

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

November 19, 2001

TO: File for Methyl Sulfonyl Chloride (CAS No. 124-63-0)

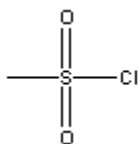
FROM: Michael Depa, Toxics Unit, Air Quality Division

SUBJECT: Development of the Screening Level

The initial threshold screening level (ITSL) for methyl sulfonyl chloride is 2 µg/m³ (annual averaging time).

The following references or databases were searched to identify data to determine the screening level: Environmental Protection Agency's (EPA's) Integrated Risk Information System (IRIS), the Registry of Toxic Effects of Chemical Substances (RTECS), the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), National Institute of Occupational Safety and Health (NIOSH) Pocket Guide to Hazardous Chemicals, Environmental Protection Bureau Library, International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) Online (1967- May 2001), National Library of Medicine (NLM), Health Effects Assessment Summary Tables (HEAST), and National Toxicology Program (NTP) Status Report. The EPA has not established a reference concentration (RfC) or reference dose (RfD) for methyl sulfonyl chloride. The ACGIH and NIOSH have not established Occupational Exposure Limits (OELs). The molecular weight is 114.55 g, and the molecular formula is CH₃ClO₂S. The melting point is -33°C. The boiling point is 161°C, and its physical state is a clear liquid. Methyl sulfonyl chloride is a lachrymator. The molecular structure is pictured in Figure 1.

Figure 1. Molecular Structure of Methyl Sulfonyl Chloride



Animal Toxicity Studies

In an acute inhalation study, groups of 5 male and 5 female CD rats were exposed to 165, 174, or 300 ppm methyl sulfonyl chloride for 1 hour and observed for 14 days (Biodynamics Inc., 1986). The in-chamber particle count determination suggested that there was only a very small amount of aerosol during exposure with the majority of these particles at 1.4 microns or less. A 1-hour LC-50 could not be derived from this data but the authors felt that it was most likely to be in the range of 175 to 250 ppm (see Table 1.).

Table 1. Mortality of 1-hr Inhalation Exposure (Biodynamics Inc., 1986)

Dose Group	Male Mortality	Female Mortality
165 ppm	1/5	0/5
174 ppm	1/5	1/5
300 ppm	5/5	5/5

In another acute inhalation study, groups of 5 male and 5 female Sprague-Dawley rats were exposed to 0, 95.5, 130.6, or 251.6 mg/m³ methane sulfonyl chloride for 4 hours and observed for 14 days (HRC, 1987). Signs observed during exposure included closing or partial closing of the eyes, wet fur around the mouth, disturbances of the respiratory pattern and adoption of a hunched body posture. Signs observed during the observation period included lethargy and disturbances of the respiratory pattern which persisted for several days in rats that survived exposure. Mortality is shown in Table 2.

Table 2. Mortality from Acute Inhalation Exposure to Methane Sulfonyl Chloride (HRC, 1987)

Dose Group	Males	Females	Total
Control	0/5	0/5	0/10
95.5	1/5	0/5	1/10
130.6	4/5	5/5	9/10
251.6	5/5	5/5	10/10

The rats that survived exposure to methane sulfonyl chloride lost weight or gained at a reduced rate for up to 2 days following exposure. Subsequently the rate of body weight gain was similar to that of the control rats. In groups with rats surviving to 14 days following exposure there was a marked to moderate reduction in food consumption for up to 1-2 days and slightly reduced consumption for 2-3 further days. There was a marked to moderate reduction in water consumption for up to 4 days in groups exposed at 95.5 or 130.6 mg/m³. The lung to body weight ratio was higher than normal for most decedent rats. Lung congestion and damage to the corneal surface of the eyes was seen in a high proportion of the decedent and considered to be treatment-related. The 4-hour LC-50 was determined to be 117.7 mg/m³ (25 ppm) ±12.7 mg/m³.

In a 1-hour LC-50 study, groups of 5 WBS/S mice were dosed with 0.7, 1.0, 1.4, 2.0, 2.8 and 4.0 mg/L methane sulfonyl chloride for 1 hour and observed for three weeks (Pharmacology Research Inc., 1976). Severe sensory irritation (eyes, nose), mild lacrimation, peripheral vasodilation, and bronchospastic gasping, recovery was virtually complete one or two hours after exposure. Pronounced and prolong losses in body weight occurred post-exposure. Hemorrhagic lungs were found in the animals which succumbed after exposure was terminated. The 1-hour LC-50 was determined to be 1.9 mg/L (1900 mg/m³) (see Table 3.).

Table 3. Mortality of Mice After 1-hr Exposure (Pharmacology Research Inc., 1976)

Dose	Number Dead per Number Exposed	Mortality %	Day of Death
0.7	0/5	0%	- - - - -
1.0	0/5	0%	- - - - -
1.4	3/5	60%	- - 2 2 10
2.0	2/5	40%	- - - 1 2
2.8	3/5	60%	- - 1 2 8
4.0	5/5	100%	1 1 1 1 2

In an acute oral toxicity study, groups of WBS/W rats (sex no given) were gavaged with 100, 141, 200, 283, or 400 mg/kg methane sulfonyl chloride and observed for 7 days (Pharmacology Research Inc., 1977). General distress (immediate) and hypotonia was observed. Surviving animals showed significant losses in body weight for one to 5 days but these were recovered 2 to 7 days after treatment. Autopsies revealed the glandular gastric mucous to be severely hemorrhagic (black). The LD-50 was determined to be 255 mg/kg (95% confidence limit = 205-317).

Derivation of the ITSL

The best study with which to derive an ITSL was determined to be the 4-hr LC50 study by HRC (1987). The ITSL was calculated pursuant to Rule 232(1)(f) as follows:

$$\text{ITSL} = \text{LC50}/(500 \times 100)$$

$$\text{ITSL} = (117.7 \text{ mg/m}^3)/50000$$

$$\text{ITSL} = 0.00235 \text{ mg/m}^3$$

$$\text{ITSL} = 2 \text{ }\mu\text{g/m}^3 \text{ (annual averaging time)}$$

The ITSL for methyl sulfonyl chloride is 2 $\mu\text{g/m}^3$ (averaging time) based on Rule 232(1)(f).

References

Biodynamics. 1986. An acute inhalation toxicity study of methane sulfonyl chloride in the rat. Project No. 85-7854. Submitted to Joel Seckar, Pennwalt Corporation

HRC. 1987. Methane sulfonyl chloride acute inhalation toxicity in rats 4-hour exposure. Huntingdon Research Centre, Huntingdon, England. Authors: Joel Seckar, Colin Hardy and Graham Jackson. PWT 45/861670.

Pharmacology Research Inc. 1976. (2) One-hour inhalation toxicity in mice. Letter from A.R. Latven of Pharmacology Research Inc. to George Abbott of Pennwalt Corporation dated 1 September 1st, 1976.

Pharmacology Research Inc. 1977. (2) Acute oral toxicity in rats. Letter from A.R. Latven of Pharmacology Research Inc. to George Abbott of Pennwalt Corporation dated November 8th, 1977.

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