2-CHLORO-1,1,1-TRIFLUOROETHANE

Data were last reviewed in IARC (1986) and the compound was classified in *IARC Monographs* Supplement 7 (1987).

1. Exposure Data

1.1 Chemical and physical data

1.1.1 *Nomenclature*

Chem. Abstr. Serv. Reg. No.: 75-88-7

Chem. Abstr. Name: 2-Chloro-1,1,1-trifluoroethane

1.1.2 *Structural and molecular formulae and relative molecular mass*

$C_2H_2ClF_3$ Relative molecular mass: 118.49

1.1.3 *Physical properties* (for details, see IARC, 1986)

(*a*) *Boiling-point*: 6.9°C

(*b*) *Melting-point*: –105.5°C

(*c*) *Conversion factor*: $mg/m^3 = 4.85 \times ppm$

1.2 Use and human exposure

2-Chloro-1,1,1-trifluoroethane is used as a chemical intermediate in the production of the anaesthetic halothane. Human exposure occurs due to its presence as a low-level impurity in, and as a metabolite of, halothane (IARC, 1986).

2. Studies of Cancer in Humans

No data were available to the Working Group (IARC, 1986).

3. Studies of Cancer in Experimental Animals

2-Chloro-1,1,1-trifluoroethane was tested for carcinogenicity in one experiment in rats by gavage at one dose level. Increased incidences of uterine carcinomas and benign testicular tumours were observed (IARC, 1986).

4. Other Data Relevant to an Evaluation of Carcinogenicity and its Mechanisms

4.1 Absorption, distribution, metabolism and excretion

4.1.1 *Humans*

No data were available to the Working Group.

4.1.2 *Experimental systems*

Male Fischer 344 rats were exposed by inhalation to 1% 2-chloro-1,1,1-trifluoroethane for 2 h and then urine was collected for 24 h. Urinary metabolites identified by ^{19}F nuclear magnetic resonance and gas chromatography/mass spectrometry were 2,2,2-trifluoroethyl glucuronide (16%), trifluoroacetic acid (14%), trifluoroacetaldehyde hydrate (26%), trifluoroacetaldehyde-urea adduct (40%) and inorganic fluoride (3%). A minor, unidentified metabolite was also detected. No covalent binding of fluorine-containing metabolites was observed in the liver and kidney from the exposed rats (Yin *et al*., 1995). In-vitro incubation of 2-chloro-1,1,1-trifluoroethane with rat liver microsomes and an NADPH-generating system has been shown to involve a dechlorination reaction (Salmon *et al*., 1981) that produced trifluoroacetaldehyde hydrate as the only metabolite (Yin *et al*., 1995).

4.2 Toxic effects

4.2.1 *Humans*

No data were available to the Working Group.

4.2.2 *Experimental systems*

The toxicity of 2-chloro-1,1,1-trifluoroethane was reviewed by a WHO task group which concluded that, in an inhalation experiment, the compound produced nasal and lung damage and atrophy of the thymus, spleen, testes and ovaries. In addition, thyroid weight was increased in male rats (WHO, 1992).

4.3 Reproductive and developmental effects

4.3.1 *Humans*

No data were available to the Working Group.

4.3.2 *Experimental systems*

2-Chloro-1,1,1-trifluoroethane was reviewed by a WHO task group, which concluded that it is embryotoxic at exposure concentrations that did not produce clear evidence of maternal toxicity and that there was evidence of teratogenicity (WHO, 1992).

4.4 Genetic and related effects

4.4.1 *Humans*

No data were available to the Working Group.

4.4.2 *Experimental systems*

2-Chloro-1,1,1-trifluoroethane did not induce mutations in *Salmonella typhimurium* (IARC, 1986). 2-Chloro-1,1,1-trifluoroethane was reviewed by a WHO task group, which also concluded that it did not induce mutations in *S. typhimurium*, but additionally that it did not induce chromosomal aberrations in rat bone-marrow cells *in vivo*. Dominant lethal effects were observed in two of three studies in male mice (WHO, 1992).

5. Evaluation

No epidemiological data relevant to the carcinogenicity of 2-chloro-1,1,1-trifluoroethane were available.

There is *limited evidence* in experimental animals for the carcinogenicity of 2-chloro-1,1,1-trifluoroethane.

Overall evaluation

2-Chloro-1,1,1-trifluoroethane is *not classifiable as to its carcinogenicity to humans (Group 3)*.

6. References

IARC (1986) *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans*, Vol. 41, *Some Halogenated Hydrocarbons and Pesticide Exposures*, Lyon, pp. 253–259

IARC (1987) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Suppl. 7, *Overall Evaluations of Carcinogenicity: An Updating of* IARC Monographs *Volumes 1 to 42*, Lyon, p. 60

Salmon, A.G., Jones, R.B. & Mackrodt, W.C. (1981) Microsomal dechlorination of chloroethanes: structure-reactivity relationships. *Xenobiotica*, **11,** 723–734

WHO (1992) *Partially Halogenated Chlorofluorocarbons (Ethane Derivatives)* (Environmental Health Criteria 139), Geneva, International Programme on Chemical Safety

Yin, H., Jones, J.P. & Anders, M.W. (1995) Metabolism of 1-fluoro-1,1,2-trichloroethane, 1,2-dichloro-1,1-difluoroethane, and 1,1,1-trifluoro-2-chloroethane. *Chem. Res. Toxicol.*, **8,** 262–268