMICAL** | | | | |
| 2.1 | Melting Point | -- | -- | -103.5 °C |
| 2.2 | Boiling Point | -- | -- | 32°C |
| 2.3 | Density | -- | -- | 1.24 g/cm3 at 20°C |
| 2.4 | Vapour Pressure | -- | -- | 76.3 kPa at 25°C |
| 2.5 | Partition Coefficient (Log $K_{ow}$) | -- | -- | 2.3 |
| 2.6 A. | Water Solubility | -- | -- | 4 g/L at 20°C |
| B. | PH | -- | -- | No data |
| | Pka | -- | -- | No data |
| 2.12 | Oxidation: Reduction Potential | -- | -- | No data |
| **ENVIRONMENTAL FATE AND PATHWAY** | | | | |
| 3.1.1 | Photodegradation | -- | Estimated | Half Life = 4.9 years |
| 3.1.2 | Stability in Water | -- | Estimated | Hydrolysis is not expected to occur. |
| 3.2 | Monitoring Data | -- | Measured | 0.75-1.5 ppt in atmosphere. <100 ppm occupational. |
| 3.3 | Transport and Distribution | -- | Fugacity estimates | Primarily distributes to air compartment (99.9%). |
| 3.5 | Biodegradation | -- | Measured OECD TG 301D | Not readily biodegradable. |
| **ECOTOXICOLOGY** | | | | |
| 4.1 | Acute/Prolonged Toxicity to Fish | Brachidanio rerio | 96-hr lethality OECD TG 203 | LC50 = 126 mg/L |
| 4.2 | Acute Toxicity to Aquatic Invertebrates *(Daphnia)* | Daphnia magna | 48-hr lethality OECD TG 202 | EC50 = 31.2 mg/L |
| 4.3 | Toxicity to Aquatic Plants e.g. Algae | Selenastrum capricornum | 72-hr growth rate/biomass OECD TG 201 | NOEC > 44 mg/L |
| 4.5.2 | Chronic Toxicity to Aquatic Invertebrates (*Daphnia*) | -- | -- | No data |
| 4.6.1 | Toxicity to Soil Dwelling Organisms | -- | -- | No data |
| 4.6.2 | Toxicity to Terrestrial Plants | -- | -- | No Data |
| 4.6.3 | Toxicity to Other Non-Mammalian Terrestrial Species (Including Birds) | -- | -- | No data |

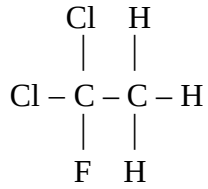
| CAS NO: 1717-00-6 | | SPECIES | PROTOCOL | RESULTS |
|---|---|---|---|---|
| **TOXICOLOGY** | | | | |
| 5.1.1 | Acute Oral Toxicity | Rat | Acute lethality Other TG/EPA | LD50 >5,000 mg/kg |
| 5.1.2 | Acute Inhalation Toxicity | Rat | Acute toxicity Other TG | LC50 = 62,000 ppm |
| 5.1.3 | Acute Dermal Toxicity | Rat/Rabbit | Acute lethality OECD TG 402 | LD50 >2,000 mg/kg |
| 5.2.1 | Skin Irritation | Rabbit | OECD TG 404 | Not irritating |
| 5.2.2 | Eye Irritation | Rabbit | OECD TG 405 | Slightly irritating |
| 5.3 | Skin Sensitization | Guinea pig | Other TG/EPA | Not sensitizing |
| 5.4 | Repeated Dose Toxicity | Rat | 13-week inhalation OECD TG 413 | NOEL = 8,000 ppm<br>LOEL = 20,000 ppm |
| 5.5 | Genetic Toxicity In Vitro | | | |
| A. | Bacterial Test (Gene mutation) | Salmonella typhimurium | Mutagenicity OECD TG 471 | - (With activation)<br>- (Without activation) |
| B. | Non-Bacterial In Vitro Test | Chinese hamster ovary cells | Cytogenetics assays OECD TG 473 | -/+ (With activation)<br>-/+ (Without activation) |
| 5.6 | Genetic Toxicity In Vivo | Mice | Micronucleus assays OECD TG 474 | Negative |
| 5.7 | Carcinogenicity | Rat | Two-year bioassay/ inhalation OECD, ISBN 92-64-12367-9 | NOEL = 20,000 ppm females<br>NOEL = 1,500 ppm males—Hyperplasia and adenoma (Leydig cells) at 5,000 and 20,000 ppm |
| 5.8 | Toxicity to Reproduction | Rat | Two-generation/ inhalation Other TG/EPA/MITI 303 | NOEL = 8,000 ppm<br>LOEL = 20,000 ppm |
| 5.9 | Developmental Toxicity/ Teratogenicity | Rat | Inhalation OECD TG 414 | NOEL = 3,200 ppm maternal toxicity<br>NOEL = 8,000 ppm embryotoxicity<br>LOEL = 20,000 ppm embryotoxicity<br>NOEL = 20,000 ppm teratogenicity |
| | | Rabbit | Inhalation OECD TG 414 | NOEL = 1,400 ppm maternal toxicity<br>NOEL > 12,600 ppm fetotoxicity |
| 5.11 | Experience with Human Exposure | Human | Respiratory irritation/ metabolism | No effects 250-1,000 ppm |

# SIDS INITIAL ASSESSMENT REPORT

**1.0 GENERAL INFORMATION**: 1,1-dichloro-1-fluoroethane (HCFC 141b)

**1.1 Identity**:

| | |
|---|---|
| CAS Number: | 1717-00-6 |
| EINECS No: | 404-080-1 |
| Molecular Weight: | 117 |
| Empirical Formula: | $C_2H_3CL_2F$ |
| Structural Formula: | |



| | |
|---|---|
| Common Name: | HCFC 141b |
| Synonyms: | dichlorofluoroethane, R–141b |
| Form: | Clear, colorless liquid |
| Boiling Point: | 32°C |
| Vapor Pressure: | 76.3 kPa @ 25°C |
| Melting Point: | - 103.5°C |
| Solubility in Water: | 4 g/L at 20°C |
| Partition Coefficient: | Log $K_{ow}$ = 2.3 |
| Liquid density at 20°C: | 1.24 g/cm$^3$ |
| Odor: | Ethereal |
| Flammability: | Non flammable |

**1.2 Purity:** >99.5%

## 2.0 GENERAL INFORMATION ON EXPOSURE

### 2.1 General Discussion:

#### 2.1.1 Production Volume/Uses:

Production for 1999 was 127 thousand tonnes most of which was for foam blowing. The remainder was for a variety of uses such as precision cleaning.

The major producers of HCFC 141b are Honeywell, Atofina and Ausimont in the U.S.; Atofina and Solvay in France; Daikin and Central Glass in Japan; Formosa Plastics in Taiwan; Ulsan in Korea and 3F and Fist in China (AFEAS, 2000).

In the U.S., HCFC 141b production is scheduled for phase out in 2003, production levels will, therefore, not exceed the level of 127 Ktonnes/yr.

#### 2.1.2 Uses and Functions:

HCFC 141b was developed as a substitute for CFC-11, a fully halogenated chlorofluorocarbon mainly for use as a blowing agent for polyurethane and polyisocyanurate insulating foams and as a solvent in electronic and other precision cleaning applications.

## 2.2 Environmental Exposure and Fate:

### 2.2.1 Photodegradation:

HCFC 141b's atmospheric lifetime is 10.8 years and its ozone depleting potential, relative to CFC11 = 1.0, is 0.10 – 0.12 (ECETOC, 1994). This is supported by an estimated half-life of 1,787 days for reacting with photochemically generated OH radicals (U.S. EPA, 2001).

### 2.2.2 Fate in Waste Water Treatment Plants (WWTP):

Modeled data indicate that total removal from a WWTP is anticipated to be 90% in which, less than 1% maybe attributed to biodegradation.

### 2.2.3 Transport/Distribution in Air Water and Soil:

Release data provided in the dossier indicate that primary releases of HCFC 141b are anticipated to be to the air compartment with fugitive emissions of 332 lbs/day (150 kg/day). It was estimated, using a level III fugacity model, that when primary releases occur to the air compartment, 99.9% of HCFC 141b will remain in that compartment.

Any HCFC 141b, which might be present in aqueous waste streams, discharged directly into rivers and lakes, are estimated to have a half-life of 1 hour for rivers and 4 days for lakes, which is similar with analogous compounds (U.S. EPA, 2001). HCFC 141b present in surface or ground waters would have little tendency to partition into biota or soil as the log $P_{ow}$ is 2.3, indicating little potential for passive bio-accumulation, and the log $K_{oc}$ is estimated to be in the range of 1.9 – 2.2, indicating moderate mobility in soils (RCC, 1989c).

### 2.2.4 Abiotic and Biotic Degredation in Air, Water and Soil:

Degradation in water will be very slow. In soil only two systems have been identified that will break down HCFC 141b. One is an aerobic bacteria *Methylosinus trichorsporium* OB 3b, the other an ammonia oxidizing bacterium *Nitrosomas europa*. However, the wide distribution and abundance of methanotrophs and ammonia oxidizing bacteria in the environment suggests that these organisms may provide a natural sink (DeFlaun et al, 1992; Hyman et al., 1992).

In a closed bottle assay with activated sludge only 2-3% degradation was seen in 28 days, classifying HCFC 141b as not readily biodegradable (Oyama, 1991).

The predominate degradation of HCFC 141b will occur in the air. The atmospheric breakdown will occur mainly in the troposphere, being initiated by attack of naturally occurring hydroxyl radicals. This very slow process, with a reaction half-life of 1787 days, will proceed via various free-radical and molecular intermediates to give $CO_2$, COClF, and HCl. The latter two species will be removed from the atmosphere within a few days to a few months, by uptake into clouds, rain and the oceans. The COCIF will then rapidly hydrolyze to $CO_2$, HCL and HF (AFEAS, 1992 and U.S. EPA, 2001).

HCFC 141b has an ozone depletion potential of 0.10 to 0.12 relative to CFC 11, depending on the model used (WMO, 1991)

### 2.2.5 Bioaccumulation:

HCFC 141b has a log $P_{ow}$ of 2.3 and a high vapor pressure at ambient conditions. It is therefore not expected to bio-accumulate to any significant degree.

### 2.2.6 Environmental Occurrence:

Tropospheric levels of HCFC 141b were measured above California in 1992 at 0.2 – 0.4 ppt and of 0.75 – 1.5 ppt in the northern hemisphere in the Spring of 1993 (Schauffler, 1993 and Montzka, S.A. et al., 1994). An estimate of current and near term future global tropospheric levels can be estimated using current global production levels of 127 Ktonnes/y at 70 ppt. This value is based on the estimate that emissions of 200 Ktonnes/yr would yield an upper limit of 100 ppt (ECETOC, JACC #29, 1994) and scaling back to the actual current production level of 127 Ktonnes/yr. As HCFC 141b production is scheduled for phase out in 2003, due to the fact that its ozone depletion potential is greater than 0.10, production levels will not exceed that level.

## 2.3 Potential Exposure to Humans:

### 2.3.1 Occupational Exposure:

Potential Exposures to HCFC 141b can occur primarily via the inhalation route, as a result of loading / unloading, use as blowing agent for rigid foams, and use in precision cleaning. In a limited survey of production and use in these applications, exposures were below 100 ppm as a time-weighted average for an 8-hour shift. This compares favorably with the occupational exposure guideline recommended by the American Industrial Hygiene Association of 500 ppm as an 8-hr time weighted average (Zink, 1993 and AIHA, 1991).

The French authorities also recommend 500 ppm as a workplace exposure limit. For single exposures ranging from 10 minutes to 8 hours, the U.S. National Advisory Committee on Acute Exposure Guideline Levels recommends an AEGL-1 (annoyance level) of 1,000 ppm, an AEGL-2 (potential for irreversible serious toxicity) 1,700 ppm and an AEGL-3 (potential lethal threshold) of 3,000 ppm (AEGL, 2001).

### 2.3.2 Consumer Exposure:

The only potential use in which consumer exposure may occur is anticipated to be in the use of rigid foam insulation products. In rigid foam, loss is limited to a very slow diffusion resulting in levels below 1 ppb. Overall consumer exposure is extremely limited (Turnbill et al., 1994)

### 2.3.3 Indirect Exposure via the Environment:

HCFC 141b does not accumulate in water due to its high vapor pressure of 76.3 kPa. It also has a low affinity for soil and with a log $P_{ow}$ of 2.3 would not be expected to show significant passive bioconcentration. It will thus partition into the air. Measured levels of HCFC 141b in the atmosphere were in the order of 0.75 – 1.5 parts per trillion (ppt) in the Northern Hemisphere in 1993. Based on production levels of 127 ktonnes/yr, the estimated upper-level concentration would be 70 ppt (ECETOC, JACC No. 29 (1994)). As HCFC 141b is scheduled for phase out in the United States beginning in 2003, even these levels will drop in the near future. This is a revised production estimate based on actual current production levels and the original estimate that production of 200 ktonnes/yr would result in maximum airborne levels of 100 pptv.

### 2.3.4 Opportunities for Recycling

HCFC 141b that has been used in refrigeration may be reclaimed, purified by distillation and recycled. HCFC 141b that has been used in the production of rigid foams is held within the foam and can not readily be reclaimed. Where HCFC 141b is used in precision cleaning, material from not emissive applications such as vapor degreasers can be recycled.

## 3.0 HUMAN HEALTH HAZARDS

### 3.1 Toxicokinetics and metabolism and mechanism of action:

Pharmacokinetic and biotransformation data indicated a rapid initial uptake of HCFC 141b followed by a slow linear uptake when rats were exposed to multiple concentrations of HCFC 141b via inhalation. 2,2-dichloro-2-fluoroethanol was the major metabolite in the urine showing a linear relationship between the metabolite and HCFC 141b exposure concentrations (Loizou and Anders, 1993). Another inhalation study showed the presence of a small quantity of dichlorofluoroacetic acid in the urine when rats were exposed to very high concentrations of HCFC 141b, indicating oxidation of some 2,2-dichoro-2-fluoroethanol. The majority of the alcohol is excreted as the glucuronate conjugate in the urine. In this study, NMR analysis of liver cytosolic and microsomal fractions of rats exposed to HCFC 141b showed no covalent binding of metabolites of HCFC 141b in the liver, indicating no bioaccumulation of metabolites (Harris and Anders, 1991).

### 3.2 Acute Toxicity:

### 3.2.1 Oral

No mortality was observed in male and female rats receiving oral doses of 5,000 mg/kg (Brock et al., 1995). The only signs of toxicity noted were piloerection on the first day post dosing and a slight reduction in body weight gain in 1 of 5 treated males and 2 of 5 treated females, compared to controls.

### 3.2.2 Inhalation

The 4-hr $LC_{50}$ in rats was 62,000 ppm (297,600 mg/m$^3$). Also, a 6-hr exposure of mice at 41,000 ppm (196,800 mg/m$^3$) caused narcosis but not lethality (Vlachos, 1989). Single exposures of mice for 30 minutes indicated that the $LC_{50}$ was between 61,800 (296,640 mg/m$^3$) and 103,000 ppm (494,400 mg/m$^3$) (Davies et al., 1976). No significant respiratory effects were seen when rats were exposed to 10,000 ppm (48,000 mg/m$^3$) of HCFC 141b for 25 minutes, however, exposure of dogs and monkeys at this level, combined with concurrent injections of epinephrine (adrenalin) at 4 to 12 μg/kg resulted in cardiac sensitization to the adrenalin (Brock et al., 1995).

### 3.2.3 Dermal

Dermal exposure of male and female rats and rabbits to 2,000 mg/kg for 24 hrs followed by a 14 day observation period, caused no mortality and no signs of toxicity (Brock et al., 1995).

### 3.3 Irritation and Sensitization:

### 3.3.1 Skin Irritation

A single dermal application of 0.5 mL of HCFC 141b to rabbit's skin showed no irritation after 24-hr exposure in one study (Brock et al., 1995.) and minimal irritation after 4-hr exposure in one animal in the second study (Brock et al., 1995). Overall, the test substance is considered as non-irritating to rabbit's skin.

### 3.3.2 Eye Irritation

In one study, a single application of 0.1 ml of HCFC 141b to rabbit's eyes showed mild irritation (conjunctivitis, chemosis, and moderate blood-tinged discharge) with no corneal involvement. All treated eyes of all rabbits were normal by 72-hours after treatment (Brock et al., 1995). In a similar second study, HCFC 141b did not show a positive response in eyes of any of the six treated rabbits (Brock et al., 1995).

### 3.3.3 Skin Sensitization

A maximization test for hypersensitivity in Hartly/Dunkin guinea pigs showed no dermal sensitizing potential for HCFC 141b (Brock et al., 1995). In this study, guinea pigs were initially given a 0.1 mL injection of a 50/50 mixture of Alembicol D containing 5% HCFC 141b with Freunds complete adjuvant. The dermal challenge was with 0.4 mL of 141b.

## 3.4 Repeated Dose Toxicity:

Repeat inhalation exposure studies of 6hr/day, 5d/wk for periods from 2 to 13 weeks or 6hr/day, 7d/wk for 4 weeks were conducted with rats. All studies used air concentrations between 2,000 (9,600 mg/$m^3$) and 20,000 ppm (96,000 mg/$m^3$). The NOEL was judged to be 8,000 ppm (38,400 mg/$m^3$) (13 week study). The highest exposure level, 20,000 ppm, induced only reduced bodyweight gain and slightly elevated levels of cholesterol, triglycerides and glucose. No treatment-related hematological or histopathological changes were noted in any exposure level group (Brock et al., 1995).

## 3.5 Reproduction/Developmental Toxicity:

### 5.5.1 Reproductive Toxicity

A two-generation inhalation study was conducted with rats. In this study, the rats were exposed to HCFC 141b at levels of 0, 2,000, 8,000, and 20,000 ppm 6-hrs/day, 7 days/week. The NOEL for reproductive parameters was 8,000 ppm. At the highest concentration, 20,000 ppm, the following effects were observed: (1) lower pregnancy rate (72 % vrs 91 % in controls) and fertility index ($F_o$ only); (2) reduction in combined seminal vesicle/prostate weights ($F_o$ and $F_1$ generations); (3) reduction in litter size at birth (13.9 vrs 13.3 and 13.4 vrs 11.5, $F_o$ and $F_1$ generations, respectively); (4) a small increase in implantation loss ($F_1$ only); (5) a one to two day delay in attainment of sexual maturation in males ($F_1$ only); and (6) slightly lower litter size and pup birth weights (13.4 vrs 11.5 pups/litter; 6.2 vrs 6.0 gms, $F_1$ only) (Rusch et al., 1995). As some evidence of toxicity was reported in rats exposed to 20,000 ppm of HCFC 141b in a subchronic study, alterations in some clinical chemistries and slight reductions in body weight gain, some of the effects seen in this reproduction study at 20,000 ppm may be related to systemic toxicity.

### 3.5.2 Developmental Toxicity

Pregnant rats were exposed to levels of 0, 3,200, 7,900 and 20,000 ppm HCFC 141b for 6-hrs/day via inhalation from day 6 to 15 of gestation. No developmental effects were seen at 3,200 or 7,900

ppm (15, 360 or 38, 000 mg/m3). At 20,000 ppm there was an increase in early and late embryonic deaths (0.7 vrs 2.7, combined) but no increase in malformations; in dams, a transient reduction in food consumption and an increase in water consumption were observed. Reduced litter (41.3 vrs 29.9 gms) and mean fetal weights (3.53 vrs 3.08 gms) and delayed ossification were also seen at this level. In the dams, salivation, a hunched posture, and diaphragmatic breathing were reported along with a transient decrease in food consumption and marginal reduction in body weight gain. The NOEL for maternal toxicity is 3,200 ppm (15, 360 mg/m3) and 7, 900 ppm for embryotoxic effects. There was no evidence of teratogenicity at any level (Rusch et al., 1995).

In a separate study, pregnant rabbits were exposed to levels of 0, 1,400 (6720 mg/m3), 4,200 (20, 000 mg/m3), and 12,600 ppm (60, 480 mg/m3) of HCFC 141b via inhalation 6-hrs/day from day 7 to day 19 of pregnancy. Signs of maternal toxicity including pre-narcotic signs, partially closed eyes, respiratory disturbances and body weight losses were observed in the 4,200 and 12,600 ppm exposed groups. There was no indication of any treatment-related effects on embryo or fetal development or any evidence of teratogenicity at any exposure level. Exposures at 1,400 ppm represent a NOEL for maternal toxicity and >12,600 ppm for fetotoxicity (Rusch et al., 1995).

### 3.6 Genetic Toxicity:

In vitro bacterial reverse mutation assays were negative (Ames assays w/wo metabolic activitation) while some mammalian cell culture assays gave positive as well as negative results (in vitro cytogenetic assays) (ECETOC, 1994 and Millischer et al., 1995). Two micronucleus tests were performed in male and female mice. Both gave negative results after a nose-only 6-hr inhalation exposure at concentrations ranging from 2,000 to 20,000 ppm (Bootman, 1988) or a 6-hr whole-body exposure to concentrations ranging from 3,600 to 34,000 ppm (Vlachos, 1989). These tests were conducted at concentrations high enough to induce toxic effects, depression of the central nervous system, in the mice. There was no indication of toxicity to the bone marrow as the PCE:NCE ratios were not modified (Millischer et al., 1995).

### 3.7 Other Relevant Information:

#### 3.7.1 Neurotoxicity

The potential neurotic effects of HCFC 141b were investigated in a 16-week neurotoxicity study with rats. Test animals were exposed to vapors of HCFC 141b 6-hr/day, 5days/wk for 16 wks at levels of 0, 1,500, 5,000 and 15,000 ppm. Some animals were held for a 4-week post exposure observation period. Animals were evaluated at several intervals for neurological effects. Following sacrifice, the brain and several peripheral nerve tissues were evaluated histopathologically. There were no treatment-related effects at any of the three levels tested. This result is consistent with the lack of any clinical signs in the subacute, subchronic and chronic studies (ECETOC, 1994)

#### 3.7.2 Carcinogenic Effects in Experimental Animals

Sprague Dawley rats were exposed by inhalation in a lifetime study to concentrations of 0, 1,500, 5,000 and 20,000 ppm 6-hr/day, 5days/wk. No evidence of toxicity was seen, however, at the highest level, reduced body weight was seen. HCFC 141b did not produce neoplastic changes in female rats at any test exposure level. In male rats no neoplastic changes were seen at 1,500 ppm, but increased incidences of testicular interstitial cell (Leydig cell) hyperplasia and adenomas were observed at 5,000 ppm and 20,000 ppm. These changes appeared late-in life and were not correlated with increased mortality. Because of the non-genotoxicity of HCFC 141b, these effects on the rat Leydig cells are considered to be of epigenic origin and associated with senile endrocrine

disturbances. In fact they have been reported in lifetime studies with hypolipodemic agents conducted in rats, but have not been seen in people on chronic hypolipodemic therapy (Millischer et al., 1995).

### 3.7.3 Human Exposure

In a controlled human exposure study, male and female volunteers were exposed by inhalation to levels of 250 to 1,000 ppm of HCFC 141b for from 3 to 4 hours with intermittent periods of exercise. They were evaluated for irritation of the respiratory tract, clinical signs of adverse effects and uptake, clearance and metabolism. There were no adverse signs associated with the exposures. It was also noted that the metabolism of HCFC 141b in humans produced the same metabolites as were found with the rat, 2,2-dichloro-2-fluoroethanol and dichlorofluoroacetic acid (Loizou and Anders, 1993;Tong et al., 1998).

## 4.0 HAZARDS TO THE ENVIRONMENT

### 4.1 Aquatic Effects:

### 4.1.1 Acute Toxicity:

**Fish:** The 96-hr $LC_{50}$ for zebra fish (*Brachidanio rerio*) was 126 mg/L in a static test using a sealed vessel (Bazzon et al., 1989).

**Daphnia magna:** The 48-hr $EC_{50}$ was 31.2 mg/L using a sealed vessel (Brian et al., 1989).

**Algae:** The 72-hr No-Observed-Effect-Level for both growth rate and biomass for algae (*Selenastrum capricornutum*) was > 44 mg/L in a static test using a sealed system (Groeneveld, 1991). Although the water solubility of HCFC 141b is much higher, its low boiling point and high vapor pressure limit the amount that remains in the water for 72 hrs.

Applying an uncertainty factor of 100 to the 48-hr $EC_{50}$ of 31.2 mg/L for daphnia, a PNEC of 0.31 mg/L was derived.

### 4.2 Terrestrial Effects:

There were no data concerning terrestrial effects. However, concentrations in the terrestrial environment are predicted to be very low as HCFC 141b will partition predominantly into the air. Considering this and its overall low degree of toxicity in other systems, terrestrial effects are not anticipated to be of concern.

## 5. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

**Environment**

Within 1 to 3 weeks following a release to water, HCFC 141b would migrate into the atmosphere. The majority would then be broken down in the lower atmosphere by hydroxyl radicals to ultimately yield water, carbon dioxide, fluoride and chloride. HCFC 141b has an atmospheric

lifetime of 10.8 years. Relative to CFC 11 (given a value of 1.0), the HCFC 141b halocarbon global warming potential is 0.12 and its stratospheric ozone depletion potential is 0.11. Bioaccumulation is not a concern because of its low log $P_{ow}$ of 2.3 and high vapor pressure of 76.3 kPa at 25 degrees C. Short- term tests with fish (zebra fish: 96-hr $LC_{50}$ 126 mg/L), daphnia (48-hr $EC_{50}$ 31.2 mg/L) and algae (72-hr NOEC >44 mg/L) indicate a low to moderate hazard potential.

Based on these results, its physical and chemical properties and use pattern, HCFC 141b is not expected to present an aquatic hazard.

**Human Health**

HCFC 141b has a low acute toxicity by all routes of exposure. It is not irritating to the skin, only mildly irritating to the eye, and is not a skin sensitizer in the Guinea pig. Inhalation repeat dose toxicity studies for up to 13 weeks show mild effects (reduced body weight gain and increase in cholesterol levels) at the highest concentration tested (20,000 ppm). HCFC 141b did not cause teratogenic effects in rats with exposures up to 20,000 ppm nor in rabbits with exposures up to 12,600 ppm. Some maternal toxicity was seen at 8,000 and 20,000 ppm in rats and at 4,200 and 12,600 ppm in rabbits. In a 2-generation reproduction study, the NOEL was 8,000 ppm. At the highest concentration, 20,000 ppm, a decrease in the number of litters, in the number of pups per litter and also some retardation of sexual maturation of male pups were seen. The delayed sexual maturation of about 1 to 2 days, may have been caused by the slight body weight growth retardation. None of these effects were seen in the second generation. Based on the overall weight of evidence, HCFC 141b is not considered to be a mutagenic hazard. In an inhalation carcinogenicity study, no effects were seen in female rats at any level. In the males, at 5,000 and 20,000 ppm increased incidences of interstitial cell (Leydig Cell) hyperplasia and adenomas were reported. These changes appeared late in life and did not effect lifespan. In addition, given that HCFC 141b was not mutagenic and that these tumors are common in the aging rat but not in humans, they were judged not to be relevant to humans. In a clinical study, exposures to vapors at levels up to 1,000 ppm did not show any evidence of adverse effects in humans.

## 5.2 Recommendations:

**Environment:**

Low Priority for further work.

**Human Health:**

Low priority for further work.

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# SIDS DOSSIER
# ON THE HPV PHASE CHEMICAL

# 1,1-dichloro-1-fluoroethane

# CAS No. 1717-00-6

**USA: OECD**

**DATE: May 4, 2001**

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Note: *; Data elements in the SIDS
†; Data elements specially required for inorganic chemicals

# SIDS PROFILE

DATE: February, 2000

| | | |
|---|---|---|
| 1.01 A. | **CAS No.** | 1717-00-6 |
| 1.01 C. | **CHEMICAL NAME (OECD Name)** | 1,1-dichloro-1-fluoroethane |
| 1.01 D. | **CAS DESCRIPTOR** | Not applicable in this case |
| 1.01 G. | **STRUCTURAL FORMULA** | CCl2FCH3 |
| | **OTHER CHEMICAL IDENTITY INFORMATION** | HCFC 141b |
| 1.5 | **QUANTITY** | 270 million lbs (globally) |
| 1.7 | **USE PATTERN** | 95% as a blowing agent for polyurethane, polyisocyanate and thermoplastic foams. 5% as a solvent or aerosol cleaning agent for precision cleaning/electronics applications |
| 1.9 | **SOURCES AND LEVELS OF EXPOSURE** | Estimates of worker exposure to HCFC-141b can be made based upon general knowledge of the processes used and the work practices employed. In all applications, exposure is expected to be low. In foam applications, the HCFC-141b is blended along with various other components in a blend tank or foam machine and then poured or sprayed into a mold, free-rise conveyor system or cavity and allowed to cure. Solvent use is primarily in vapor degreasing unit which are equipped with refrigerated cooling coils to minimize fugitive emissions. Aerosol cleaning uses are typically for re-work or spot cleaning applications. Cleaning uses for HCFC-141b have been greatly reduced due to the Montreal Protocol legislation and similar country specific legislation on ozone depleting substances. |
| **ISSUES FOR DISCUSSION (IDENTIFY, IF ANY)** | SIDS testing required: **NONE** | |

# S I D S S U M M A R Y

| CAS NO 1717-00-6. | | Information | OECD Study | GLP | Other Study | Estimation Method | Acceptable | SIDS Testing Required |
|---|---|---|---|---|---|---|---|---|
| **STUDY** | | **Y/N** | **Y/N** | **Y/N** | **Y/N** | **Y/N** | **Y/N** | **Y/N** |
| **PHYSICAL-CHEMICAL DATA** | | | | | | | | |
| 2.1 | Melting Point | Y | Y | Y | | | Y | N |
| 2.2 | Boiling Point | Y | Y | Y | | | Y | N |
| 2.3 | Density | Y | Y | Y | | | Y | N |
| 2.4 | Vapour Pressure | Y | Y | Y | | | Y | N |
| 2.5 | Partition Coefficient | Y | Y | Y | | | Y | N |
| 2.6 | Water Solubility | Y | Y | Y | | | Y | N |
| | pH and pKa values | Y | Y | Y | | | Y | N |
| 2.12 | Oxidation: Reduction potential | | | | | | | |
| | OTHER P/C STUDIES RECEIVED | | | | | | | |
| **ENVIRONMENTAL FATE and PATHWAY** | | | | | | | | |
| 3.1.1 | Photodegradation | N | | | | | | N |
| 3.1.2 | Stability in water | N | | | | | | N |
| 3.2 | Monitoring data | N | | | | | | N |
| 3.3 | Transport and Distribution | N | | | | Y | | N |
| 3.5 | Biodegradation | Y | Y | Y | | | Y | N |
| | OTHER ENV FATE STUDIES RECEIVED | | | | | | | |
| **ECOTOXICITY** | | | | | | | | |
| 4.1 | Acute toxicity to Fish | Y | Y | Y | | | Y | N |
| 4.2 | Acute toxicity to Daphnia | Y | Y | Y | | | Y | N |
| 4.3 | Toxicity to Algae | Y | Y | Y | | | Y | N |
| 4.5.2 | Chronic toxicity to Daphnia | N | | | | | | N |
| 4.6.1 | Toxicity to Soil dwelling organisms | N | | | | | | N |
| 4.6.2 | Toxicity to Terrestrial plants | N | | | | | | N |
| 4.6.3 | Toxicity to Birds | N | | | | | | N |
| | OTHER ECOTOXICITY STUDIES RECEIVED | | | | | | | |
| **TOXICITY** | | | | | | | | |
| 5.1.1 | Acute Oral | Y | Y | Y | | | Y | N |
| 5.1.2 | Acute Inhalation | Y | Y | Y | | | Y | N |
| 5.1.3 | Acute Dermal | Y | Y | Y | | | Y | N |
| 5.4 | Repeated Dose | Y | Y | Y | | | Y | N |
| 5.5 | Genetic Toxicity *in vitro* | Y | Y | Y | | | Y | N |
| | . Gene mutation | | | | | | | |
| | . Chromosomal aberration | | | | | | | |
| 5.6 | Genetic Toxicity *in vivo* | Y | Y | Y | | | Y | N |
| 5.8 | Reproduction Toxicity | Y | Y | Y | | | Y | N |
| 5.9 | Development / Teratogenicity | Y | Y | Y | | | Y | N |
| 5.11 | Human experience | Y | N | | | | Y | N |
| | OTHER TOXICITY STUDIES RECEIVED | Y | Y | Y | | | Y | |

## 1. GENERAL INFORMATION

### 1.01 SUBSTANCE INFORMATION

***A. CAS-Number** 1717-00-6

**B. Name** *(IUPAC name)* 1,1-dichloro-fluoroethane

***C. Name** *(OECD name)* 1,1-dichloro-fluoroethane

**†D. CAS Descriptor** *(where applicable for complex chemicals)*
Not applicable in this case

**E. EINECS-Number** 404-080-1

**F. Molecular Formula** CCl2FCH3

***G. Structural Formula** *(indicate the structural formula in smiles code, if available)*
CCl2FCH3

**H. Substance Group** *(if possible, only for petroleum products, see HEDSET Explanatory note)*
Not applicable

**I. Substance Remark** *(indicate the substance remark as prescribed in the EINECS Inventory, if possible)*

**J. Molecular Weight** 117

### 1.02 OECD INFORMATION

**A. Sponsor Country:** United States/ICCA

**B. Lead Organisation:**

Name of Lead Organisation: U.S. Environmental Protection Agency
OPPT/RAD (7403)
401 M Street, SW
Washington, DC 20460

Contact Person: Oscar Hernandez, Director
Risk Assessment Division (7403)

Address: 401 M Street, SW
Washington, DC 20460

Telephone: 202-260-1832
e-mail: hernandez.oscar@epa.gov

Name of Lead Organisation: European Fluorocarbon Technical Committee
Ave. E Van Nieuwenhuyse 4 Bte 2
B-1160 Bruxelles
Belgium

Contact person: Dr. George M. Rusch
Address: Honeywell

101 Columbia Road
Morristown, NJ 07962
U.S.A.

Telephone: 01-973-455-3672
Fax: 01-973-455-5405
e-mail: george.rusch@honeywell.com

**C. Name of responder**

Name: Dr. George M. Rusch
Address: **Honeywell International, Inc.**
101 Columbia Road
Morristown, NJ 07962
U.S.A.

Tel: 01-973-455-3672
Fax: 01-973-455-5405

## 1.1 GENERAL SUBSTANCE INFORMATION

**A. Type of Substance**

element [ ]; inorganic [ ]; natural substance [ ]; organic [ X ]; organometallic [ ]; petroleum product [ ]

**B. Physical State** *(at 20°C and 1.013 hPa)*

gaseous [ ]; liquid [X ]; solid **[ ]**

**C. Purity** *(indicate the percentage by weight/weight) 99.5%*

.

## 1.2 SYNONYMS

HCFC 141b, R 141b

## 1.3 IMPURITIES

CAS No: 75-68-2
EINECS No:
Name: 1-chloro-1,1-difluoroethane
Value: 0.2000 %
Remarks:

CAS No.: 420-46-2
EINECS No:
Name: 1,1,1-trichloroethane
Value: 0.0500 %
Remarks:

CAS No.:
EINECS No:
Name: 1,2-dichloro-2,2-difluoroethane
Value: 0.0050 %
Remarks:

CAS No.:
EINECS No:
Name: 1,2,2 trichlo-2-fluoroethane
Value: 0.0050 %
Remarks:

CAS No.:
EINECS No:
Name: 1 chloro-1-fluoroethane
Value: 0.0025 %
Remarks:

CAS No.: 79-01-6
EINECS No:
Name: trichloroethylene
Value: 0.0300 %
Remarks:

CAS No.: 156-59-2
EINECS No:

Name: 1,2-dichloroethylene
Value: 0.0500 %
Remarks:

CAS No.: 75-35-4
EINECS No:
Name: 1,1-dichloroethylene
Value: 0.0200 %
Remarks:

CAS No.: 7572-29-4
EINECS No:
Name: dichloroacetylene
Value: 0.0005 %
Remarks:

CAS No.:
EINECS No:
Name: Total other saturated HFC or HCFC compounds
Value: 0.1500 %
Remarks:

CAS No.:
EINECS No:
Name: Total other unsaturated halocarbons detectable by this method such as 1141, 1353, 1326
Value: 0.0020 %
Remarks:

**1.4 ADDITIVES** None

***1.5 QUANTITY**

Remarks: There are four manufacturing sites in the USA.
HCFC-141b global production levels are in the range of 280 million pounds. Approximately 60 million lbs are used or manufactured in Europe, 133 million lbs in the US, and the remainder in Asia and Latin America. The producers and locations are listed below.
United States: Honeywell, Atofina, La Roche, Ausimont
Europe: Atofina (France), Solvay (France)
Asia: Daiken (Japan), Central Glass (Japan), Formosa Plastics (Taiwan), Ulsan (Korea), 3F (China), Fist Chemical (China)
Reference: AFEAS, 2000

**1.6 LABELLING AND CLASSIFICATION**

Labelling
Type: Harmonized
Specific limits: no data
Symbols: N
Nota:
R-phrases: 52/53 and 59
S-phrases: 61
Text of S-phrases: Avoid release to the environment. Refer to special instructions/Safety Data sheets

Text of R-phrases: R 52 Harmful to aquatic organisms
R 53 May cause long-term adverse effects in the aquatic environment
R 59 Dangerous for the ozone layer

Remarks: R 52 is used for substances with EC50's or LC50's below 100 mg/L. For HCFC 141b, it is based on EC 50 to Daphnia magna of 31.2 mg/L.

Classification

Type: Provisional or Harmonized

Category of danger: Dangerous for the environment

Remarks: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Dangerous for the ozone layer.

## *1.7 USE PATTERN

### A. General

| Type of Use: | Category: |
|---|---|
| (a) Blowing Agent for: | |
| Polyurethane, | 45% Boardstock |
| Polyisocyanate | 30% Systems (multiple end uses) |
| thermoplastic foam | 20% Appliances |
| (b) Solvent/Aerosol | |
| industrial cleaning | 5% electronics and precision cleaning |

Remarks: Estimates of worker exposure to HCFC 141b can be made based upon general knowledge of the processes used and the work practices employed. Based on monitoring data and modeling, exposure is expected to be low in all applications. In foam applications, the HCFC-141b is blended along with various other components in a blend tank or foam machine and then poured or sprayed into a mold, free-rise conveyor system or cavity and allowed to cure. Solvent use is primarily in vapor degreasing unit which are equipped with refrigerated cooling coils to minimize fugitive emissions. Aerosol cleaning uses are typically for re-work or spot cleaning applications. Cleaning uses for HCFC-141b have been greatly reduced due to the Montreal Protocol legislation and similar country specific legislation on ozone depleting substances.

**B. Uses in Consumer Products** Not used in consumer products

## 1.8 OCCUPATIONAL EXPOSURE LIMIT VALUE

Exposure limit value

Type: WEEL (USA)
Value: 500 ppm
Length of exposure: 8hr time weighted average
Frequency: Daily
Reference: AIHA, Workplace Environmental Exposure Limit, 1991

Short term exposure limit value

| | | | |
|---|---|---|---|
| Value: | 1000 ppm | 1700 ppm | 3000 ppm |
| Length of exposure: | Up to 8 hrs | Up to 8 hrs | Up to 8 hrs |
| Frequency: | In Frequent | In Frequent | In Frequent |

| | | | |
|---|---|---|---|
| Remarks: | Accidental Annoyance Level | Accidental Potentially Toxic Level | Accidental Potentially Lethal Level |

Reference: AEGL, 2001

***1.9 SOURCES OF EXPOSURE**

(a)

Source: Fugitive air emissions of 332 lbs/day (150kg/day) occur at one plant producing 74 million lbs/year (34 million kg/yr).

Remarks: Information obtained from required governmental reporting and process/packaging flow diagrams.

Reference: Premanufacturing Notice P-90-212.

(b)

Source:

Remarks: HCFC-141b for solvent use is blended with alcohols in a closed system to form a nonflammable azeotrope. HCFC-141b is delivered to the industrial users blended and ready for use in drums and tank trucks, where it will be transferred by pumping through closed piping to point of use.

Industrial users have been using fluorocarbon solvents for many years in cleaning equipment. Both ventilated open units and closed equipment with vapour recovery systems are utilized in operations to remove soldering fluxes, greases and oil accumulated in manufacture of such devices.

In some cases the HCFC-141b or mixture may be used at room temperatures where some evaporation is expected but standard industrial hygiene practices will keep worker exposure well below the internal permissible exposure level established by AIHA WEEL at 500 ppm which is a safe level of exposure for workers exposed 8 hours, 5 days per week for a working lifetime. In cases where vapour recovery is used, standard industrial hygiene practices are employed and exposures to workers are below the 500 ppm level.

Exposures from uses as an insulating material have been shown to be below 1 ppm

References: Premanufacturing Notice P-90-212. Turnbull et al (1994)

(c)

Remarks: HCFC-141b is used as a blowing agent in industrial manufacture of insulating polyurethane and polyisocyanate.

The exposure of workers to HCFC-141b in foam manufacture is very small. In foam manufacture, the atmosphere must be controlled to keep exposure of isocyanate chemical compounds below the TLV of 0.005 ppm. control of the isocyanate concentrations will automatically limit exposure to HCFC 141b. While the same exposure standards are applicable to insulating forms, the nature and an objective of the process is to trap most of the HCFC-141b within the cells to improve the insulation, therefore further reducing worker exposure. Typically the amount of blowing agent emitted during the manufacture of rigid polyurethane foam is less than 5 per cent of the total amount of blowing agent utilized in producing the foam. The half life of the encapsulated HCFC-141b in the closed cell foam is projected at about 100 years.

Exposure measurements performed during foaming operations using HCFC-141b as a blowing agent, demonstrated exposure to HCFC-141b would be well below recommended levels. Exposure monitoring in manufacturing locations indicate that exposure is also well below the recommended levels.

**1.10 ADDITIONAL REMARKS**

**A. Options for disposal**

Remarks: Foam uses are emissive. Spent solvent can be recovered and recycled by distillation or incinerated at an approved facility.
Reference: Premanufacturing Notice P-90-212.

**B. Other remarks**

Remarks: None
Reference:

## 2. PHYSICAL-CHEMICAL DATA

***2.1 MELTING POINT** *(if more than one, identify the recommended value)*

(a) **Preferred result**

| | |
|---|---|
| Value: | = - 103.5°C |
| Decomposition: | Yes **[ ]** No **[X]** Ambiguous **[ ]** |
| Sublimation: | Yes **[ ]** No **[X]** Ambiguous **[ ]** |
| Method: | |
| GLP: | Yes **[X ]** No **[ ]** ? **[]** |
| Remarks: | |
| Reliability: | 1 |
| Reference: | ECETOC: JACC No. 29, 1994 |

***2.2 BOILING POINT** *(if more than one, identify the recommended value)*

(a) **Preferred result**

| | |
|---|---|
| Value: | =32°C |
| Pressure: | At 101.3 kPa |
| Decomposition: | Yes **[ ]** No **[X]** Ambiguous **[ ]** |
| Method: | EEC directive 84/449 EEC, Part A, Methods for the determination of physico-chemical properties, A.2: "Boiling point/boiling range", EEC Publication No. L251, September 1984 |
| GLP: | Yes **[X ]** No **[ ]** ? **[ ]** |
| Remarks: | |
| Reliability: | 1 |
| Reference: | a) RCC, 1989 |

**†2.3 DENSITY (Relative density)** *(Where applicable, indicate the relative density of the substance)*

| | |
|---|---|
| Type: | Bulk density **[ ]**; Density **[ ]**; Relative Density **[X]** |
| Value: | 1.2422 gm/cm3 |
| Temperature: | 20°C |
| Method: | EEC directive 84/449 EEC, Part A, Methods for the determination of physico-chemical properties, A.3: "Relative density", EEC Publication No. L251, September 1984 |

GLP: Yes **[X]** No **[ ]** ? **[ ]**
Remarks: .....
Reliability: 1
Reference: a) RCC, 1989a
b) ECETOC: JACC No. 29, (1994)

***2.4 VAPOUR PRESSURE** *(if more than one, identify the recommended value)*

Value: =76.31 kPa
Temperature: 25 °C
Method: Calculated **[ ]**; measured [X]
EEC directive 84/449 EEC, Annex, Part A, Methods for the determination of physico-chemical properties, A.4: "Vapour pressure", EEC Publication no. L251, September 1984
GLP: Yes **[X ]** No **[ ]** ? **[ ]**
Remarks: Purified substance ( >99.5%) used
Reliability: 1
Reference: a) RCC, 1989b
b) ECETOC: JACC No. 29, (1994)

***2.5 PARTITION COEFFICIENT log $P_{ow}$** *(if more than one, identify the recommended value)*

Log Pow: = 2.3
Temperature: 22°C
Method: Calculated **[ ]**; measured **[X ]**
High Performance Liquid Chromatography (HPLC) method, using refractive index detector. This HPLC method has not yet been evaluated by the Organization for economic Co-operation and Development (OECD), but is recommended as an alternative method for the "Flask-shaking method" (see OECD Guidelines for Testing of Chemicals, Guideline no. 107, "Partition coefficient (n-octanol/water)", Adopted May 12, 1987.
GLP: Yes **[X ]** No **[ ]** ? **[ ]**
Remarks:
Reliability: 1
Reference: a) RCC, 1989c
b) ECETOC: JACC No. 29, (1994)

***2.6 WATER SOLUBILITY** *(if more than one, identify the recommended value)*

**A. Solubility**

(a) **Preferred result**
Value: 4 g/L
Temperature: 20-21°C
Description: Miscible**[ ]**; Of very high solubility **[ ]**;
Of high solubility **[ ]**; Soluble **[ ]**; Slightly soluble **[ ]**;
Of low solubility **[X]**; Of very low solubility **[ ]**; Not soluble **[ ]**
Method: Flask Method. EEC directive 84/449 EEC, Annex, part A, Methods for the determination of physico-chemical properties, A.6: "Water solubility", EEC Publication no. L251, September 1984
GLP: Yes **[X ]** No **[ ]** ? **[ ]**
Remarks:
Reliability: 1
Reference: a) RCC, 1989d
b) ECETOC: JACC No. 29, (1994)

**B. pH Value, pKa Value** Not determined

**2.7 FLASH POINT** *(liquids)*

| | |
|---|---|
| Value: | Nonflammable |
| Type of test: | Closed cup **[ ]**; Open cup **[ ]**; Other **[ ]** |
| Method: | *(with the year of publication or updated of the method used)* |
| | ..... |
| GLP: | Yes **[ X ]** No **[ ]** ? **[ ]** |
| Remarks: | No Flash Point |
| Reliability: | 1 |
| Reference: | a) RCC (1989a)<br>b) ECETOC: JACC 29, (1994) |

**2.8 AUTO FLAMMABILITY** No studies located

**2.9 FLAMMABILITY**

| | |
|---|---|
| Results: | Extremely flammable **[ ]**; Extremely flammable - liquified gas **[ ]**; Highly Flammable **[ ]**; Flammable **[ ]**; Non flammable **[ X ]**; Spontaneously flammable in air **[ ]**; Contact with water liberates highly flammable gases **[ ]**; Other **[ ]** |
| Method: | *(with the year of publication or updated of the method used)* |
| | ..... |
| GLP: | Yes **[X ]** No **[ ]** ? **[ ]** |
| Remarks: | |
| Reliability: | 1 |
| Reference: | a) RCC, (1989f)<br>b) ECETOC: JACC No. 29, 1994 |

**2.10 EXPLOSIVE PROPERTIES**

| | |
|---|---|
| Results: | Explosive under influence of a flame**[ ]**;<br>More sensitive to friction than m-dinitrobenzene **[ ]**;<br>More sensitive to shock than m-dinitrobenzene **[ ]**; Not explosive **[ X ]**;<br>Other **[ ]** |
| Method: | *(with the year of publication or updated of the method used)* |
| | ..... |
| GLP: | Yes **[ X ]** No **[ ]** ? **[ ]** |
| Remarks: | |
| Reference: | a) RCC Project 006211 (1989)<br>b) ECETOC: JACC NO. 29 (1994) |

**2.11 OXIDIZING PROPERTIES**

Remarks: No studies located, but not expected from structure to have oxidizing properties.

**†2.12 OXIDATION: REDUCTION POTENTIAL**

Remarks: No studies located, substance is a liquid

**2.13 ADDITIONAL DATA**

**A. Partition co-efficient between soil/sediment and water (Kd)**

Remarks: No studies located

**B. Other data**

Results: 6 g/l bar
Remarks: Calculated Henry's Law Constant
Reference: ECETOC: JACC No. 29, (1994)

Results: 2.208E-002 atm-m3/mole
Remarks: Estimated using EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C
Reference: U.S. EPA, EPIWIN model output, 4/01.

## 3. ENVIRONMENTAL FATE AND PATHWAYS

### 3.1 STABILITY

### *3.1.1 PHOTODEGRADATION:

Test Substance: Dichlorofluoroethane
Method: Estimated via EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C
Results: OH radical = 1,787 Days
O3 = not determined
Remarks:
Reference: U.S. EPA, EPIWIN model output, 4/01.

Test Substance: Dichlorofluorethane
Remarks: Its atmospheric lifetime is 10.8 years and its ozone depleting potential, relative to CFC11 = 1.0, is 0.10 – 0.12. As such, it is viewed as a transitional CFC replacement. It will be phased out of production in 2003 although it will continue to be used in existing equiptment until 1/01/05.

Reference: (ECETOC, 1994).

### *3.1.2 STABILITY IN WATER

Test Substance: Dichlorofluoroethane
Method: Estimated using EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C
Results: Hydrolysis is not expected to occur. Quantitative values are unreliable due to calculation not including the neutral hydrolysis rate constant. In some instances the neutral rate constant is the dominant hydrolysis rate at environmental pHs. If the neutral rate constant is important then this program will underestimate the actual rate.
Reference: U.S. EPA, EPIWIN model output, 4/01.

### 3.1.3 STABILITY IN SOIL No studies located

### *3.2 MONITORING DATA (ENVIRONMENT) No Studies Located

### 3.3 TRANSPORT AND DISTRIBUTION BETWEEN ENVIRONMENTAL COMPARTMENTS INCLUDING ESTIMATED ENVIRONMENTAL CONCENTRATIONS AND DISTRIBUTION PATHWAYS

***3.3.1 TRANSPORT:**

***3.3.2 THEORETICAL DISTRIBUTION (FUGACITY CALCULATION)**

| | |
|---|---|
| | Water, soil, sediment, and air: $0.4056 \times 10^{-6}$ / $0.4042 \times 10^{-6}$ |
| Reference: | Fugacity: McKay 1 Model Calculation by Atofina, 2000. |
| Test Substance: | Dichlorofluoroethane |
| Method: | Estimation vial Level III EQC model, with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-103.5C) |
| Results: | |

| | |
|---|---|
| Air | 99.9% |
| Water | 0.0346% |
| Soil | 0.0134% |
| Sediment | 4.81E-05% |

| | |
|---|---|
| Remarks: | Estimation was based upon release data contained in section 1.9 of the dossier indicating fugitive air emissions of 150 kg/day. Hourly air emission rate used in the input value was determined to be 6.25 kg/hr. Data indicated that releases were expected to occur primarily to the air compartment therefore, the model data is based on 100% release to only the air compartment. |
| Reference: | U.S. EPA, EQC model output, 4/01. |

**3.4 IDENTIFICATION OF MAIN MODE OF DEGRADABILITY IN ACTUAL USE**

| | |
|---|---|
| Results: | Atmospheric degradation is the primary mode of environmental degradation. The atmospheric degradation of dichlorofluoroethane will occur mainly in the troposphere, being initiated by attack of naturally occurring hydroxyl radicals. It proceeds via various free-radical and molecular intermediates to give $CO_2$, COClF and HCl. The latter two species will be removed from the atmosphere by uptake into clouds, rain and in the oceans. COClF will rapidly hydrolyse into $CO_2$, HCl and HF followed by uptake into clouds, rain and in the oceans. |
| Remarks: | The atmospheric lifetime for dichlorofluoroethane has been calculated to be 10.8 years. |
| Reliability: | 1 |
| Reference: | a) WMO, (1991).<br>b) AFEAS, 1992. |

***3.5 BIODEGRADATION - PRIMARY**

| | |
|---|---|
| Species: | Activated sludge |
| Exposure Period: | 28 days |
| Concentration: | 2.0 and 9.0 mg/L |
| Degradation: | 2-3% |
| Method: | OECD Test Guideline 301 D 12 May 1981 and EEC. Test Guideline C.6 (Directive 84/449/EEC). |
| Test Substance: | 1,1 Dichloro-1-fluoroethane, purity >99.5% |
| GLP: | Yes |
| Remark: | The test substance and activated sludge (return sludge Tsubuker city sewer plant , Fukuoku, Japan) at 1 drop / liter were combined in 100 ml of water. Studies were run in duplicate and controls were used. The solution was stored in the dark at 20°C for 28 days. Dissolved oxygen and the level of test substance were measured. Test substance levels were determined by GC. |

Result: BOD was reduced 3-10%, HCFC 141b levels were reduced 2-3%. HCFC 141b was not readily biodegradable.
Reliability: 1
Reference: Oyama, I., (April 5, 1991).

**BIODEGRADATION – SUPPLEMENTAL**

Species: Methylosinus trichorsporium OB 3b
Exposure Period:
Concentration:
Degradation: Complete within 5 hours
Method:
Test Substances:
GLP:
Remark: Under laboratory conditions, anaerobic degradation of dichlorofluoroethane was essentially complete within 5 hours. Given the widespread abundance of methanotrophs this study suggests that these organisms may provide a natural degradation pathway.
Reliability: 1
Reference: DeFlaun, et al., (1992)

**BIODEGRADATION - SUPPLEMENTAL**

Species: Nitrosumas europa
Exposure Period Unknown
Concentration Unknown
Degradation Degradation was demonstrated
Method Unknown
Test Substance HCFC 141b purity unknown
GLP No
Remarks Very limited data available
Reliability: 3
Reference: Hyman et al 1992

## 3.6 $BOD_5$,COD OR RATIO $BOD_5$/COD

## 3.7 BIOACCUMULATION

Results: Log POW = 2.3
Remarks: This result indicates a low potential for Bioaccumulation.
Reference: ECETOC:JACC No. 29, 1994.

## 3.8 ADDITIONAL REMARKS

Fate in Wastewater Treatment Facility
Test Substance: Dichlorofluoroethane
Method: Estimated using EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C
Results: Total Removal: 90%
Total Biodegradation: 0.03%
Reference: U.S. EPA, EPIWIN model output, 4/01.

Volatilization from Water
Test Substance: Dichlorfluoroethane

Method: Estimated using EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C; HL=0.0221 atm-m3/mol (calculated from VP/WS)

Results: River with a water depth of 1 meter, Wind Velocity of 5 m/sec and Current Velocity of 1 m/sec
T1/2 = 1.132 hours, 0.047 days

Lake with a water depth of 1 meter, Wind Velocity of 0.5 m/sec and Current Velocity of 0.05 m/sec
T1/2 = 103 hours, 4.3 days

Reference: U.S. EPA, EPIWIN model output, 4/01.

**3.8 Ozone Depletion** Relative to CFC 11 which has an ozone depletion value set equal to 1, HCFC 141b has an ozone depletion value of 0.10 to 0.12.

Reference: ECETOC JACC No. 29 (1994).

## 4. ECOTOXICOLOGICAL DATA

### *4.1 ACUTE/PROLONGED TOXICITY TO FISH

Species: Zebra fish (Brachydanio rerio)
Exposure Period: 96 hours
Concentration: 60, 96, 120, 156, 204, 256, 348 and 444 mg/L
Method: ISO Standard 7346/1 (1984); OECD Method 203 4 April 1984 and EEC Directive 84/449 , Method Cl.
Test Substance: 1,1-Dichloro-1-fluoroethane, purity> 99.5%
GLP: Yes
Results: The 96 hr. - $LC_{50}$ for zebra fish was 126 mg/L in a static test using a sealed vessel
Remarks: Groups of 20 fish were used. Survival was noted at 24, 48, 72, and 96 hours from initiation of the study. There was no renewal of test substance
Results: Highest non-lethal level at 24 hours-96 mg/L at 48 to 96 hours <60 mg/L.
The estimated LC 50 for 24 hr - 276 mg/L, 48 hr - 192 mg/L. 72 hrs - 174 mg/L and 96 hrs 126 mg/L
Reliability: 1
Reference: Bazzon, M and Hervouet, G., (1989).

### 4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

### *A. Daphnia

Species Daphnia magna
Exposure Period: 48 hours
Concentration: 25.4, 38.1, 63.5 and 114.3 mg/L, nominal
Method: French standard T 90 301 Jan. 1983; OECD Method 202, 4 April 1984 and EEC Directive 84/449, Method C
Test Substance: 1,1-Dichloro-1-fluoroethane, purity> 99.5%
GLP: Yes
Results: With Daphnia magna the 48 hr EC50 was 31.2 mg/L
Remarks: Four replicates containing five daphnia each were exposed to the nominal concentrations noted above. As the test substance was volatile, the jars were sealed. At the end of the 48 hour exposure period, the level of HCFC 141b

was determined by gas chromatographic analysis. Recovery ranged from 83.9 to 95.7% of nominal concentration
Reliability: 1
Reference: Brian, D. and Hervouet, G., (1989)

***4.3 TOXICITY TO AQUATIC PLANTS e.g. Algae**

Acute Toxicity to Algae
Species/strain: Selenastrum capricornutum
Exposure Period: 72 hours
Concentration: 16, 20, 35 ul/L analytical
Method: OECD Guideline 201 (1984); EPA guideline 40 CFR Part 797 & 1060 (1989)
Test Substance: 1,1-Dichloro-1-fluoroethane, purity > 99%
GLP: Yes
Results: The 72 hour no-observed effect concentration for both growth rate and biomass for algae was >44 mg/L. (35 uL/L).
Remarks: The test was conducted under static conditions in a sealed apparatus. Difficulty was experienced in dissolving the HCFC 141b in the test medium resulting in large differences between nominal and analytical concentrations. As a result, 44 mg/L was the highest achievable level. Results were based on analytical determinations.
Reliability: 1
Reference: Groeneveld, AHC and Kuijpers, LAM, January 1991.

**4.4 TOXICITY TO BACTERIA**

See Biodegradation Test: Exposure to Concentration of 90 mg. No effects were seen.

**4.5 CHRONIC TOXICITY TO AQUATIC ORGANISMS**

No Data Available

**4.6 TOXICITY TO TERRESTRIAL ORGANISMS**

No Data Available

**4.7 BIOLOGICAL EFFECTS MONITORING (INCLUDING BIOMAGNIFICATION)**

No Data Available

**4.8 BIOTRANSFORMATION AND KINETICS**
*(Under this item, studies on absorption, distribution, metabolism and excretion etc. should be given.)*

Type: Animal **[** X **]**; Aquatic **[ ]**; Plant **[ ]**; Terrestrial **[ ]**; Other **[ ]**

**Primary Study**
Species: Rat (male, Fischer 344)
Exposure Period: 6 hours
Concentration: Multiple from 1000 to 14,800 ppm
Test Substance: HCFC 141b, purity > 99.8%
Method: Individual rats were placed in a closed loop inhalation chamber. The levels of HCFC 141b were monitored at 10 minute intervals by gas chromatography with a flame ionization detector. Carbon dioxide was removed and oxygen was added during the exposure period. Urine was collected for 24 hours

following the end of the exposure. Metabolites in urine were identified by Fluorine-NMR and comparison to known structures.

GLP: ?

Results: There was an initial period of rapid dichlorofluoroethane uptake that lasted about 80 minutes, followed by a slow linear uptake. The initial phase was attributed to uptake and equilibrations of the dichlorofluoroethane and the later phase to a saturable metabolism or deposition of the material in poorly perfused tissues. The kinetic constants for the metabolism were: Km=59.9 umol/l and Vmax=1.75 umol/h. The high Km indicates a low affinity of dichlorofluoroethane for the metabolising enzyme. A linear relationship between dichlorofluoroethane and urinary 2,2-dichloro-2-fluoroethanol excretion was found.

Reliability: 1

Reference: Loizou G. D. and Anders, M.W. (1993)

**Secondary Study**

Species: Rat (male, Fischer 344)

Exposure Period: 2 hours

Concentration: 11,400 ppm

Test substance: HCFC 141b, purity >99.8%

Method: Exposures were conducted on 3 male rats in an individual closed loop inhalation chamber as described above. During the exposure, chamber concentrations were monitored by gas chromatography coupled with mass spectroscopy (GC-MS). Immediately after cessation of exposure the animals were placed in metabolism cages and urine was collected for 15 hours. The livers of some rats were removed for covalent binding analysis of cytosolic and microsomal fractions

GLP No

Results: Covalent binding of metabolites of HCFC 141b was not detected by 19F NMR indicating that this compound is not metabolized to liver acylating intermediates. Urine samples were found to contain a single fluorinated metabolite, which was identified as glucoronic-2,2-dichloro-2-fluoroethanol. In a second study, using 4-hour exposures to a level of 40,000 ppm, a small amount of dichlorofluoroacetic acid was detected in the urine of the rats indicating that oxidation of the dichlorofluoroethanol may occur at high concentrations.

Remarks: While a third study was conducted using 7 groups of 5 male Sprague-Dawley rats, exposed for 16-20 hours to levels up to 2500 ppm, no metabolites were detected. Exposure levels may have been to low for metabolite detections (Zwart, A., 1989)

Reliability: 2

Reference: Harris, JW and Anders, M.W. 1991

## 4.9 ADDITIONAL REMARKS

**Bioconcentration:**

Test Substance: Dichlorofluoroethane

Method: Estimated using EPIWIN with the following input values: VP=574 mmHg, WS=4E+003 mg/L, Log Kow=2.30, BP=32C, MP=(-)103.5C

Results: Based on Log Kow value, the BCF = 11.78

Reference: U.S. EPA, EPIWIN model output, 4/01.

# 5. TOXICITY

## *5.1 ACUTE TOXICITY

### 5.1.1 ACUTE ORAL TOXICITY

| | |
|---|---|
| Type: | $LD_0$ **[ X ]** |
| Species/Strain: | Groups of 5 male and 5 female rats (Crl: $CD^R$ (SD) BR VAF plus] |
| Dose: | 5.0 gm/kg body weight and vehicle (corn oil) control. |
| Method: | Testing Guidelines, U.S. EPA, CFR 50 No. 188 Part II 27 September, 1985 Section 798-1175 Acute Oral Toxicity |
| GLP: | Yes |
| Test Substance: | 1,1-Dichloro-1-fluoroethane, purity 99.7% administered at 50% wt/v in corn oil. |
| Results: | Two experimental groups were used, one treated the other a vehicle control. There was no mortality in either group. Rats were held for observation for 14 days post-dosing. The concentration of test article in the dosing solution was determined by gas chromatography. The only clinical signs noted were pilo-erection on the day of dosing and slightly lower body weight gains compared to controls, in one of five males and two of five females. |
| Remarks: | Two other acute oral studies were found, neither was of the quality of this study. In the first, dosing 5 male and 5 female rats at 2gm/kg of dichlorofluoroethane in corn oil did not cause mortality (Janssen, P.J.M. and Pot, T.E., 1988). In the second, treating five male rats at 5 gm/kg, also in corn oil, did not result in mortality. (Sarver, J., 1989). |
| Reliability: | 1 |
| Reference: | 1. Liggett, M.P., et al., 1989.<br>2. Brock, R.J., et al., (1995) |

### 5.1.2 ACUTE INHALATION TOXICITY

(a) **Preferred Result**

| | |
|---|---|
| Type: | $LC_{50}$ |
| Species/strain: | Rat Sprague-Dawley, 5 males and 5 females per exposure level. |
| Exposure Levels: | 142 mg/L (30,000 ppm), 217 mg/L (45,000 ppm), 323 mg/L (56,000 ppm), 366 mg/L (75,000 ppm) plus air-exposed control |
| Method: | Rats were exposed whole body, for 4 hours by inhalation to vapours of HCFC 141b at the levels noted above. They were then observed for 14 days post exposure. Clinical signs were noted during exposure, immediately following exposure and daily until sacrifice. Body weights and food and water consumption were measured daily. At sacrifice, a gross necropsy examination was conducted, lung weights were measured and lung body weight calculations were evaluated. At least 5 samples of the exposure atmospheres were collected from each exposure chamber using a gas adsorption trap. The level of HCFC 141b in the chamber was then determined by gas chromatography using a flame ionisation detector. |
| GLP: | Yes |
| Test substance: | 1,1-dichloro-1-fluoroethane purity 99.00% |
| Results: | There were no deaths in the 30,000 and 45,000 ppm exposure level groups. Five rats (4 males and 1 female) died at 56,000 ppm while all rats died when exposed to 79,000 ppm. Signs of CNS depression wee recorded during the exposure but disappeared within minutes of termination of the exposures. Body weights and food consumption were decreased and water consumption was increased on the day following the exposures. Thereafter these parameters were comparable to controls. Lung weights on animals surviving to the scheduled sacrifice were normal. Lung weights of animals dying during exposure were higher, how ever this may be agonal in origin. |

Necropsy findings were unremarkable. The 4-hour LC50 for the combined sexes was 62,000 ppm, for males alone it was 59,000 ppm, while for females it was 65,000 ppm.

Remarks: Other than transient signs of CNS depression, no signs of toxicity were seen in this study.

Reliability: 1

Reference: 1. Hardy, C.J., et al., 1989.
2. Brock, W.J., et al., (1995).

(b)

Type: Other, Acute Inhalation Toxicity

Species/strain: Groups of 5 males and 5 females Wistar derived rats.

Exposure Level: 3000, 6000 and 11000 ppm plus air exposed control for 6 hours

Method: Rats were exposed by inhalation for a single 6-hour period to a test-atmosphere containing 0, 3000, 6000 or 11000 ppm of FC 141b. During exposure the animals were especially observed for signs of irritation or anaesthesia. Immediately after exposure the animals were weighed and transferred to metabolism cages. Urine was collected during the second 24-hour interval after initiation of exposure. At the end of this period the animals were weighed, anaesthetised for collection of blood from the abdominal aorta and necropsied. In the blood and urine a set of clinico-chemical parameters providing information on kidney, liver and haematological changes was measured. Gross post mortem examination was done on all animals. Kidneys, livers, lungs and testes, were weighed and fixed for histology. The tissues of the 0, 3000 and 11000 ppm exposed animals were examined microscopically. The test atmospheres were monitored continuously using a Miran 1A IR-analyser.

GLP: Yes

Test substance: 1,1 dichloro-1-fluoroethane, purity min. 95.5% major impurity pentafluorobutane at 3.8%

Results: No irritation, anaesthesia or other clinical signs were observed during or after exposure. Slight effects on body weight gain, inorganic phosphate levels in blood plasma and kidney function (increased urine volume and creatinine levels at 11000 ppm in males only) were observed.

Remarks: While slight effects were seen in male rats exposed to 11000 ppm for 6 hours, these effects were not seen in the subsequent subchronic and chronic inhalation toxicity studies.

Reliability: 2

Reference: Janssen, P.J.M., 1988.

(c)

Type: Other, Acute Inhalation Toxicity

Species/strain: Mouse

Exposure Level: 64,000 ppm

Method: Mice were exposed by inhalation for 30 min to a test-atmosphere containing 64,000 ppm of 141b.

GLP: ?

Test substance: 1,1 dichloro-1-fluoroethane

Results: At a concentration of 64,000 ppm, narcosis was observed at 30 minutes. An LC50 (30 min) was then estimated to be between 61,800 and 103,000 ppm.

Remarks: Originally cited in ECETOC JACC No. 29 (1994).

Reliability: 3

Reference: Davies et al, 1976

(d)

| | |
|---|---|
| Type: | Other, Acute Inhalation Toxicity |
| Species/strain: | Mouse |
| Exposure Level: | 41,000 ppm |
| Method: | This was the range finding study for the mouse in vivo micronucleus assay. Mice were exposed to the chemical for 6 hours a day. |
| GLP: | Yes |
| Test substance: | 1,1 dichloro-1-fluoroethane |
| Results: | Results indicated that narcosis was observed at an exposure to 41,000 ppm. |
| Remarks: | Based on the range finding study it was determined that the highest dose to be used in the in vivo testing would be 34,000 ppm. Further information maybe found in the section 5.6 of the dossier. |
| Reliability: | 1 |
| Reference: | Vlachos, 1989. |

### 5.1.3 ACUTE DERMAL TOXICITY

(a) **Preferred Result**

| | |
|---|---|
| Type: | $LD_0$ **[ ]**; $LD_{100}$ **[ ]**; $LD_{50}$ **[ X ]**; $LDL_0$ **[ ]**; Other **[ ]** |
| Species/strain: | Rat (CD Sprague-Dawley) |
| Value: | 2.0 g/kg bodyweight |
| Method: | U.S. EPA Testing Guidelines, CFR 50 No. 188, Part II 27 September, 1985 Section 798-1100 Acute Dermal Toxicity. Also Guideline 402, 20 February, 1987. |
| GLP: | Yes **[X ]** No **[ ]** ? **[]** |
| Test substance: | 99.8% purity |
| Results: | A group of ten rats (five male and five female) was treated at 2.0 g/kg body weight. The test material was applied neat and covered with an impermeable dressing for 24 hours. All animals were observed for 14 days after dosing.<br><br>There was no mortality. The acute lethal dermal dose to rats of dichlorofluoroethane was found to be greater than 2.0 g/kg body weight. There were no effects on body weight, nor signs of irritation or clinical signs of toxicity |
| Remarks: | Similar results were reported when Wistar rats were treated with dichlorofluoroethane at 2.0 g/kg. The test material used in this second study was not as pure (95.5% wt/wt) as in the preferred study.<br>(Janssen, P.J.M. and Pot, T.E., 1988). |
| Reliability: | 1 |
| Reference: | a) Gardner, J.R., 1988.<br>b) Brock et al, 1995. |

(b)

| | |
|---|---|
| Type: | $LD_{50}$ |
| Species/strain: | Rabbits (White New Zealand) |
| Value: | 2000 mg/kg |
| Method: | OECD 402 (27 September, 1987) |
| GLP: | Yes |
| Test substance: | > 99.9% purity |
| Remarks: | A single dose of FC-141b was applied to the clipped, intact skin of 5 male and 5 female rabbits at a dosage of 2000 mg/kg bodyweight. The application site was occluded for 24 hours. The rabbits were observed for 14 days following application. Mild erythema was observed in some rabbits 1 day after treatment. By the $7^{th}$ day, 1 rabbit exhibited moderate erythema. No edema was observed throughout the study. Other dermal effects observed |

were epidermal scaling and raw areas. All dermal irritation had resolved by study termination (test day 15) except that mild erythema was still evident in 1 rabbit and epidermal scaling was observed in 2 rabbits. Gross observations made at necropsy revealed a slight reddening of the skin in 2 rabbits that was considered a compound-related irritation. Under the conditions of this test, the skin absorption $LD_{50}$ for FC-141b was greater than 2000 mg/kg of body weight.

Reliability: 1
Reference: a) Gardner, J.R., 1988.
b) Brock et al, 1995.

### 5.1.4 ACUTE TOXICITY, OTHER ROUTES OF ADMINISTRATION

None

## 5.2 CORROSIVENESS/IRRITATION

### 5.2.1 SKIN IRRITATION/CORROSION

(a) **Preferred**

Species/strain: Rabbit (New Zealand White)
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[]**;
Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**; Not irritating **[X]**
Classification: *(If possible, according to EC Directive 67/548/EEC)*
Highly corrosive (causes severe burns) **[ ]**;
Corrosive (caused burns) **[ ]**; Irritating **[ ]**; Not irritating **[ X ]**
Method: *(e.g. OECD, other (with the year of publication or updated of the method used)*)
OECD 404 ( 1987)
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: Commercial, purity: 99.9%
Results: A single application of 0.5 mL aliquot of HCFC-141b was applied to the skin of five female and one male rabbits. The test material application site was covered with an occlusive dressing for 24 hours, then removed. HCFC-141b produced no dermal irritation in any of the treated rabbits throughout the study. Under conditions of this study, HCFC-141b was not a skin irritant.
Reliability: 1
Reference: a) Brock, W.J., 1989.
b) Brock et al, 1995.

(b)

Species/strain: Rabbit (New Zealand White)
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**;
Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**;
Not irritating **[ X ]**
Classification: *(If possible, according to EC Directive 67/548/EEC)*
Highly corrosive (causes severe burns) **[ ]**;
Corrosive (caused burns) **[ ]**; Irritating **[ ]**; Not irritating **[ X ]**
Method: *(e.g. OECD, other (with the year of publication or updated of the method used)*) OECD, ISBN 92-64-12367-9, Paris 1982
Other, under occlusion.
GLP: Yes **[X ]** No **[ ]** ? **[]**
Test substance: 99.8%

Results: A single semi-occlusive application of 0.5 ml aliquot of HCFC 141b to the intact skin of 6 rabbits for four hours elicited minimal irritation, in one animal only.
Reliability: 1
Reference: a) Liggett, M.P., 1988.
b) Brock et al., 1995.

### 5.2.2 EYE IRRITATION/CORROSION

(a) **Preferred results**
Species/strain: Rabbit (New Zealand White)
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**;
Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ X ]**;
Not irritating **[ ]**
Classification: *(If possible, according to EC Directive 67/548/EEC)*
Irritating **[ X ]**; Not irritating **[ ]**; Risk of serious damage to eyes **[ ]**
Method: *(e.g. OECD, other (with the year of publication or updated of the method used)*)
OECD 405 (1987)
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: Commercial, purity: > 99.9%
Results: An 0.1 ml aliquot of HCFC-141b produced mild conjunctival redness in 5 of 6 rabbits, along with mild chemosis in 1 rabbit and moderate blood-tinged discharge (confirmed with Hemastix ® reagent strips) in 3 rabbits. In addition, FC-141b produced slight chemosis in 2 rabbits and minimal blood-tinged discharge in 1 rabbit. No ocular irritation was observed in 1 rabbit. Biomicroscopic examinations revealed no corneal injury in any of the rabbits. The treated eyes of all rabbits were normal by 72 hours after treatment. Under conditions of this study, HCFC-141b was a mild irritant.
Reliability: 1
Reference: a) Brock, W.J., 1988.
b) Brock et al., 1995

(b)
Species/strain: Rabbit (White, New Zealand)
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[]**;
Irritating **[ ]**; Moderate irritating **[]**; slightly irritating **[ ]**; not irritating **[ X ]**
Classification: *(If possible, according to EC Directive 67/548/EEC)*
Irritating **[ ]**; Not irritating **[ X ]**; Risk of serious damage to eyes **[ ]**;
Method: *CFR 50 No. 188, Sept. 1985 Section 798.4500*
GLP: Yes **[ X ]** No **[ ]** ? **[]**
Test substance: Substance 99.8%.
Remarks: Instillation of 0.1 ml of HCFC-141b into the eyes of 6 rabbits did not elicit a positive response in any of the six treated animals according to TSCA test criteria. Eyes were examined 1 hr and 1, 2, 3, 4 and 7 days after instillation.
Reliability: 1
Reference: a) Liggett, M.P., 1988.
b) Brock et al , 1995.

### 5.3 SKIN SENSITISATION

(a)
Type: Maximization
Species/strain: Guinea pig (Hartley/Dunkin)
Results: Sensitizing **[ ]**; Not sensitizing **[ X ]**; ambiguous **[ ]**

Classification: Sensitizing **[ ]**; Not sensitizing **[ X ]**
Method: *CFR 50 No. 188, Sept. 1985 Section 798.4100 Dermal Sensitization*
GLP: Yes **[ X ]** No **[]** ? **[ ]**
Test substance: 99.8% purity
Results: Initially, guinea pigs were treated with 0.1 ml of a 50/50 mixture of Freunds complete adjuvant and Alembicol D with 5% v/v of HCFC 141b. Dermal application (challenge) was with 0.4 ml of pure HCFC 141b or 50% HCFC 141b in Alembicol D. The dermal reaction seen in the 20 test animals at both challenge intervals were similar to those seen in the 20 controls. In this screening test, performed in albino guinea pigs, HCFC-141b did not produce evidence of delayed contact hypersensitivity.
Reliability: 1
Reference: a) Kynoch, S. R. and Parcell, B. I. , 1989.
b) Brock et al., 1995

## *5.4 REPEATED DOSE TOXICITY

(a)
Species/strain: Rat ( Fischer 344)
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[]**
Route of Administration: Inhalation
Exposure period: 13 weeks
Frequency of treatment: 6 hrs/day, 5days/week
Post-exposure observation period: None
Dose: 0, 2,000, 8,000 and 20,000 (10 animals/sex /group)
Control group: Yes **[ X ]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[X]**; Concurrent vehicle **[ ]**; Historical **[ ]**
**NOEL**: 8,000 ppm
**LOEL**: 20,000 ppm
Results: There were very few findings of toxicological significance. A slight body weight decrease in 20,000 ppm exposed rats was not considered to be exposure-related. Rats exposed to 20,000 ppm appeared to move slower and were less alert than the controls during exposures. Serum cholesterol values were slightly increased in rats exposed to 20,000 ppm. There was no exposure-related mortality nor any gross or histopathologic effects. The lack of pathologic effects at any of the concentrations tested indicate a low potential for subchronic toxicity.
Method: OECD 413 (1981) Groups of 15 male and 15 female Fischer 344 rats were exposed to the targeted concentrations of 1,1-dichloro-1-fluoroethane for 6-hours per day five days per week. Five rats/sex/group were sacrificed after 4 weeks of exposure, the remaining ten/sex/group were sacrificed after 13 weeks of exposure. The chamber exposure levels were monitored by a Miron I.R. The results from the thirteen week study are described in this summary. All rats were evaluated daily for obvious clinical signs and were weighed and given a detailed clinical assessment weekly. Hematologic assay (full WBC), clinical chemistry measurements (alanine amino transferase, aspartate amino transferase, and alkaline phosphatase activities, urea nitrogen, glucose, total protein, albumin, globulins, triglycerides cholesterol and serum electrolytes) and urinalysis were conducted prior to sacrifice (following four or 13 weeks of exposure). Organ weights were measured for brain, heart, lungs, kidneys, testes, ovaries and adrenals during necropsy. Microscopic examination was conducted on all major organs, approximately 50 tissues per animal, from control and high exposure level animals as well as gross lesions from all other animals. Ophthalmoscopic examinations were conducted on all animals

prior to initial exposure and prior to the final exposure. Statistical analysis was conducted on all quantal data.

GLP: Yes **[ X ]** No **[]** ? **[ ]**

Test substance: Commercial, purity: >99.4%

Remarks: Three other multiple exposure studies were conducted with HCFC 141b. The first was the pilot study for these two studies. It involved exposures of groups of 10 male and 10 female rats for two weeks to levels of 0, 5000, 8700, 14000 and 20000 ppm 6 hours/day, 5 days each week. Results were similar to those seen in the primary study, in that only mild effects were seen at 20,000 ppm and the no-observed-effect level was 14,000 ppm.(Ref. Coombs, D.W., 1987).

The second multiple exposure study was the four weeks study run concurrently with the 13 weeks study described above. This study had 5 rats/sex/level. Exposures were conducted 5 days each week at levels of 0, 2,000, 8,000 and 20,000 ppm. The same clinical observations, body weight measurements, WBC, clinical chemistry urinalysis, organ weight, and histopathology were conducted on these rats as were conducted on the rats from the 13 weeks study. No significant effects were reported (Yano, B.L., et al., 1989. Also, Brock et al., 1995). The third repeat inhalation toxicity study involved exposure of groups of 5 male and 5 female rats six hours per day for 28 consecutive days. Two additional groups of 5 male and 5 female rats were included, one was a control group the other a high level exposure group. Rats were exposed to either 0 (control), 1500 ppm, 8000 ppm or 20,000 ppm. As with the other studies, body weight, organ weight, WBC, clinical chemistry and daily clinical observations were conducted. Chamber analysis was conducted by gas chromatography. Findings indicated a slight increase in cholesterol levels. The results suggested that the 8000 ppm represented a no-observed-effect-level (Hino, Y., 1992; ECETOC: JACC No. 29, 1994)

Reliability: 1

Reference: a) Landry, T.D., et al., (1989)
b) Brock et all, 1995.

## *5.5 GENETIC TOXICITY IN VITRO

### A. BACTERIAL TEST

(a) **Primary**

Type: *(e.g. Bacterial reverse mutation assay, Bacterial gene mutation study, etc.)*
Bacterial reverse mutation assay

System of testing: Strain: S. typhimurium TA 98, TA 100, TA 1535, TA 1537, TA 1538 and Escherichia coli WP2 uvrA

Concentration: 0.3, 1, 3, 10 and 30% vapour in air

Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[ X ]**; No data **[ ]**

Results:

| | | | | |
|---|---|---|---|---|
| Cytotoxicity conc: | With metabolic activation: | 30% | | |
| | Without metabolic activation: | 30% | | |
| Genotoxic effects: | | + | ? | - |
| | With metabolic activation: | **[ ]** | **[ ]** | **[X ]** |
| | Without metabolic activation: | **[ ]** | **[ ]** | **[ X]** |

Method: OECD 471 1983

GLP: Yes **[X ]** No **[ ]** ? **[ ]**

Test substance: 99.95%

Remarks: The test material, HCFC-141b, was devoid of mutagenic activity under the conditions of test.

Reliability: 1
Reference: a) May, K., 1989.
b) Millischer et al., 1995.

(b)
Type: *(e.g. Bacterial reverse mutation assay, Bacterial gene mutation study, Cytogenetic Assay etc.)*
Bacterial reverse mutation assay
System of testing: Strain: S. typhimurium, TA 1535, and Escherichia coli WP2 uvrA
Concentration: 0.3, 1, 3, 10 and 30% vapour in air
Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[ X ]**; No data **[ ]**
Results:
Cytotoxicity conc: With metabolic activation: 30%
Without metabolic activation: 30%
Genotoxic effects: + ? -
With metabolic activation: **[ ] [ ] [X]**
Without metabolic activation: **[ ] [ ] [X]**
Method: OECD471 (1983)
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Teat substance: Commercial, purity: 99.83%
Remarks: The test material, HCFC-141b, was devoid of mutagenic activity under the conditions of test.
Reliability: 1
Reference: a) May, K., 1990.
b) Millischer et al., 1995

(c)
Type: Bacterial reverse mutation assay
System of testing: Strain: S. typhimurium TA 98, TA 100, TA 1535, TA 1537 and TA1538
Concentration: 5, 25%, 10, 50%, 21% and 42% vapour in air
Metabolic Activation: With [ ]; Without [ ]; With and Without [ X ]; No data [ ]
Results:
Cytotoxicity conc: With metabolic activation: 42%
Without metabolic activation: 42%
Genotoxic effects: + ? -
With metabolic activation: [ ] [ ] [X]
Without metabolic activation: [ ] [ ] [X]
Method: OECD 471 (1983)
GLP: Yes [X] No [ ] ? [ ]
Test substance: 97.6%
Remarks: It is concluded that HCFC 141b showed no evidence of mutagenic potential when tested in the Ames bacterial system at the concentrations used.
Reliability: 1
Reference: a) Koorn, J.C., 1988.
b) ECETOC JACC NO. 29, 1994.

(d)
Type: Bacterial reverse mutation assay
System of testing: Strain: S. typhimurium TA 98, TA 100, TA 1535, TA 1537 and TA1538
Concentration: 0.3, 1.0, 3.0, 10.0 and 30.0% vapour in air
Metabolic Activation: With [ ]; Without [ ]; With and Without [ X ]; No data [ ]
Results:
Cytotoxicity conc: With metabolic activation: 30%
Without metabolic activation: 30%

| | | |
|---|---|---|
| Genotoxic effects: | | + ? - |
| | With metabolic activation: | [X] [ ] [ ] in strain 1535 only |
| | Without metabolic activation: | [X] [ ] [ ] in strain 1535 only |
| Method: | OECD 471 (1983) | |
| GLP: | Yes [X] No [ ] ? [ ] | |
| Test substance: | 99.6% received at lab 21, October 1987 | |
| Remarks: | It was concluded that HCFC 141b under the conditions of test exhibited some mutagenic activity in these studies at vapour levels of 10 and 20%, inducing base substitution mutations with no requirement for metabolic activation, but only in strain TA 1535. As no activity was seen in three other studies with this strain, nor in any other study with other strains of bacteria, the weight of evidence suggests that HCFC 141b is not active in this assay. As noted above, several studies of potential mutagenic activity have been conducted with HCFC 141b, one at higher concentrations than used here. HCFC 141b was consistently inactive in these studies. This finding may have resulted from an impurity no longer present in this product. | |
| Reliability: | 1 | |
| Reference: | a) Hodson-Walker, G. and May, K., 1988.<br>b) ECETOC: JACC No 29 (1994). | |

(e)

| | | |
|---|---|---|
| Type: | Bacterial reverse mutation assay | |
| System of testing: | Strain: Escherichia coli WP2, WP67 and CM871 | |
| Concentration: | 10,000, 3,160, 1,000, 316 and 100 ug/ml with S-9<br>1,000, 316 and 100 ug/ml without S-9 | |
| Metabolic Activation: | With [ ]; Without [ ]; With and Without [ X ]; No data [ ] | |
| Results: | | |
| Cytotoxicity conc: | With metabolic activation: | 10,000 and 3,160 ug/ml |
| | Without metabolic activation: | 1,000 ug/ml |
| Genotoxic effects: | | + ? - |
| | With metabolic activation: | [ ] [ ] [X] |
| | Without metabolic activation: | [ ] [ ] [X] |
| Method: | UK EMS “Report of the UK EMS Subcommittee for Mutagenicity Testing” Part II 1984. | |
| GLP: | Yes [X] No [ ] ? [ ] | |
| Test substance: | 99.6% | |
| Remarks: | Under conditions of test, HCFC 141b did not produce lethal DNA damage. | |
| Reliability: | 1 | |
| Reference: | a) Hodson-Walker, G. and May, K., 1988.<br>b) ECETOC: JACC No 29 (1994). | |

**B. NON-BACTERIAL IN VITRO TEST**

(a) **Primary**

| | | |
|---|---|---|
| Type: | Cytogenetics Assay | |
| System of Testing | Human Lymphocytes | |
| Concentration: | 10, 20 30% vapour in air with S-9<br>1.25, 2.5 and 5% vapour in air without S-9 | |
| Results: | | |
| Cytotoxicity conc: | With metabolic activation | 30% |
| | Without metabolic activation | 5% |
| Genotoxic effects: | | + ? - |
| | With metabolic activation | [ ] [ ] [ X ] |
| | Without metabolic activation | [ ] [ ] [ X ] |
| Method | OECD 473 (1983) | |

GLP Yes [X] No [ ] ? [ ]
Test substance: 99.83% purity
Remarks: It is concluded that HCFC-141b, under conditions of test, showed no evidence of clastogenic activity. The sensitivity of the test procedure, and the metabolic activity of the S-9 mix employed, were demonstrated by the clear responses to the positive control agents cyclophosphamide and chlorambucil.
Reliability: 1
Reference: a) Hudson-Walker, G., 1990.
b) ECETOC: JACC No. 29 (1994).

(b)
Type: Cytogenetics Assay
System of testing: Strain: Chinese Hamster Ovary (CHO-K1) Cells
Concentration: 0, 2.5, 5.0 and 10.0% vapour in air with S-9
0, 2.5 , 5.0 and 10% vapour in air without S-9
Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[ X ]**; No data **[ ]**
Results:

| | | |
|---|---|---|
| Cytotoxicity conc: | With metabolic activation: | 2.5% |
| | Without metabolic activation: | 10% |
| Genotoxic effects: | | + ? - |
| | With metabolic activation: | **[X] [ ] [ ]** |
| | Without metabolic activation: | **[X] [ ] [ ]** |

Method: OECD 473 (1983)
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: Commercial, purity 99.83%
Results: It is concluded that HCFC 141b, under the conditions of test, showed clear evidence of clastogenic activity in both the presence and absence of S-9 mix. After 4 hrs of exposure and in the absence of S-9 at 4 and 48 hrs of exposure but not after 24 hrs of exposure. S-9 containing cultures were not tested past 4 hr. of exposure due to cytotoxicity.
Reliability: 1
Reference: a) Hudson-Walker, G. ,1990.
b) Millischer et al., 1995

(c)
Type: Cytogenetics Assay
System of Testing: Chinese Hamster Ovary Cells
Concentration: 0, 0.53, 1.58, 4.73 and 13.2 mg/ml with S-9
0, 0.11, 0.33, 1.0 and 3.0 mg/ml without S-9
Results:

| | | |
|---|---|---|
| Cytotoxicity conc: | With metabolic activation: | 13.2 mg/ml |
| | Without metabolic activation: | 3.0 mg/ml |
| Genotoxic effects: | | + ? - |
| | With metabolic activation: | **[ ] [ ] [ X]** |
| | Without metabolic activation: | **[ ] [ ] [ X]** |

Method: OECD 473 (1983)
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: Purity not stated. Believed to be greater than 99%
Results: It is concluded that HCFC 141b did not induce structural chromosome aberrations in cultured CHO cells, either in the absence or in the presence of the S-9 mix, under the conditions employed in this examination.
Reliability: 1
Reference: a) Wilmer, TWGM and deVogel, N., (1988).
b) ECETOC: JACC No 29 (1994).

(d)

| | |
|---|---|
| Type: | Cytogenetics Assay |
| Systems of Testing: | Chinese Hamster Ovary (CHO-KI) Cells |
| Concentration: | 10, 20, 35 and 40% vapour in air with S-9<br>10,20, 30, 40 and 45% vapour in air without S-9 |
| Results: | |
| Cytotoxicity conc. | With metabolic activation: 35% vapour in air<br>Without metabolic activation: 10% vapour in air |
| Genotoxic effects: | + ? - |
| | With metabolic activation: [ X ] [ ] [ ] |
| | Without metabolic activation: [ X ] [ ] [ ] |
| Method: | OECD 473 (1983) |
| GLP: | Yes [X] No [ ] ? [ ] |
| Test Substance: | 99.6% purity |
| Remarks: | It is concluded that HCFC 141b, under the conditions of test, demonstrated clastogenic activity both in the presence and absence of S-9 mix. However, while the studies conducted with S-9 showed a dose related pattern of chromosome aberrations, 9.0%, 16.3%, 14.3% and 22.7% for control, 10%, 20% and 35% atmospheres, respectively excluding gaps, those conducted without S-9 did not, 7%, 11.3%, 14.3% ad 12.7% with atmospheres of control, 10%, 20% and 30% respectively. |
| Reliability: | 1 |
| Reference: | a) Bootman, T. and Hodson-Walker, G., 1988.<br>b) ECETOC: JACC No 29 (1994) |

(e)

| | |
|---|---|
| Type: | Cytogenetics Assay |
| System of Testing: | Chinese Hamster V79 Cells0 |
| Concentration: | 0, 5, 10, 20, 25, 30 and 35% vapour in air with S-9<br>0, 5, 10, 20, 25, 30 and 35% vapour in air without S-9 |
| Results: | |
| Cytotoxicity conc: | With metabolic activation 35%<br>Without metabolic activation 35% |
| Genotoxic effects: | + ? - |
| | With metabolic activation [ ] [ ] [ X ] |
| | Without metabolic activation [ ] [ ] [ X ] |
| Method: | OECD 473 (1983) |
| GLP | Yes [X] No [ ] ? [ ] |
| Test substance: | 99.6% purity |
| Remarks: | It is concluded that under the conditions of the test, HCFC 141b induced no significant increases in mutation frequency at the HGPRT locus when cells were treated in the absence or presence of S-9 mix. In the same test systems, EMS and DMBA induced marked increases in mutation frequency. |
| Reliability: | 1 |
| Reference: | a) Bootman J, et al., 1988<br>b) ECETOC: JACC No. 29 (1994). |

## 5.6 GENETIC TOXICITY IN VIVO

**Primary**

| | |
|---|---|
| Type: | Micronucleus assay |
| Species/strain: | CD-1 Mice (15/sex/group) |
| Sex: | Female [ ]; Male [ ]; Male/Female [X]; No data [ ] |
| Route of Administration: | Concentrations in air, monitored hourly |
| Exposure period: | 6 hours |

Doses: 0, 2,000, 7200 and 20,000 ppm
Results:
Effect on mitotic
Index or P/N ratio: ?
Genotoxic effects: + ? -
[ ] [ ] [X]
Method: OECD 474 (1983)
GLP: Yes [X] No [ ] ? [ ]
Test substance: 1,1-dichloro-1-fluoroethane designated 4874-89 purity > 99%
Remarks: Mice were given single (nose only) exposures to designated levels of HCFC 141b, then groups of 5/sex/level were sacrifice 24, 48 and 72 hours post exposure. Both negative (air exposed) and positive (chlorambucil treated) control groups were included. At least 2000 erythrocytes per animal were examined for the presence of micronucleic using the light microscope. Calculated values of micronucleic per 1000 polychromatic Erythrocytes were analyzed statistically using the Mann-Whitneyll test. The ratio of polychromatic mature cells was also calculated by each animal as an indicator of gross toxicity.

A second study was conducted according to the same design but used whole body exposure with groups of 15 male and 15 female mice. Whole body exposures were for 6 hrs to levels of 0, 3600, 10,000 and 34,00 ppm. The test compound was 99.98% pure. As in the first study, there was no evidence of induced micronuclei in the bone marrow of mice. The compound was negative in this in-vivo test. (Vlachos, D., 1989.)
Results: It is concluded that, under conditions of test, there was no evidence of induced chromosomal or other damage leading to micronucleus formation in bone marrow erythrocytes of treated mice killed 24, 48, or 72 hours after initiation of a six-hour exposure to the test material.
Reliability: 1
Reference: a) J. Bootmann et al., 1988
b) ECETOC: JACC No. 29 (1994)

## 5.7 CARCINOGENICITY

Species/strain: Rat (Sprague-Dawley)
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[ X ]**; No data **[ ]**
Route of Administration: Inhalation
Exposure period: 104 weeks
Frequency of treatment: 6 hours/day, 5days/week
Post-exposure observation period: None
Doses: 0, 1,500, 5,000, 15,000 and 20,000 ppm (80 animals/sex /group)
Control group: Yes **[ X ]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ X ]**; Concurrent vehicle **[ ]**; Historical **[ ]**
**NOEL** 1,500 ppm
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: Commercial, purity: > 99.5%
Results: Even though 20,000 ppm for 6 hours represents nearly 50% of the estimated 6-hour acute median lethal concentration, there were no effects on survival, hematology, clinical observations, urinalysis or organ weights. No treatment related clinical signs were seen. The ophthalmoscopic examination did not reveal evidence for treatment related effects. Serum chemistry analysis did show occasional increases in triglyceride levels in the high exposure level rats, however, the effects were not of toxicological significance. While body weight gain was slightly reduced for the high exposure level males in the first

15 weeks of exposure, subsequently it was comparable between all groups. For the high exposure level female rats it was reduced through out most of the study. These reductions in body weight were less than 10% compared to the control values. Food consumption paralleled body weight gain, in that it tended to be a little lower in the high level exposure group, but was comparable in all others. The only noteworthy finding in the gross examination was the presence of testicular masses and overall reduced testicular size, flaccid condition and the presence of white subtunical striae. Microscopically, the only findings considered to be related to the exposure were increased interstitial cell tumors (Leydig cell tumors) in the mid and high level exposure groups. The frequency was as follows: control – 3/70; low level 4/70; mid level 14/70; and high level 12/70. Thus there was not a clear dose response differentiating the mid and high level exposure groups. All except 5 were observed at terminal sacrifice. The distribution for thses 5 was: control – 1; low exposure level – none; mid exposure level – 2; high exposure level 2. Additionally, there was an increase in Leydig cell hyperplasia, anain predominately in the mid level exposure group. There was no effect on survival.

Method: OECD , ISBN 92-64-12367-9, Paris 1982. Groups of 80 male and 80 female Sprague Dawley rats were exposed to the target levels of 1,1-dichloro-1-fluoroethane for 6 hours/day, 5 days/week for 2 years. Initially the high exposure level rats were exposed to 15,000 ppm (weeks 1-17). As there were no apparent effects on body weight or clinical signs of toxicity, the exposure level was increased to 20,000 ppm during week 18 and continued at that level for the duration of the study. Ophthalmoscopy was performed pre-exposure, during week 53 and during week 104. Hematology (WBC), blood biochemistry (21 end points) and urinalysis were conducted on 10 rats/sex/level during weeks 13, 26, 52, 78 and at termination. Ten rats/sex/level were sacrificed at the end of 52 weeks of exposure. Body weight, food consumption and detailed clinical assessments were conducted weekly (body weights were measured bi-weekly from week 13 on until study termination). Pathological examinations were performed on the control and high exposure level animals (approximately 50 organs) plus nasal turbinates, lungs, liver, kidneys, testes and macroscopic abnormalities from the low and mid level rats. A full set of tissues was also examined from all animals that died spontaneously or were sacrificed in extremus during the study. Organ weights were measured on the brain, pituitary, thyroids, heart, lungs, liver, spleen, kidneys, adrenals, testes and ovaries. All quantal data was compared statistically.

Remarks: The only pathological finding associated with the treatment consisted of an increased incidence of benign Leydig cell tumors and related to hyperplasia seen in male rats in the mid and high level exposure goups. These tumors were found predominately in animals sacrificed at the end of the study and did not result in any life shortening effects and are judged not to represent a risk to man. The only other finding was occasional evidence, particularly during weeks 13, 26 and 52, of an increase in triglyceride concentration in the high level rats, predominately females. This was not considered to be of toxicological significance.

Reliability: 1

Reference: a) Hardy, C.J., (1993)
b) Millischer et.al., 1995

***5.8 TOXICITY TO REPRODUCTION**

Study type: 2 Generation Reproduction

Species/strain: Rat/Specific Pathogen Free males and females (Crl:CD® (SD) BR VAF/Plus)
Sex: Male and Female
Route of Administration: Inhalation
Exposure Period: Parental: 10 weeks + during mating, pregnancy and lactation
First Generation: 12 weeks + during mating, pregnancy and lactation.
Second Generation: None
Frequency of treatment: 6hr/day, 7 days/week
Exposure levels: 0 (control), 2000, 8000 and 20,000 ppm.
Control Group: Yes, air exposed
**NOEL**: 8,000 ppm
**LOEL**: 20,000 ppm
Method: U.S. EPA TSCA Guideline 798.4700, CFR 52 No. 97, May 30, 1987, p. 19056. Japanese Directive 62 Kikyoku No. 303 MITI, 31 March, 1987.
Study design: In this assessment of the effect of HCFC 141b on the growth and reproductive performance of the rat, male and female animals were exposed to the test material for six hours per day, seven days per week, at fixed concentrations of 0 (Control), 2000, 8000 and 20000 ppm. The FO animals (32/sex/group) were treated continuously from 7 weeks of age for 10 weeks prior to pairing and, with the exception of a short period around parturition, treatment continued throughout the two pairing phases. The second mate was performed because of an inferior mating performance at 20000 ppm (mate 1); and females and litters were sacrificed shortly after Day 4 post partum. The F1 generation (28/sex/group) was derived from litters of the first mate. Selected weanlings were reared to maturity and mated at 16 weeks of age (exposures commenced at 4 weeks of age).

Weight analyses of the reproductive organs and pituitary were performed on adults and selected weanlings. Histopathological examinations were confined to the reproductive tract tissues and pituitary of all adults from the control group and at 20000 ppm and also from the males and females that appeared infertile at 2000 and 8000 ppm.

Inhalation exposure systems: The inhalation exposure systems produced comparable results across the groups for airflow, temperature and relative humidity. Exposure levels were monitored at 7.5 minute intervals using an on-line gas chromatograph with an automatic sampling loop.

Dosing regimen: During all the pre-mating phases the animals were exposed 6 hours/day, 7 days a week. Animals were held individually in stainless steel mesh cages during exposure and returned to their home cages overnight. For mating, designated pairs (1 male: 1 female) were co-habited overnight for the 20-day mating period.

During the mating period and up to presumed Day 20 of pregnancy, the animals were exposed 6 hours/day, 7 days a week, and held in individual cages during exposure.

From presumed Day 20 of pregnancy through to Day 4 post partum, males continued to be exposed 7 days a week whereas females were housed in their breeding cages and allowed to deliver their young and to establish lactation without exposure to vapour. The males were returned to their home cages overnight.

From, and including Day 5 post partum, females and males were exposed 7 days a week, with the males returned to their home cages overnight and the females returned to their breeding cages.

In the case of females that showed evidence of mating (copulation), and were not therefore exposed to the vapour from presumed Day 20 of pregnancy, but did not deliver any young, exposure was reinstated 7 days after the presumed Day 20 of pregnancy (unless inspection of the available data suggested that parturition was imminent). If further evidence of mating was apparent in animals that were re-exposed, exposure was continued until the second presumed Day 20 of pregnancy. Females that were considered to be non-pregnant were exposed to vapour throughout.

The presumed Day 20 of pregnancy was based on available information prior to parturition; for some females the day of conception was later re-assessed including data following parturition.

GLP: Yes
Test substance: 1,1-dichloro-1-fluoroethane, purity >99%

Results: Treatment of adult rats at 20,00 ppm was associated with an increase in water consumption, variations (both increases and decreases) in food consumption and body weight gain. Also a lower pregnancy rate and fertility index was seen at both Fo matings, with an increase in the number of apparently infertile animals, although at least 20 litters were born at each pairing. Lastly, there was a reduction in combined seminal vesicle/prostate weight at necropsy of F1 males with a similar, non-statistically significant, trend noted in the Fo males. There were no noteworthy microscopic changes.

In the offspring from animals exposed to 20,000 ppm of HCFC 141b, there was a slight but significant reduction in litter size at birth following the second pairing of the Fo generation and in the F1 generation but not in the first pairing in the Fo generation. In the F1 generation there was a small increase in implantation loss. There was also a delay of one to two days in the age of attainment of sexual maturation of males, as assessed by balanopreputial skinfold clevage. This was probably related to the slightly lower growth rate seen in the F1 generation males. Finally, there was a slightly lower litter and mean pup birth weight. This persisted only up to weaning.

Exposure of rats to 8000 ppm was associated with an increase in water consumption and slight variations (increases and decreases) in body weight. There were no significant effects on the offspring.

Exposure of rats to 2000 ppm was not associated with any significant effects in either the adults or offspring.

Overall, there were no effects on pup viability or survival at any level, including 20,000 ppm.

Remarks: None
Reliability: 1
Reference: a) Brooker, A.J., et al., 1993
b) Rusch et. al. (1995).

***5.9 DEVELOPMENTAL TOXICITY/TERATOGENICITY**

| | | |
|---|---|---|
| | Test substance: | 1.1-dichloro-1-fluoroethane, designated as 4874-89; purity >99.6% |
| | Species/strain: | Rat ($CD^R$ BR VAF/Plus strain) |
| | Sex: | Female, pregnant |
| | Route of Administration: | Inhalation |
| | Exposure Period: | Days 6-15 of pregnancy, inclusive |
| | Post-exposure observation period: | Until day 20 |
| | Frequency of treatment: | 6 hrs/day, daily |
| | Dose: | 20,000 ppm, 8000 ppm and 3200 ppm |
| | Control Group: | Yes, concurrent no treatment |
| | GLP: | Yes |
| | **NOEL:** | dam 3200 fetus 8000 |
| | **LOEL:** | dam 8000 fetus 20,000 |
| | Results: | At 20,000 ppm early and late embryonic deaths were significantly increased. Litter and mean fetal weights were reduced. This was accompanied with signs of fetal immaturity and delayed ossification. There was no evidence of a treatment related increase in malformations. There was no indication of an effect of treatment on fetuses from the 8000 and 3200 ppm groups.<br><br>At 20,000 ppm the dams showed increased salivation, hunched posture, and diaphragmatic breathing, transient reduction in food consumption, and an increase in water consumption. From day 6 to 8 a marginal decrease in body weight was noted and body weight gains were depressed throughout the study. At 8000 ppm, the only effect noted in the dams was a slight, transcient body weight gain depression at the initiation of exposures. No significant effects were seen at 3200 ppm. |
| | Method: | OECD 414 (1984)<br>Groups of 25 pregnant animals were exposed by inhalation to the test compound. Exposure levels were monitored at least 4 times daily. The method involved gas chromatographic analysis of vapour from a known volume of air, trapped on adsorption tubes. |
| | Remarks: | None |
| | Reliability: | 1 |
| | Reference: | a) Hughes, E.W., 1988<br>b) Rusch et. al., (1995). |
| **5.9.B** | Species / strain: | New Zealand white rabbits |
| | Sex: | Female, pregnant |
| | Route of Administration: | Inhalation |
| | Exposure period: | Days 7-19 of gestation, inclusive |
| | Post exposure observation period: | Until Day 29 of gestation |
| | Frequency of treatment: | 6 hr/day, daily. |
| | Dose: | 12,600 ppm, 4200 ppm and 1400 ppm |
| | Control Groups: | Yes<br>Concurrent, No treatment |
| | **NOEL**: | Does 1400 ppm fetus 12,600 ppm |
| | **LOEL**: | Does 4200 ppm fetus >12,600 ppm |
| | Results: | No clear effects of treatment were seen in the fetuses at any level. In the does, at 12,600 weight loss was observed from day 7 through day 11, and mean body weights remained lower than controls through sacrifice. Other signs recorded during the exposure included partially closed eyes, increased respiration and slow irregular breathing. At 4200 ppm, weight loss was noted up to day 9. Also, some animals were observed with partially closed eyes and increased respiration. No effects were noted for the group exposed to 1400 ppm. |

| | |
|---|---|
| Method: | OECD 414 (1984)<br>Groups of 16 pregnant rabbits were exposed by inhalation to the test compound. Exposure levels were monitored at least four times daily. The method involved gas chromatographic analysis of vapour from a known volume of air, trapped on adsorption tubes. |
| GLP: | Yes |
| Test substance: | 1,1-Dichloro-1-fluoroethane, designated as 4874-89, purity 99.6% |
| Remarks: | None |
| Reliability: | 1 |
| Reference: | a) Hughes, E.W., 1989<br>b) Rusch et al., (1995). |

## 5.10 OTHER RELEVANT INFORMATION

**A. Specific toxicities** - Neurotoxicity

| | |
|---|---|
| Species/strain: | Rat Sprague Dawley (Crl:CD(SD)BR) |
| Sex: | Male and Female |
| Route of Administration: | Inhalation |
| Exposure Period: | 6 hr/day, 5 days/wk for 16 weeks |
| Post exposure observation period: | 4 weeks |
| Frequency of treatment: | Daily |
| Dose: | 15,000, 5000 and 1500 ppm |
| **NOEL:** | 15,000 ppm |
| **LOEL:** | > 15,000 ppm |
| Results: | No treatment related effects were seen of any level tested. Parameters evaluated included: mortality, clinical signs, body weight, food consumption, neurobehavioral observations, brain weight and neuropathology. |
| Methods: | WHO (1986) Principles and Methods for the assessment of neurotoxicity associated with exposure to chemicals. Environ. Health Criteria No. 60. Groups of 10 male and 10 female rats were exposed to vapours of HCFC 141b 6 hr/day, 5 days/week for 16 weeks. The exposures were conducted concurrently and in the same exposure chambers as the chronic inhalation toxicity study. Rats were group housed (either 4 or 2 to a cage) in temperature and humidity controlled rooms with 12 hour light cycles. Food and water were available ad libitum during non-exposure periods. Exposures were conducted using individual stainless steel cages in the exposure chambers. Vapours of the test compound were produced by metering the liquid to all-glass atomizers heated by a warm water heating gasket. Exposure levels were monitored approximately 8 times per hour using on-line gas chromatographic analysis.<br><br>Animals were given a pre-test ophthalmoscopic examination and randomly sorted into groups based on body weight. They were observed twice daily, body weight, food consumption and detailed clinical assessments were conducted weekly. A detailed neurobehavioral assessment was conducted during week 17. The parameters evaluated included those described in the Irwin neurobehavioral screen such as home cage activity, fighting, apathy restlessness, tremor, twitches, convulsions, alertness, respiration, startle response, gait, pilo-erection touch response, reflexes, fearfulness, passivity, aggressiveness, lacrimation, salivation, paralysis, grooming, vocalisation, diarrhoea, hypothermia etc. [Irwin, S (1968) Comprehensive observational assessment; a systematic quantitative procedure for assessing the |

behavioral and psychologic state of the mouse. Psychopharmacologia 13, 222-257]. Rats were sacrificed and 5 male and 5 female fixed by whole-body perfusion. The remaining animals were held for 4 weeks, sacrificed and also fixed by whole body prefusion. Sections of brain, sciatic nerve spinal cord, tibial nerve and dorsal and ventral root fibers were examined microscopically from the animals sacrificed at the end of the exposure period. As no effects were seen in these rats, tissues from the rats held without treatment for 4 weeks were not examined.

GLP: Yes

Test substance: 1,1 Dichloro-1-fluoroethane, purity >99.5%

Remarks: There were also no clinical or pathological signs of neurological effects in the concurrent 2 years inhalation toxicity study.

Reliability: 1

Reference: a) Coombs, D., et al., 1992
b) ECETOC: JACC No. 29 1994.

**B. Cardiac Sensitization to Adrenalin**

**1. Primary Study**

Type: Determination of the threshold for Cardiac Sensitization to Adrenalin

Species/strain: Dogs (6) pure bred male beagles 12-27 months old.

Exposure levels: 1% (10,000 ppm) and 2% (20,000 ppm).

Method: The protocol involves training a group of dogs to calmly accept the procedure for several days prior to the exposure. On the day of the exposure, each dog is exposed individually. The dog is placed in a sling and the snout-only exposure mask and EKG leads attached. After two minutes, he is given an injection of epinephrine (adrenaline) of from 4 to 12 μg/kg. An amount that has previously been determined to be just below that necessary to produce a spontaneous arrhythmia. He is observed for five minutes. If no arrhythmias are produced, the exposure is initiated. After five minutes of exposure, the dog is given a second injection of epinephrine and the exposure is continued for another five minutes while his EKG is monitored for ventricular fibrillations or cardiac arrhythmias. The test is concluded at that point. Each dog can receive multiple exposures each separated by at least one week. The study was designed to allow for the determination of a no-observed-effect level (NOEL) and a threshold.

GLP: Yes

Test substance: 1,1-dichloro-1-fluoroethane, purity 99.99%

Results: No animals responded to the exposure at 1% (10,000 ppm) and 1 of 6 dogs responded to the exposure at 2% (20,000 ppm). Therefore, it was concluded that the NOEL for HCFC 141b in this study was 10,000 ppm while the threshold was 20,000 ppm.

Remarks: The level of epinephrine used represents approximately ten times the level seen in people under stress, this makes the test highly sensitive. In fact, the NOEL determined in this test is well below the minimum exposure level required to induce cardiac effects in man or animals resulting solely from a combination of stress and exposure. This has been demonstrated using CFC 113 as an example. For CFC 113, with injections of epinephrine, the highest NOEL was 2,5000 ppm and the threshold was 5,000 ppm (Reinhardt, 1973). When 12 dogs were exposed to 2,000 ppm for six hours and then given an injection of epinephrine, only one developed an arrhythmia. When dogs were exposed to concentrations up to 12,000 ppm and frightened by electric shock or loud noise, none developed an arrhythmia. Likewise, when

dogs were exercised on a treadmill and exposed to 20,000 ppm of CFC 113, none developed an arrhythmia (Mullin, 1969). No arrhythmias were seen in monkeys exposed to 50,000 ppm or in mice exposed to 100,000 ppm of CFC 113 without injections of epinephrine or other stressers.

Reliability: 1

References:
a) Kenny, T., 1994.
b) Reinhardt, C.F., et al., (1973).
c) Mullin, L.S., 1969

**2. Supporting Study**

Type: Determination of Threshold for Cardiac Sensitization to Adrenalin

Species/strain: Dogs (4), pure-bred, male beagles 3 to 4 months old
Monkeys (2) wild-caught cynomolgus (Macaca fascicularis)

Exposure levels: Up to 5% were used with both dogs and monkeys

Method: The method is the same as described in section 5.10.B.a Primary Study. In this study both monkeys and dogs were trained to accept the procedures. The dogs were found to more readily accept the procedure and were calmer during the exposures. This allowed for the more accurate collection of response data.

GLP study: Yes

Test substance: 1,1-dichloro-1-fluoroethane, 99%

Results: There were no clinical responses seen in the monkeys. At exposure levels above 1% (10,00 ppm) trembling and raising of limbs was reported. These clinical signs were similar to those noted with CFC-11 (trichlorofluoromethane) the positive control substance used in this study. The threshold for cardiac sensitization response to adrenalin injections occurred at 1% (10,000 ppm) with the dogs and between 0.5 to 1.0% (5,000 to 10,000 ppm) with the monkey. This was similar to the response seen with CFC11.

Remarks: This was the first study of cardiac sensitization conducted on HCFC 141b after it was identified as a potential replacement for CFC-11. For that reason, the test animals received separate exposures to both substances. The results indicated that the potential to sensitize the heart to the action of adrenalin was similar for the two substances.

Reliability: 1

References:
a) Hardy, C.J., 1989
b) Brock, W.J., et al., (1995)

## *5.11 EXPERIENCE WITH HUMAN EXPOSURE: CLINICAL

Clinical Study

Species: Human

Exposure Period: 3 and 4 hours

Concentration: 250, 500 and 1000 ppm

Test substance: HCFC 141b purity >99.8%

Method: Seven volunteers were exposed in pairs to vapours of HCFC 141b in an isolated whole body exposure room. During the exposure, volunteers alternated periods of rest with 20-minute periods of exercise on an hourly schedule. Exposure levels were monitored using GC. Lung function and nasal lavage exudate were analyzed. Cardiac function was monitored during both the resting and exercising phases of the study.

GLP: Yes

Results: No change in lung function or cardiac function were observed. There were no significant increases in headache, fatigue, nausea, eye irritation,

| | |
|---|---|
| | or cardiac palpitations. The metabolites found in the urine were similar to those found when laboratory animals were exposed to HCFC 141b |
| Reliability: | 1 |
| Reference: | Tong, Z., et al., (1998) |
| Species: | Seven human each served as his own control |
| Exposure period: | 3 to 4 hours |
| Concentration: | Air control, 250 ppm, 500 ppm, 1000 ppm |
| Test substance: | HCFC 141b purity > 99% |
| Method: | Human volunteers were exposed to vapours of HCFC 141b at the concentrations noted above. The effects of exercise as well as limited evaluations of alertness were measured. The subjects were observed both during the study and for a period of 1 hour after the study for any abnormal clinical signs. Subjects were observed immediately after the exposure for signs of respiratory irritation. Blood and urine samples were analysed for HCFC 141b and its major metabolites. Cardiac function was also measured. |
| GLP: | No |
| Results: | No change in lung or cardiac function was observed in any subject at any level. There were no significant differences in the frequency of headache, fatigue, nausea, eye irritation or cardiac palpitations when air control frequency was compared to frequency during test substance exposures. The metabolites were similar to those found when laboratory animals were exposed to vapours of HCFC 141b. |
| Reliability: | 2 Due to absence of GLP procedures and small sample population |
| Remarks: | This study is the only reported clinical study with HCFC 141b. While limited, it supports previous findings in animal studies. |
| Reference: | Utell, M. and Anders, M., (1997) |

## 5.12 EXPERIENCE WITH HUMAN EXPOSURE: ACCIDENTAL

| | |
|---|---|
| | A 40-year-old man was found collapsed in a factory workroom where he had been cleaning a degreasing tank. The solvent used in the process was HCFC 141b (purity > 99%). The man was found inside the degreasing tank, which was free of liquid. He wore no protective clothes except a surgical mask, which would offer no protection from exposures to vapours of HCFC 141b. His body and clothes were free of any liquid. At postmortem examination, there was evidence of violaceous coloration and edema of the face. He had no history of cardiac or respiratory diseases, but there was evidence of chronic alcohol intoxication. No macroscopic abnormality was found at the autopsy except slight pulmonary edema. High concentrations (14 mg/liter) of HCFC 141b were found in the man's blood. Even higher concentrations were found in the liver and heart (both 29 mg/kg). No urinary metabolites were found. Exposure levels were not estimated, but the high tissue levels indicate that exposure must have been high. This is the only report of a death or illness associated with exposure to HCFC 141b. |
| Reliability: | 3 Since this was an isolated exposure and there were no measurements or estimates of exposure. |
| Reference: | Astier, A. and Paraire, F., 1997 |

### 5.1.3 HumanExposure:Workplace

In a limited study of workplace exposure, levels tended to be at or below 100 ppm.

Reliability: 2 Since the study was limited inscope.

Reference: Shankland, I.R. Blowing Agent Emissions Calculations for a Refigerator. Polyurethanes World Congress, (October 10-13, 1993) pp 154-160.

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