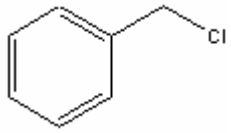
FOREWORD INTRODUCTION

BENZYL CHLORIDE

CAS N°: 100-44-7

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	100-44-7
Chemical Name	Benzyl chloride
Structural formula	

CONCLUSIONS AND RECOMMENDATIONS

Environment

The chemical is hydrolyzed to benzyl alcohol in a temperature dependent manner in aquatic environment and benzyl alcohol is readily biodegradable. The chemical has high toxicity to aquatic organisms. However, toxicity of benzyl alcohol is low. Although PEC/PNEC ratio of the chemical is greater than 1 based on the local exposure scenario in the Sponsor country, PEC/PNEC ratio of benzyl alcohol is considered to be less than 1. Therefore, it is currently considered of low potential risk generally, but the environmental fate and degree of hydrolysis should be considered by each country.

Human health

The chemical is toxic in a repeated dose study (i.e. stomach, heart, liver) and carcinogenic in rats (thyroid) and mice (liver, stomach, lung). Genotoxicity of the chemical seems weakly positive. The chemical is also considered as an irritant to skin, eyes and respiratory system. The chemical is considered as a possible carcinogen although there is no clear evidence in human. There is no available information on consumer use. As the chemical is rapidly hydrolyzed to benzyl alcohol in water phase, health risk via environment was assessed as benzyl alcohol exposure. As margin of safety for indirect exposure is more than 5×10^5, it is currently considered of low potential risk for the population via the environment. Depending on the current exposure situation further risk management in the workplace may be necessary or considered by countries.

SHORT SUMMARY WHICH SUPPORTS THE REASONS FOR THE CONCLUSIONS AND RECOMMENDATIONS

Benzyl chloride is liquid at room temperature and the production volume is ca. 7,700 tonnes/year in 1993 in Japan. The chemical is used as intermediate for organic synthesis (benzyl alcohol, dyes and perfumes). No consumer use is reported. The chemical is classified as “readily biodegradable”. In a Japanese environmental survey, the chemical was not detected from surface water, sediments and biota in 1977 and 1990.

The potential environmental distribution of benzyl chloride obtained from a generic fugacity model (Mackey level III) showed the chemical will be distributed mainly to air and water. Predicted environmental concentration (PEC_{local}) of the chemical was estimated as 1.8×10^{-3} mg/l from Japanese local exposure scenario.

The main route of occupational exposure is inhalation with workers potentially exposed during drum and tank filling operation. The daily intake was estimated to be 0.096 mg/kg/day as the worst case, based on the average atmosphere concentration. As for indirect exposure via the environment, the assessment was conducted on assumption that all of benzyl chloride would be converted to benzyl alcohol and the environmental concentration would be the same of the predicted benzyl chloride concentration because benzyl chloride is rapidly hydrolysed to benzyl alcohol in water phase. The daily intakes through drinking water and fish are estimated as 6.00 x 10^{-5} mg/kg/day and 1.35 x 10^{-4} mg/kg/day, respectively, based on the highest predicted environmental concentration of 1.80 x 10^{-3} mg/l.

As the lowest acute toxicity data to each of algae, zooplankton and fish, 96 h-EC_{50} of *Selenastrum capricornutum* (19.3 mg/l), 48 h-EC50 of *Daphnia magna* (3.2 mg/l) and 14 d-LC_{50} of *Poecilia reticulata* (0.39 mg/l) were selected. As the lowest chronic toxicity data to algae and zooplankton, 72 h-NOEC (growth) of *Selenastrum capricornutum* (10.0 mg/l) and 21d-NOEC (reproduction) of *Daphnia magna* (0.1 mg/l) were adopted. Therefore, the assessment factors of 100 were applied to both acute and chronic toxicity data to determine PNEC, according to the OECD Provisional Guidance for Initial Assessment of Aquatic Effects, because chronic toxicity data for fish was absent. Thus, PNEC of benzyl chloride is 0.001 mg/l. PEC/ PNEC ratio (1.8) of the chemical is greater than 1. However, the PEC/PNEC ratio of benzyl alcohol (0.015), which is a hydrolyzed product of the chemical, is expected to be less than 1. It is currently considered 'needs further work on environmental fate'.

Benzyl chloride is considered as an irritant to the skin, eye, respiratory system and some evidence of sensitization exists. Major toxicity of the chemical in subchronic study was the tissue damage in the heart and stomach, and a slight developmental change was observed on fetus. The no observed effect level was as 6.4 mg/kg/day for repeated dose toxicity and 50 mg/kg/day for developmental toxicity, respectively. As for benzyl alcohol, the no observed effect level was 100 mg/kg/day in a subchronic study and neoplastic changes were not observed in a two year carcinogenicity study.

For non-cancer endpoint, occupational risk is considered to be low because a margin of safety is calculated to be 66.7 as the worst case. There is no available information on consumer exposure. The margin of safety of benzyl alcohol for drinking water or fish was calculated as 1.67 x 10^{6} or 7.41 x 10^{5}, based on no observed effect level of 100 mg/kg/day. As the margin of safety for benzyl alcohol via indirect exposure is sufficient, it is currently considered of low potential human risk.

In carcinogenicity study, thyroid C-cell adenoma/carcinoma in female rats and hemangioma/hemangiosarcoma, forestomach carcinoma/papilloma in male mice and forestomach carcinoma/papilloma, lung alveolar-bronchiolar adenoma/carcinoma in female mice were observed in a dose-dependent manner. Hepatocellular carcinoma/adenoma was observed in only male mice in none dose-dependent manner. In vitro genotoxicity study showed negative or weakly positive and in vivo micronucleus test presented the negative result. Therefore the possibility of occupational cancer risk could not be excluded.

IF FURTHER WORK IS RECOMMENDED, SUMMARISE ITS NATURE

Depending on the current exposure situation further risk management in the workplace may be necessary or considered by countries.

COVER PAGE
SIDS Initial Assessment Report
for
8th SIAM

(France, October 28-30, 1998)

Chemical Name: Benzyl chloride
CAS No: 100-44-7
Sponsor Country: Japan

National SIDS Contact Point in Sponsor Country: Mr. Kenichi Suganuma
Ministry of Foreign Affairs, Japan

HISTORY:

SIDS Testing Plan were reviewed in SIDS Review Process, where the following SIDS Testing Plan was agreed:

no testing (X)
testing ( )

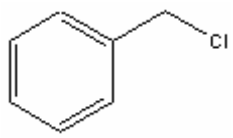
Deadline for circulation: July 31, 1998
Date of Circulation: October 5, 1998
(To all National SIDS Contact Points and the OECD Secretariat)

SIDS INITIAL ASSESSMENT REPORT

Benzyl chloride (CAS No. 100 - 44 - 7)

1. IDENTITY

- OECD Name: Benzyl chloride
- Synonym: omega-Chlorotoluene; Chlorophenylmethane; (chloromethyl)Benzene; alpha-Chlorotoluene; tolyl chloride
- CAS Number: 100 - 44 - 7
- Empirical Formula:
- Structural Formula:



- Degree of Purity: 99.8 %
- Major Impurity: Benzal chloride, Benzaldehyde, Chlorotoluene, 2,4-Dichlorotoluene, Toluene
- Essential Additives: None
- Physical-chemical properties
  - Melting Point: -43°C
  - Vapour pressure: 9.3×10^3 Pa at 55 °C
    1.9×10^4 Pa at 60 °C
  - Water solubility: ca. 1.2 g/l
  - Log Pow: 2.66

2. GENERAL INFORMATION ON EXPOSURE

2.1 Production and import

7,759 tonnes/year in 1993 in Japan

2.2 Use pattern

Intermediate in closed system.
Intermediate for organic synthesis (benzyl alcohol, dyes, perfumes)

2.3 Other information

3. ENVIRONMENT

3.1 Environmental Exposure

3.1.1 General Discussion

Benzyl chloride is rapidly hydrolysed to benzyl alcohol in water phase, and is readily biodegradable (OECD 301C: 70.9% after 2 weeks).

The potential environmental distribution of benzyl chloride obtained from a generic Mackay level III fugacity model is shown in Table 1. Parameters used for this model are shown as Annex to this report. The results show that, if benzyl chloride is released into air, water or soil, it is unlikely to be distributed into other compartments..

Table 1 Environmental distribution of benzyl chloride using a generic level III fugacity model.

Compartment	Release 100% to air	Release 100% to water	Release 100% to soil
Air	99.7 %	8.2 %	1.0 %
Water	0.3 %	91.8 %	0.0 %
Soil	0.0 %	0.0 %	99.0 %
Sediment	0.0 %	0.0 %	0.0 %

As this chemical is used in closed system and is not included in consumer products, its release to the environments may occur only from the production cites.

3.1.2 Predicted Environmental Concentration

As benzyl chloride is produced under the well controlled closed system, amount of release to air phase is negligibly small. The waste of benzyl chloride treated in own wastewater treatment plant and then released into river. The waste of benzyl chloride is released into the river through the manufacturer's wastewater-treatment plant. Therefore, Predicted Environmental Concentration (PEC) will be calculated only for the water environment.

Local exposure

According to the report from a Japanese manufacturer, 122 kg/year (measured) of benzyl chloride was released with 2.6 x 10^{10} l/year of effluent into the river whose flow rate is 10.2 x 10^{10} l/year. Local Predicted Environmental Concentration (PEC_{local}) is calculated to be 1.8 x 10^{-3} mg/l, employing the following model and dilution factor of 2.6.(See Appendix 1)

Amount of release (122 x 10^{6} mg/y)
Volume of effluent (2.6 x 10^{10} l/y) x Dilution factor (2.6)

3.2 Effects on the Environments

3.2.1 Effects on aquatic organisms

Acute and chronic toxicity data of Benzyl chloride to aquatic organisms are summarized below (Table 2). Predicted no effect concentration (PNEC) of this chemical was determined mainly based on the toxicity data obtained by the Environmental Agency of Japan. Other data reported by different organizations were also examined to evaluate effects of this chemical on aquatic environments. As the lowest acute toxicity data to each of algae, zooplankton and fish, 96 h-EC50 (19.3 mg/l) of *Selenastrum capricornutum*, 48 h-EC50 (3.2 mg/l) of *Daphnia magna* and 14 d-LC50 (0.39 mg/l) of guppy were selected, respectively. As the lowest chronic toxicity data to algae

and Zooplankton, 72 h-NOEC (10.0 mg/l) of *Selenastrum capricornutum* (growth) and 21d-NOEC (0.1 mg/l) of *Daphnia magna* (reproduction) were adopted. Therefore, the assessment factors of 100 were used to both acute and chronic toxicity data to determine PNEC, according to the OECD Provisional Guidance for Initial Assessment of Aquatic Effects (EXCH/MANUAL/96-4-5.DOC/May 1996) because chronic toxicity data for fish was absent.

From acute toxicity data (14 d-LC50 of guppy): PNEC = 0. 39/ 100= 0.0039
From chronic toxicity data (NOEC of 21 d *Daphnia*): PNEC = 0.1/ 100 = 0.001 mg/l

Thus, PNEC of Benzyl chloride is 0.001 mg/l.

The LC50 values of *Orizias latipes* and *Pimephales promelas* decreased significantly from first to fourth day in the 4-d acute toxicity tests, suggesting the necessity of chronic toxicity tests on fish and/or other aquatic organisms since LC50 of most chemicals to fish usually do not change so much in acute toxicity tests.

Table 2 Toxicity data of Benzyl chloride to aquatic organisms at different trophic levels. Relatively high toxicity data were selected from AQUIRE data base.

Species	Endpoint	Conc. (mg/l)	Remarks
Selenastrum capricornutum (algae)	Gro 72 h EC50 do. 72 h NOEC	19.3 10.0	a, 1), A c, 1), C)
Daphnia magna (Water flea)	Imm 24 h EC50 48 h EC50 Rep 21 d NOEC	4.2 3.2 0.10	a, 1) a, 1), A c, 1), C
Penaeus setiferus (shrimp)	Mor 24 h LC50 Mor 48 h LC50 Mor 96 h LC50	7.1 4.4 3.9	a, 2) a, 2) a, 2)
Oryzias latipes (fish, Medaka)	Mor 24 h LC50 Mor 48 h LC50 Mor 72 h LC50 Mor 96 h LC50	7.5 4.2 2.4 1.9	a, 1) a, 1) a, 1) a, 1),
Pimehales promelas (fathead minnow)	Mor 24 h LC50 Mor 48 h LC50 Mor 96 h LC50	12.5 7.3 5.0	a, 3) a, 3) a, 3)
Brachydanio rario (zebrafish)	Mor 96 h LC50	4.0	a, 4)
Poecilia reticulata (guppy)	Mor 14 d LC50	0.39	a, 5) A

Notes: Gro; growth, Imm; immobilization, Mor; mortality, Rep; reproduction, No. 1- 4), reference number, A), C); selected as the lowest value respectively among the acute or chronic toxicity data of algae, cladocera (water flea) and fishes to determine PNEC of Benzyl chloride.

Table 3 Half-live times of Benzyl chloride in water at different water temperature

Water temperature	k Hydrolysis (s^{-1})	$t_{1/2}$	References
0	1.33×10^{-6}	ca. 6 d	6)Hills & Viana(1971)
5	1.25×10^{-6}	ca. 6.5 d	
10	1.67×10^{-6}	ca. 5 d	
15	2.92×10^{-6}	ca. 3 d	
25	1.38×10^{-5}	ca. 14 h	7)Fierens & Berkowithch(1957)
30	2.42×10^{-5}	ca. 6 h	8)Oliver (1934)

6) – 8); reference number

3.2.2 Terrestrial effects

Panagrellus redivivus (Nematoda) 96 h LC60: ca. 126 mg/l
(Samoiloff, E.R. et al., (1980) Can. J. Fish. Aquat. Sci., 37, 1167-1174.

3.2.3 Other effects

3.3 Initial Assessment for the Environment

Predicted no effect Concentration (PNEC) of Benzyl Chloride for aquatic organisms is calculated based on the lowest acute and/or chronic toxicity data among algae, cladocera (water flea) and fishes and assessment factor of 100.

PNEC = 0.1 (NOEC of *Daphnia*)/ 100 = 0.001 mg/l

The highest PEC from Japanese local exposure scenario is 1.8×10^{-3} mg/l

PEC_{local} / PNEC = 1.8×10^{-3}/ 0.001 = 1.8 > 1

PEC/PNEC ratio exceeded a critical value, 1. However, it is unrealistic to use this ratio for risk assessment of this chemical because this chemical is unstable in aquatic environments. Benzyl Chloride is hydrolyzed to Benzyl Alcohol in water depending on water temperature. For example, it is assumed that almost all of Benzyl Chloride is hydrolyzed to Benzyl Alcohol in several days at 25 C according to several data cited in Table 3. Therefore, risk assessment of Benzyl Alcohol is needed rather than Benzyl Chloride itself. According to AQUIRE, about 40 toxicity data are cited to various aquatic organisms including algae, daphnids and fishes. Toxicity of Benzyl Alcohol to aquatic organisms are very low because all available toxicity data are higher than 10 mg/L. PNEC of Benzyl Alcohol is decided as follows based on the highest acute toxicity data, 10 mg/l (4-d LC50 of Bluegill, Ref. no. 9) and assessment factor of 100 because three acute toxicity data (algae, daphnia and fish) are available.

PNEC (Benzyl Alcohol) = 10 /100 = 0.1 mg/L

On the other hand, PEC of Benzyl Alcohol is tentatively determined based of PEC of Benzyl Chloride and molecular weight ration of both chemicals.

PEC (Benzyl Alcohol) = 1.8×10^{-3} x (108.1/126.6) = 1.5×10^{-3} mg/l

In this case, PEC_{local} / PNEC of Benzyl Alcohol = 1.5×10^{-3} / 0.1 = 0.015 < 1

This ratio indicates that effects of Benzyl Chloride on aquatic ecosystems is at low concern at present. However, the hydrolysis rate of Benzyl Chloride depends on water temperature (Table 3). Therefore, the PEC/PNEC varies from season to season and/or country to country. This fact suggests the necessity of monitoring of the actual concentration of Benzyl Chloride or of estimation of hydrolysis rate.

References

1) Toxicity data of the tests were conducted by the Environment Agency of Japan based on OECD Test Guide Lines.
2) Curtis, M.W., Copeland, T.L. and Ward, C.H. (1979) Acute toxicity of 12 industrial chemicals to freshwater and saltwater organisms. Water Res. 13 (2), 137-141.
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4. 1 Human Exposure

4.1.1 Occupational exposure

Benzyl chloride is produced in closed systems of Japanese factories. Occupational exposures in production sites were expected in dram and tank filling operations. The major route of exposure is inhalation. Local exhaust ventilation systems were in place at the operation sites. Workers wear protective gloves and respiratory protective equipment during these operations. The concentrations in atmosphere measured along with the duration and frequency of each operation were as follows;

Operations	Average concentration	Duration	Frequency
Drum filling	1 mg/m^3	150 min	127 /year
Tank filling	4.4 mg/m^3	90 min	235 /year

If a single worker is assigned to implement all above daily operation for a year without mask, the daily intake is calculated as 0.096 mg/kg/day, based on the time weighted average atmosphere concentration, body weight of 70 kg and respiratory volume of 1.25 m^3/hour.

Although these operations were semi-automatic, and workers wear protective gloves, possibility of accidental dermal exposure could not be excluded. In such cases, exposure was classified as non-dispersive use, direct handling, and incidental contact. Therefore, dermal exposure was estimated to be 0-0.1 mg/cm^2/day. Using surface area of 840 cm^2, and yearly average working hours per day, estimated human exposure were 0-0.13, and 0-0.15 mg/kg/day for drum filling, and tank filling operations.

Occupational exposure levels measured in Australia at a factory manufacturing quaternary ammonium chlorides using benzyl chloride were 0.46-0.55, 2.3, and 0.74 mg/m^3 for drum decanting, benzyl chloride charging, and unspecified operation, respectively. Estimated human exposure for these operations were less than the cases in Japanese production factory.

4.1.2 Consumer exposure

There are no available data.

4.1.3 Indirect exposure via the environment

Benzyl chloride is rapidly hydrolysed to benzyl alcohol in water phase. Benzyl alcohol is readily biodegradable. The exposure to the general population via the environment would be possible through drinking water processed from surface water and through fish which may accumulate this chemical. The concentration in drinking water should be estimated to be equal to the predicted environmental concentration of 1.80 x 10^{-3} mg/l. The daily intake through drinking water is calculated as 6.00 x 10^{-5} mg/kg/day (2 l/day, 60 kg b.w.).

Because benzyl chloride is rapidly hydrolysed to benzyl alcohol in water phase, bioaccumulation test for benzyl chloride can not be performed. However, using partition coefficient of benzyl chloride ($\log_{10}P_{ow}$; 2.66), bioconcentration factor is expected to be about 50. Using the predicted bioconcentration factor of 50, the concentration of this chemical in fish can be calculated as follows:

$$PEC_{fish} = (1.80 \times 10^{-3} \text{ mg/l}) \times 50 = 9.00 \times 10^{-5} \text{ mg/g-wet}$$

As a daily intake of fish in Japan is estimated to be 90 g for 60 kg body weight person, a daily intake of this chemical will be 1.35 x 10^{-4} mg/kg/day.

4.2 Effects on Human Health

a) Acute toxicity

Oral:
- Rats: LD_{50}: 1231 mg/kg [SIDS data]
- Mice: LD_{50}: 1500 mg/kg

Inhalation:
- Rats: LC_{50}: 740 mg/m^3 (150 ppm)/2 hr [SIDS data]
  LC_0: 1970 mg/m^3 (400 ppm)/1 hr
- Mice: LC_{50}: 390 mg/m^3 (80 ppm)/2 hr
  LC_0: 1970 mg/m^3 (400 ppm)/1 hr

In the EU criteria, benzyl chloride is acutely toxic by inhalation and oral routes (classified as R22 & R23).

Subcutaneous:

Rats: LD_{50}: 1000 mg/kg

b) Irritation

[SIDS data] Exposure of the rabbit ear skin to 0.5 ml benzyl chloride for 24 hours resulted in severe reddening, swelling and subsequent necrotic changes. Rabbits and cats exposed for 8 hours/day, 6 days at 95 ppm (462 mg/m^3) showed eye and respiratory tract irritation.

Irritation of mucous membranes and conjunctivitis followed exposure at 100-1000 mg/m^3 (21-205 ppm) for 2 hours (IARC: 1987). In the oral administration of repeated toxicity study, gastric irritation was reported at the 125 and 250 mg/kg dose levels. The inhalation study showed that both the respiratory and olfactory tract irritations were produced at 46 ppm (224 mg/m^3).

Based on these data, this chemical is considered as irritating to the skin, eyes and respiratory system.

c) Sensitisation

There are some data on skin sensitisation. Landsteiner & Jacobi reported this chemical was sensitising to guinea pig (1936). The other reports presented that this response was strong (von Oettingen: 1955) and leukopenia had also been observed (Mikhailova: 1964).

However, benzyl chloride is not currently classified as a sensitizer by EU data.

d) Repeated toxicity

Inhalation toxicity study was performed in Swiss OF_1 mice at concentrations of 22 and 46 ppm for 4, 9, 14 days (6 hours per day). As a result, pathological change in both the anterior respiratory epithelium adjacent to vestibule and the olfactory epithelium in the dorsal meatus was observed at 46 ppm. This change was severe in 4-day and 14-day exposure groups and very severe in 9-day exposure group. No change of trachea and lungs was observed. Based on pathological change, NOEL was considered to be 22 ppm (107 mg/m^3), equivalent to roughly 40 mg/kg/day.

[SIDS data] Oral toxicity study for 26 weeks was performed (3 times per week) in 10 male and 10 female F-344 rats at doses of 0 (vehicle; corn oil), 15, 30, 62, 125, 250 mg/kg (calculated daily doses: 6.4, 12.9, 26.6, 53.6, 107.1 mg/kg/day).

All rats died within 2 weeks in males at 250 mg/kg and in females at 250, 125 mg/kg. All rats died within 3 weeks in males at 125 mg/kg. The cause of death was mainly severe acute and chronic gastritis of the forestomach, often with ulcers. In addition, acute myocardial necrosis and edema of the heart were also observed frequently, which were probably the common causes of death at the highest dose. In female rats at 62 mg/kg, only 4 of which survived to 26 week, there were acute myocardial necrosis (in 4) and hyperplasia of the forestomach. A few female rats at 30 mg/kg had hyperkeratosis of the forestomach. A statistically significant depression of weight gain was observed in male rats at 62 mg/kg, while in female rats it was smaller. NOEL was considered to be 30 mg/kg for male (12.9 mg/kg/day) and 15 mg/kg for female (6.4 mg/kg/day).

Oral toxicity study for 26 weeks was performed (three times per week) in $B6C3F_1$ mice at doses of 0, 6.3, 12.5, 50.0, 100.0 mg/kg (calculated daily doses: 2.7, 5.4, 10.7, 21.4, 42.9 mg/kg/day). The growth retention in any treated groups was not observed. In histopathologic examination, severe hyperplasia of the liver was frequently observed at 100 mg/kg dose. At 50 mg/kg and the lower dose levels, the hyperplasia was occasionally severe, but was more usually moderate. No effect level was mentioned.

In the EU criteria, benzyl chloride is classified as R48/20/22.

e) Reproductive/developmental toxicity

[SIDS data] Oral teratogenic study was performed in female SD(Crj:CD) rats at doses of 0 (vehicle: corn oil), 50, 100 mg/kg/day from day 6 through day 15 of gestation.

Any toxicities were not observed in the dams. The number of implantations, resorptions, and live fetuses and the mean fetal weight were not affected at both dosage groups. Only significant change was the reduction of fetal length at 100 mg/kg. All live fetuses were normal in the external appearance. No major skeletal or visceral abnormalities resulting from treatment with benzyl chloride were noted. No significant increase was detected in the number of skeletal and visceral variations. Based on the reduction of fetal length, NOEL for fetal toxicity was considered to be 50 mg/kg. NOEL for teratogenicity was considered to be 100 mg/kg because no teratogenic changes were observed.

Sperm head abnormality test was performed for five days in male F_1 mice subcutaneously at doses of 0 (vehicle; Tween), 125, 250, 500 mg/kg and intraperitoneally at doses of 0, 50, 100, 200, 400 mg/kg. Small increased in sperm head abnormalities was seen with the lethal dose (500 mg/kg in subcutaneous study, 200 and 400 mg/kg in intraperitoneal study). NOEL was considered to be 250 mg/kg in subcutaneous study and 100 mg/kg in intraperitoneal study.

f) Genetic toxicity

[SIDS data] Benzyl chloride was weakly mutagenic to S. Typhimurium TA100 and Escherichia coli WP2 uvrA with or without metabolic activation, but not mutagenic to S. Typhimurium TA98 (Vennit *et al.*: 1982). It was also shown that this chemical was considerably weak in micronucleus test of Syrian hamster embryo fibroblast without metabolic activation (G.Schmuck et al.: 1988). On the other hand, it was shown that the chemical did not induce micronucleus at doses of 0, 75, 150, 300, 600 mg/kg in mice in vivo (N.Danford & Parry: 1982).

North and Parry (1982) reported that benzyl chloride produced differential cytotoxicity for a mutant of *Saccharomyces cerevisiae*, the extent of which was dependent on the presence of genes regulating DNA repair. In Drosophila melanogaster, benzyl chloride was found to induce somatic mutations more readily than sex-linked alterations (Fahmy and Fahmy, 1982). In cultured rodent cells, benzyl chloride was slightly mutagenic to DNA excision-repair deficient strains of CHO cells (Hoy *et al*.: 1984), and weakly induced sister chromatid exchanges of CHO cells (K.Hemminki et al.: 1983). In cultured human cells, benzyl chloride induced DNA strand breaks (Mirzayans *et al.*: 1982) but not unscheduled DNA synthesis (Booth *et al*.: 1983) or chromosomal aberrations (Hartley: 1982).

Balance of evidence supports that benzyl chloride might be weakly genotoxic.

g) Carcinogenicity

In a NCI carcinogenicity bioassay (Lijinsky, 1986), F-344 rats (52/sex/dose) and B6C3F1 mice (52/sex/dose) were administered benzyl chloride in corn oil by gavage 3 times/week for 104 weeks. Rats received either 0, 15, or 30 mg/kg per dose (estimated daily dose: 0, 6.4, 12.85 mg/kg); mice received either 0, 50, or 100 mg/kg per dose (estimated daily dose: 0, 21.4, 42.85 mg/kg). They were sacrificed for comprehensive histological examination 3 to 4 weeks after the last dose. No significant differences in survival were seen between treated and control groups. In rats, the only statistically significant increase in the tumor incidence attributed to treatment was thyroid C-cell adenoma/carcinoma in the female high-dose group (4/52, 8/51, 14/52 for control, low and high doses, respectively). In male mice, statistically significant increases in the following tumor incidences were observed: hemangioma/hemangiosarcoma in the high-dose group (0/52, 0/52, 5/52)

hepatocellular carcinoma/adenoma in the low-dose group (17/52, 28/52, 20/51), forestomach carcinoma in the high-dose group (0/51, 2/52, 8/52), and forestomach carcinoma/papilloma in the high-dose group (0/51, 4/52, 32/52). In female mice, a statistically significant increase in the incidence of forestomach carcinoma/papilloma was reported in the high-dose group (0/52, 5/50, 19/51). Also, a slightly increased incidence of lung alveolar-bronchiolar adenoma/carcinoma (1/52, 2/51, 6/51) was observed in the high-dose group of female mice.

Fukuda et al. (1981) conducted two skin-painting studies on female specific pathogen-free ICR mice, using benzyl chloride dissolved in benzene. In the first study, no tumors were observed in 11 mice treated with 10 µl benzyl chloride 3 times/week for 4 weeks, followed by 2 times/week until termination at 40 weeks. In the second study, 2.3 µl benzyl chloride was diluted to a final volume of 25 µl with benzene and applied to the skin of 7-week-old mice 2 times/week for 50 weeks. Two of 20 control animals developed lung adenomas, while 5/20 treated mice developed tumors, including 2 lung adenomas and 3 skin carcinomas. Two of the skin carcinomas metastasized to the primary lymphatic organs, liver, or kidneys. In respect of lung adenomas, exposure route of inhalation is suspected because these were not observed in other studies by oral, subcutaneous, and intraperitoneal route. Although skin tumor incidences were not statistically significantly greater than controls, the authors considered that benzyl chloride is a weak carcinogen when applied topically. However, the validity of this study is questionable, because benzene, which is regarded as a carcinogen in animals, was used as solvent in the second study, and administration of benzyl chloride on its own caused no tumours in the first study.

Efforts to assess the potency of benzyl chloride as a carcinogen and skin tumor initiator provided predominantly negative results. Coombs (1982a) applied 1.0 mg benzyl chloride in toluene to the backs of 40 T.O. (Swiss-Webster derived Theiler's Original) mice, followed by twice weekly treatments of croton oil in toluene for 10 months. While 8/19 positive controls treated with 0.4 mg benzo[a]pyrene developed skin tumors, none (0/37) of the benzyl chloride-treated mice did. In a second initiation-promotion test, Coombs (1982b) topically applied 10, 100, or 1000 µg benzyl chloride in acetone to Sencar mice, followed by twice weekly applications of the promotor 12-O-tetra-3'-decanoyl- phorbol-3'-acetate. At the end of 11 weeks, all of the positive controls treated with 7,12-dimethylbenz[a]anthracene had skin tumors, whereas at 6 months (approximately 12 weeks later), only 20% of the mice treated with benzyl chloride showed similar changes. Ashby et al. (1982) topically applied 100 µg benzyl chloride in toluene twice weekly to 20 Swiss mice. After 7.5 months, none of the treated mice had skin tumors compared with 18/20 of the positive controls treated with benzo[a]pyrene.

Druckrey et al. (1970) administered benzyl chloride in peanut oil via weekly subcutaneous injection to BD-strain rats for 51 weeks. Local sarcomas were produced in 3/14 rats given 40 mg/kg/week and in 6/8 rats given 80 mg/kg/week, but not in the control. The average induction time was 500 days and metastases to the lung occurred in the high-dose group only.

Groups of 20 strain A/He mice were injected intraperitoneally over a 24-week period with benzyl chloride in tricaprylin (total doses of 4.7, 11.8, or 15.8 mmol/kg). No differences in pulmonary adenoma formation between treated and vehicle control mice were observed (Poirier et al., 1975).

4.3 Initial Assessment for Human Health

The main route of occupational exposure is inhalation with workers potentially exposed during dram and tank filling operation. The daily intake was estimated to be 0.096 mg/kg/day as the worst case, based on the average atmosphere concentration. There is no available information on

consumer exposure. As for indirect exposure via the environment, the assessment was conducted on assumption that all of benzyl chloride had converted to benzyl alcohol and the environmental concentration was the same of the predicted benzyl chloride concentration because benzyl chloride is rapidly hydrolysed to benzyl alcohol in water phase. The daily intakes through drinking water and fish are estimated as 6.00×10^{-5} mg/kg/day and 1.35×10^{-4} mg/kg/day, respectively, based on the highest predicted environmental concentration of 1.80×10^{-3} mg/l.

Non-cancer endpoint

Benzyl chloride is considered as an irritant to the skin, eye, respiratory system and some evidence of sensitization exists. Major toxicity of the chemical in subchronic study was the tissue damages in heart, stomach and liver, and a slight developmental change was observed on fetus. The NOELs were 6.4 mg/kg/day for repeated dose toxicity and 50 mg/kg/day for developmental toxicity. As for benzyl alcohol, oral LD_{50} values in rats and mice range between 1,230 and 1,580 mg/kg. In developmental toxicity study conducted only at a dose of 75 mg/kg/day, the treatment related effect was not observed, except for maternal and neonatal body weight change. In 13 weeks subchronic study, neurotoxicity was the major adverse effect in rats and mice. NOELs were 100 mg/kg/day for rats and 200 mg/kg/day for mice, based on reduction of body weight gain and neoplastic changes were not observed in two years carcinogenicity study.

As the margin of safety via occupational exposure was calculated as 66.7, based on the daily intake of 0.096 mg/kg/day as the worst case and the lowest NOEL of 6.4 mg/kg/day, health risk is considered to be probably low because workers usually wear masks. The margin of safety for benzyl alcohol via indirect exposure was calculated as 1.67×10^{6} or 7.41×10^{5}, based on the daily intake of 6.00×10^{-5} or 1.35×10^{-4} mg/kg/day through drinking water or fish, and NOEL of 100 mg/kg/day. As the margin of safety is more than 5×10^{5}, it is currently considered of low potential human risk via indirect exposure.

Cancer endpoint

In carcinogenicity study, thyroid C-cell adenoma/carcinoma in female rats and hemangioma/hemangiosarcoma, forestomach carcinoma/papilloma in male mice and lung alveolar-bronchiolar adenoma/carcinoma in female mice were observed in a dose-dependent manner. Hepatocellular carcinoma/adenoma was observed in only male mice in none dose-dependent manner. In vitro genotoxicity study showed negative or weakly positive and micronucleus test in vivo genotoxicity study presented the negative result.

In epidemiological examination, some positive data of carcinogenesis was reported although there is no clear evidence for benzyl chloride alone. Workers in the production of benzoyl chloride exhibited lung tumours. As exposure to benzyl chloride also occurs in this manufacturing process, a carcinogenic risk for this compound cannot be negligible. Similar assessments were given by two other studies on workers in the chlorination of toluene.

In an assessment by USEPA, this chemical is classified to group B2, a probable human carcinogen, based on inadequate human data and sufficient evidence of carcinogenicity in animals. The European Union classifies benzyl chloride as category 3 carcinogenic substance (compounds giving cause for apprehension, due to a possible carcinogenic effect). On the other hand, International Agency for Research on Cancer (IARC) had evaluated in 1987 that α-chlorinated toluenes were possible carcinogenicity to humans (Group 2B) but not evaluated the carcinogenicity of benzyl chloride alone.

From the weakly positive genotoxicity and clear evidence of carcinogenicity in experimental animals, it should be considered that the possibility of occupational cancer risk could not be excluded.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Benzyl chloride is hydrolyzed to benzyl alcohol in a temperature dependent manner in aquatic environment and benzyl alcohol is readily biodegradable. The chemical has high toxicity to aquatic organisms. However, toxicity of benzyl alcohol is low. Although PEC/PNEC ratio of the chemical is greater than 1 based on the local exposure scenario in the Sponsor country, PEC/PNEC ratio of benzyl alcohol is considered to be less than 1. Therefore, it is currently considered of low potential risk generally, but the environmental fate and degree of hydrolysis should be considered by each country.

Benzyl chloride is toxic in a repeated dose study (i.e. stomach, heart, liver) and carcinogenic in rats (thyroid) and mice (liver, stomach, lung). Genotoxicity of the chemical seems weakly positive. The chemical is considered as an irritant to the skin, eye, respiratory system and some evidence of sensitization exists. The chemical is considered as a possible carcinogen although there is no clear evidence in human. There is no available information on consumer use. As the chemical is rapidly hydrolyzed to benzyl alcohol in water phase, health risk via environment was assessed as benzyl alcohol exposure. As margin of safety for indirect exposure is more than 5×10^5, it is currently considered of low potential risk for the population via the environment. Depending on the current exposure situation further risk management in the workplace may be necessary or considered by countries.

5.2 Recommendations

There is a need for limiting the risk at production sites; risk reduction should be taken to account.

6. REFERENCES

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Appendix 1

Method for Prediction of environmental concentration of pollutant in surface water

1 .Predicted environmental concentration in the local environment (PEC_{local}) with effluent release into river

When decomposition, precipitation and vaporization of pollutant can be ignored, it is used that simplified equation by complete mixing model shown with equation (1) to calculate predicted environmental concentration in the local environment(PEC_{local}) as for release effluent into river.

$$PEC_{local}\ (mg/L) = \frac{Co\ Q + Cs\ Qs}{Q + Qs} \quad (1)$$

Where
Co: Concentration of pollutant in upper stream of release point (mg/L)
Cs: Concentration of pollutant in effluent (mg/L)
Q : Flow rate of river(m^3/day)
Qs: Flow rate of effluent released into river(m^3/ day)

At the equation(1), when Co can be considered as 0, dilution factor of pollutant in the river(R) can be shown with following equation.

$$R = Cs/C = (Q + Qs) / Qs \quad (2)$$

As the worst case, it is used to employ a flow rate at dry season as flow rate of river(Q). When flow rate at dry season is indistinct, it is estimated using the following equation in Japan.

$$\text{flow rate at dry season} = \text{mean flow late} / 2.5 \quad (3)$$

2. Predicted environmental concentration in the local environment(PEC_{local}) with effluent release into sea.

For prediction of concentration of pollutant in the sea water with effluent, it is employed generally Joseph-Sendner equation (4). This equation is one of analytic solution led under the following conditions from diffusion equation.

- It is adopted large area of sea or lake.
- The flow rate of effluent and concentration of pollutant in the effluent are constant, and distribution of concentration is able to regard as equilibrium state.
- Effluent is distributed uniformly to vertical direction, and it spreads in a semicircle or segment to horizontal direction.
- Diffusion coefficient of pollutant at the sea is in proportion to distance from release point of effluent.
- There is not any effect of tidal current.
- Decomposition of pollutant can be ignored.

$$C(x) = (C_s - C(r))\left(1 - \exp\left(-\frac{Q_s}{\theta\, d\, p}\left(\frac{1}{x} - \frac{1}{r}\right)\right)\right) + C(r) \qquad (4)$$

Where

C(x): Concentration of pollutant at distance x(m) from release point
Cs : Concentration of pollutant in effluent
C(r) : Concentration of pollutant at distance r(m) from release point
Qs : Flow rate of effluent(m^3/day)
θ : Opening angle of seacoast(rad.)
d : Thickness of diffusion layer(m)
P : Diffusion velocity(m/day) (1.0 ± 0.5 cm/sec.)

When C(x) is 0 at r=∞ and density stratification is ignored for simplification, Joseph-Sendner equation(4) is simplified to equation(5)

$$C(x) = C_s\left(1 - \exp\left(-\frac{Q_s}{\theta\, d\, p\, x}\right)\right) \qquad (5)$$

Because of $Q_s/\theta\, d\, p\, x \ll 1$ except vicinity of release point, dilution factor in distance x from release point R(x) can be shown with equation(6).

$$R(x) = C_s/C(x) = \theta\, d\, p\, x/Q_s \qquad (6)$$

When it is employed following parameters in equation (6) as default, dilution factor R can be shown with equation (7).

P = 1 cm/sec(860m/day)
θ = 3.14
d = 10m
x = 1000m

$$R = 2.7 \times 10^7/Q_s \qquad (7)$$

Qs: volume of effluent (m^3/day)

FULL SIDS SUMMARY

CAS NO: 100-44-7		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point			-43°C
2.2	Boiling Point			177 - 181 °C
2.3	Density			
2.4	Vapour Pressure			9.3×10^3 Pa at 55 °C 1.9×10^4 Pa at 60 °C
2.5	Partition Coefficient (Log Pow)		OECD TG 107	2.66 at 25°C
2.6 A.	Water Solubility		OECD TG 105	Ca. 1.2 g/L 25 °C
B.	pH			
	pKa			No ionizable functional group
2.12	Oxidation: Reduction Potential			
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation			
3.1.2	Stability in Water		OECD TG 111	10.1 hour at pH 4 at 25 °C 9.48 hour at pH 7 at 25 °C 9.64 hour at pH 9 at 25 °C
3.2	Monitoring Data			In surface water : ND In sediment : ND In biota : ND
3.3	Transport and Distribution			
3.5	Biodegradation			70.9 % after 4 weeks
3.7	Bioaccumulation			
ECOTOXICOLOGY				
4.1	Acute/Prolonged Toxicity to Fish	*Poecilia reticulata*	OECD TG 203	LD_{50}(14d)= 0.39 mg/l
4.2	Acute Toxicity to Aquatic Invertebrates *Daphnia*	*Daphnia magana*	OECD TG 202	EC_{50}(24hr)= 4.2 mg/l EC_{50}(48hr)= 3.2 mg/l
4.3	Toxicity to Aquatic Plants e.g. Algae	Selenastrum Capricornutum	ORCD TG 201	EC_{50}(72hr, Biomass)= 19.3 mg/l NOEC=10.0 mg/l
4.5.2	Chronic Toxicity to Aquatic Invertebrates (*Daphnia*)	*Daphnia magna*	OECD TG 202	EC_{50}(21d,Repro)= 0.24 mg/l NOEC= 0.10 mg/l
4.6.1	Toxicity to Soil Dwelling Organisms			
4.6.2	Toxicity to Terrestrial Plants			No Data
4.6.3	Toxicity to Other Non-Mammalian Terrestrial Species (Including Birds)			No Data

TOXICOLOGY				
5.1.1	Acute Oral Toxicity	Rat	Other (unknown)	LD_{50} = 1231 mg/kg
5.1.2	Acute Inhalation Toxicity	Rat	Other (unknown)	LC_{50} = 740 mg/m^3/2 hr
5.1.3	Acute Dermal Toxicity			No data
5.2.1	Skin irritation/corrosion	Rabbit	Other (unknown)	Highly irritating
5.2.2	Eye irritation/corrosion	Rabbit	Other (unknown)	Irritating (the extent was not shown.)
5.4	Repeated Dose Toxicity	Rat	Other (unknown)	NOEL = 6.4 mg/kg
5.5	Genetic Toxicity In Vitro			
A.	Bacterial Test (Gene mutation)	S. typhimurium E. coli WP2	Other (unknown)	+ (With metabolic activation) + (Without metabolic activation)
B.	Non-Bacterial In Vitro Test (Micronucleus test)	Syrian hamster embryo fibroblast	Other (unknown)	+ (Without metabolic activation)
5.6	Genetic Toxicity In Vivo (Micronucleus test)	Mouse	Other (unknown)	-
5.8	Toxicity to Reproduction			
5.9	Developmental Toxicity/ Teratogenicity	Rat	Other (unknown)	NOEL fetal = 50 mg/kg NOEL teratogenicity = 100 mg/kg
5.11	Experience with Human Exposure			No data

[Note] Data beyond SIDS requirements can be added if the items are relevant to the assessment of the chemical, e.g. corrosiveness/irritation, carcinogenicity.

REVISED OECD HPV FORM 1

SIDS DOSSIER

ON THE HPV PHASE 4 CHEMICAL

Benzyl chloride

CAS No. 100-44-7

Sponsor Country: Japan

DATE: October 5, 1998

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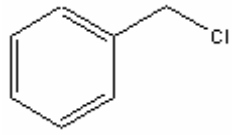
6. REFERENCES

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

SIDS PROFILE
DATE: October 5, 1998

1.01 A.	**CAS No.**	100-44-7
1.01 C.	**CHEMICAL NAME (OECD Name)**	Benzyl chloride
1.01 D.	**CAS DESCRIPTOR**	
1.01 G.	**STRUCTURAL FORMULA**	
	OTHER CHEMICAL IDENTITY INFORMATION	
1.5	**QUANTITY**	In Japan 7,759 tonnes/year in 1993
1.7	**USE PATTERN**	Intermediate in closed system. Intermediate for organic synthesis (benzyl alcohol, dyes, perfumes)
1.9	**SOURCES AND LEVELS OF EXPOSURE**	122 kg/year into river in 1997
ISSUES FOR DISCUSSION (IDENTIFY, IF ANY)	SIDS testing required: No testing	

SIDS SUMMARY
DATE: October 5, 1998

CAS NO: 100-44-7		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	N	N	Y	N	Y	N
2.2	Boiling Point	Y	N	N	N	N	Y	N
2.3	Density	N						N
2.4	Vapour Pressure	Y	Y	Y	N	N	Y	N
2.5	Partition Coefficient	Y	Y	Y	N	N	Y	N
2.6	Water Solubility	Y	Y	Y	N	N	Y	N
	pH and pKa values	N						N
2.12	Oxidation: Reduction potential	N						N
OTHER P/C STUDIES RECEIVED								
ENVIRONMENTAL FATE and PATHWAY								
3.1.1	Photodegradation	N						N
3.1.2	Stability in water	Y	Y	Y	N	N	Y	N
3.2	Monitoring data	Y	N	N	Y	N	Y	N
3.3	Transport and Distribution	N						N
3.5	Biodegradation	Y	Y	Y	N	N	Y	N
OTHER ENV FATE STUDIES RECEIVED								
ECOTOXICITY								
4.1	Acute toxicity to Fish	Y	Y	N	N	N	Y	N
4.2	Acute toxicity to Daphnia	Y	Y	N	N	N	Y	N
4.3	Toxicity to Algae	Y	Y	N	N	N	Y	N
4.5.2	Chronic toxicity to Daphnia	Y	Y	N	N	N	Y	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	N	N	Y	N	Y	N
5.1.2	Acute Inhalation	Y	N	N	Y	N	Y	N
5.1.3	Acute Dermal	Y	N	N	Y	N	Y	N
5.4	Repeated Dose	Y	N	N	Y	N	Y	N
5.5	Genetic Toxicity *in vitro*							
	. Gene mutation	Y	N	N	Y	N	Y	N
	. Chromosomal aberration	Y	N	N	Y	N	Y	N
5.6	Genetic Toxicity *in vivo*	Y	N	N	Y	N	Y	N
5.8	Reproduction Toxicity	Y	N	N	Y	N	Y	N
5.9	Development / Teratogenicity	N						N
5.11	Human experience	N						N
OTHER TOXICITY STUDIES RECEIVED								

1. GENERAL INFORMATION

1.01 SUBSTANCE INFORMATION

***A. Cas number** 100 - 44 - 7

B. Name *(IUPAC name)*

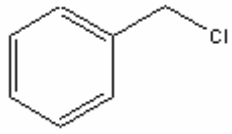
***C. Name** *(OECD name)* Benzyl chloride

†D. CAS Descriptor

E. EINECS-Number 202-853-6

F. Molecular Formula C_7H_7Cl

***G. Structural Formula**



H. Substance Group

I. Substance Remark

J. Molecular Weight 126.59

1.02 OECD INFORMATION

A. Sponsor Country: Japan

B. Lead Organisation:

Name of Lead Organisation: Ministry of Health and Welfare (MHW)
Ministry of International Trade and Industry (MITI)
Environmental Agency (EA)
Ministry of Labour (MOL)

Contact person: Mr.kenichi Suganuma
Director, Second International Organization Bureau
Ministry of Forein Affairs

Address: Street: 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100 Japan
Tel: 81-3-3581-0018
Fax:81-3-3503-3136

C. Name of responder

Name: Same as above contact person

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 99.8 %

1.2 SYNONYMS omega-Chlorotoluene; Chlorophenylmethane; (chloromethyl)benzene; alpha-Chlorotoluene; tolyl chloride

1.3 IMPURITIES

Name: Benzal chloride, Benzaldehyde, Chlorotoluene, 2,4-dichlorotoluene, Toluene

1.4 ADDITIVES

Name: aminoic stabilizer

***1.5 QUANTITY**

Remarks: 7,759 tonnes/year in 1993
Reference: MITI

1.6 LABELLING AND CLASSIFICATION

***1.7 USE PATTERN**

A. General

	Type of Use:	**Category:**
(a)	main industrial use	Intermediate Intermediate in closed system Intermediate for organic synthesis (benzyl alcohol, dyes, perfumes)

Remarks: (a) None
Reference: MITI

***1.9 SOURCES OF EXPOSURE**

In Japan, benzyl chloride is produced by 1 company.

Source: Media of release: River
Quantities per media: 122 kg/year in 1997
Remarks:
Reference: MITI, Japan

2. PHYSICAL-CHEMICAL DATA

***2.1 MELTING POINT**

Value: -43°C
Decomposition: Yes **[ ]** No **[x]** Ambiguous **[ ]**
Sublimation: Yes **[ ]** No **[x]** Ambiguous **[ ]**

Method:
GLP: Yes **[ ]** No **[ ]** ? **[x]**
Remarks:
Reference: The Sigma-Aldrich Library and Safety Data

***2.2 BOILING POINT**

Value: 177 - 181 °C
Pressure: at 1.013 hPa
Decomposition: Yes **[ ]** No **[x]** Ambiguous **[ ]**
Method:
GLP: Yes **[ ]** No **[ ]** ? **[x]**
Remarks:
Reference: The Sigma-Aldrich Library and Safety Data

***2.4 VAPOUR PRESSURE**

Value: (1) 9.3 x 10^3 Pa at 55 °C
(2) 1.9 x 10^4 Pa at 60 °C
Method: calculated **[ ]**; measured **[x]**
GLP: Yes **[ ]** No **[ ]** ? **[x]**
Remarks:
Reference: The Sigma-Aldrich Library and Safety Data

***2.5 PARTITION COEFFICIENT $log_{10}P_{ow}$**

Log Pow: 2.66
Temperature: 25 °C
Method: calculated **[ ]**; measured **[x]**
OECD TG 107
GLP: Yes **[x]** No **[ ]** ? **[ ]**
Remarks:
Reference: MITI, Japan.

***2.6 WATER SOLUBILITY**

A. Solubility

Value: Ca. 1.2 g/L
Temperature: 25 °C
Description: Miscible **[ ]**; Of very high solubility **[ ]**;
Of high solubility **[ ]**; Soluble **[x]**; Slightly soluble **[ ]**;
Of low solubility **[ ]**; Of very low solubility **[ ]**; Not soluble **[ ]**
Method:
GLP: Yes **[ ]** No **[x]** ? **[ ]**
Remarks: Benzyl chloride is hydrolysed to benzyl alcohol. Solubility was measured as the mixture of benzyl chloride and benzyl alcohol.
Reference: MITI, JAPAN.

B. pH Value, pKa Value

pH Value: No ionizable functional group

3. ENVIRONMENTAL FATE AND PATHWAYS

3.1 STABILITY

*3.1.2 STABILITY IN WATER

Type:	Abiotic (hydrolysis) **[x]**; biotic (sediment)**[ ]**
Half life:	(1) 10.1 hour at pH 4 at 25 °C (2) 9.48 hour at pH 7 at 25 °C (3) 9.64 hour at pH 9 at 25 °C
Method:	OECD TG 111
GLP:	Yes **[x]** No **[ ]** ? **[ ]**
Test substance:	Benzyl chloride, purity: 99 %
Remarks:	
Reference:	MITI, JAPAN.

*3.2 MONITORING DATA (ENVIRONMENTAL)

(a)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media:	Surface water (river)
Results:	ND (Detection limits: 0.1- 0.03 mg/l) in 15 areas in Japan as of 1976 ND (Detection limits: 0.0002 mg/l) in 3 areas in Japan of 1989
Remarks:	ND: Not detected
Reference:	Chemicals in the environment, EA, Japan (1977) Chemicals in the environment, EA, Japan (1990)

(b)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media:	Surface water (estuary)
Results:	ND (Detection limits: 0.0002 symbol 150 ¥f ″Times New Roman″ ¥s 11–} 0.000025 mg/l) in 6 sampling stations in 1989
Remarks:	ND: Not detected
Reference:	Chemicals in the environment, EA, Japan (1990)

(c)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media:	Surface water (sea)
Results:	ND (Detection limits: 0.03 mg/l) in 1 area in Japan as of 1976 ND (Detection limits: 0.0002 mg/l) in 12 areas in Japan as of 1989
Remarks:	ND: Not detected
Reference:	Chemicals in the environment, EA, Japan (1977) Chemicals in the environment, EA, Japan (1990)

(d)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media:	Sediment (river)
Results:	ND (Detection limits: 1.0 - 0.4 mg/kg-dry) in 15 areas in Japan as of 1976 ND (Detection limits: 0.01 mg/kg-dry) in 3 areas in Japan as of 1989
Remarks:	ND: Not detected
Reference:	Chemicals in the environment, EA, Japan (1977) Chemicals in the environment, EA, Japan (1990)

(e)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**

Media: Sediment (lake)
Results: ND (Detection limit: 0.01 mg/kg-dry) in a area in Japan as of 1989
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1990)

(f)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Sediment (estuary)
Results: ND (Detection limit: 1.0 mg/kg-dry) in a area in Japan as of 1976
ND (Detection limits: 0.01 mg/kg-dry) in 6 areas in Japan as of 1989
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)
Chemicals in the environment, EA, Japan (1990)

(g)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Sediment (sea)
Results: ND (Detection limits: 0.4 mg/kg-dry) in 2 areas in Japan as of 1976
ND (Detection limits: 0.01 symbol 150 ¥f ″Times New Roman″ ¥s 11–} 0.0003 mg/kg-dry) in 12 areas in Japan as of 1989
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)
Chemicals in the environment, EA, Japan (1990)

(h)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Fish (Dace/ muscular tissue) /river
Results: ND (Detection limit: 1.0 mg/kg-wet) in a area in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(i)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Ambient air
Results: Detected in 2 areas (6.4-8.3 ng/m^3: Detection limits: 5 ng/m^3) out of 7 areas in Japan as of 1989
Remarks:
Reference: Chemicals in the environment, EA, Japan (1990)

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

*3.3.2 THEORETICAL DISTRIBUTION (FUGACITY CALCULATION)

Media: Air-biota **[ ]**; Air-biota-sediment-soil-water **[x]**; Soil-biota **[ ]**; Water-air **[ ]**; Water-biota **[ ]**; Water-soil **[ ]**; Other **[ ]**
Method: Fugacity level I **[ ]**; Fugacity level II **[ ]**; Fugacity level III **[x]**; Fugacity level IV **[ ]**;
Other (calculation) **[ ]**; Other (measurement)**[ ]**
Results:

Compartment	Release 100% to air	Release 100% to water	Release 100% to soil
Air	99.7 %	8.2 %	1.0 %
Water	0.3 %	91.8 %	0.0 %

Soil	0.0 %	0.0 %	99.0 %
Sediment	0.0 %	0.0 %	0.0 %

.

Remarks: Appendix 1
Reference:

***3.5 BIODEGRADATION**

Type: aerobic **[x]**; anaerobic **[ ]**
Inoculum: adapted **[ ]**; non-adapted **[x]**;
Concentration of the chemical: related to COD **[ ]**; DOC **[ ]**; test substance **[x]**
Medium: water **[ ]; ** water-sediment **[ ]; ** soil **[ ]; ** sewage treatment **[ ]**
Degradation: 70.9 % after 4 weeks
Results: readily biodeg. **[x]; ** inherently biodeg. **[ ]**; under test condition no biodegradation observed **[ ]**, other **[ ]**
Method: OECD TG 301C
GLP: Yes **[x]** No **[ ]** ? **[ ]**
Test substance: Benzyl chloride , purity: 99 %
Remarks:
Reference: MITI, JAPAN.

4. ECOTOXICITY

***4.1 ACUTE/PROLONGED TOXICITY TO FISH**

(a) Type of test: static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**
open-system **[X]**; closed-system **[ ]**
Species: *Oryzias latipes* (Himedaka)
Exposure period: 96 h
Results: LC_{50} (24h) = 7.5 mg/l
LC_{50} (48h) = 4.2 mg/l
LC_{50} (72h) = 2.4 mg/l
LC_{50} (96h) = 1.9 mg/l
Analytical monitoring: Yes **[ ]** No **[X]** ? **[ ]**
Method: OECD TG 203 (1992)
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: As prescribed by 1.1 - 1.4, purity: 99.9%
Remarks: Groups of ten Himedaka were exposed to nominal concentrations of 1.0, 1.8, 3.2, 5.6 and 10 mg/l, DMSO & HCO-40 (4:1 weight ratio, 10 mg/l) control and laboratory water control. The LC50 (96h) was determined to be 1.9 mg/l with a 95 % confidence level (1.6 - 2.3 mg/l).
Reference: Environment Agency of JAPAN (1995)

(b) Type of test: static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**
open-system **[X]**; closed-system **[ ]**
Species: *Poecilia reticulata* (Guppy)
Exposure period: 14 d
Results: LC_{50} (14d) = 0.39 mg/l
Analytical monitoring: Yes **[ ]** No **[ ]** ? **[X]**
Method: No data.
GLP: Yes **[ ]** No **[ ]** ? **[X]**
Test substance: purity: ? %
Remarks:

Reference: Konemann, H. (1981) Quantitative structure-activity relationships in fish toxicity studies. – Part 1: Relation for 50 industrial pollutants. *Toxicology, 19 : 209-211*.

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

*A. Daphnia

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**; open-system **[ ]**; closed-system **[X]**
Species:	*Daphnia Magna*.
Exposure period:	48 h.
Results:	EC_{50} (24h) = 4.2 mg/l EC_{50} (48h) = 3.2 mg/l NOEC = 1.0 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**
Method:	OECD TG 202 .
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: 99.9 %
Remarks:	20 daphnids (4 replicates; 5 organisms per replicate) were exposed to nominal concentrations of 1, 1.8, 3.2, 5.6 and 10 mg/l, solubilizer (DMSO: HCO-40 = 9:1 weight ratio, 10 - 100 mg/l) control and laboratory water control. The EC_{50} (48h) was determined to be 3.2 mg/l with a 95 % confidence level of 2.8 mg/l to 3.8 mg/l.
Reference:	Environment Agency of JAPAN (1995).

*4.3 TOXICITY TO AQUATIC PLANTS, e.g. algae

Species:	*Selenastrum capricornutum* ATCC 22662	
Endpoint:	Biomass **[X]**; Growth rate **[ ]**; Other **[ ]**	
Exposure period:	72 h	
Results:	Biomass	EC_{50} (72h) = 19.3 mg/l
	(Endpoint)	NOEC = 10 mg/l
Analytical monitoring:	Yes **[X]** No **[ ]** ? **[ ]**	
Method:	OECD TG 201 (1984) open-system **[ ]**; closed-system **[X]**	
GLP:	Yes **[ ]** No **[X]** ? **[ ]**	
Test substance:	purity: 99.9 %	
Remarks:	Static test. The EC_{50} value for growth rate (% inhibition) was calculated based on 5 nominal concentrations (1, 1.8, 3.2, 5.6 and 10 mg/l). Minimal amount of Tween 80 - acetone (1:1) or DMSO - HCO-40 (9:1) is used as solubilizer.	
Reference:	Environment Agency of JAPAN (1995)	

4.4 TOXICITY TO BACTERIA

No data

4.5 CHRONIC TOXICITY TO AQUATIC ORGANISMS

4.5.1 CHRONIC TOXICITY TO FISH

No data

(*)4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**; open-system **[ ]**; closed-system **[X]**
Species:	*Daphnia Magna*.
Endpoint:	Mortality **[ ]**; Reproduction rate **[X]**; Other **[X]**
Exposure period:	21 d
Results:	Reproduction rate: EC_{50} (21 d) = 0.24 mg/l
	(Endpoint) NOEC = 0.10 mg/l
	LOEC = 0.32 mg/l
	Immobility: EC_{50} (48h) = 2.4 mg/l
	(Endpoint) EC_{50} (21 d) = 0.41 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**
Method:	OECD TG 202 (1984)
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	As prescribed by 1.1 - 1.4, purity: 99.9 %
Remarks:	40 daphnids (4 replicate; 10 daphnids per 500 ml beaker) were exposed to 5 concentrations (0.032, 0.1, 0.32, 1, 3.2 mg/l) in dechlorinated tap water (pH : 7.6 to 8.0; Hardness: 48 to 111 mg/l). Mixture of DMSO and HCO-40 (4 : 1) was used as solubilizer. 3.2 mg/l of the mixture was added to all test waters including control together with test substance.
Reference:	Environment Agency of JAPAN (1995).

4.6 TOXICITY TO TERRESTRIAL ORGANISMS

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 AVIAN)

No data

4.7 BIOLOGICAL EFFECTS MONITORING (INCLUDING BIOMAGNIFICATION)

No data

4.8 BIOTRANSFORMATION AND KINETICS

No data

4.9 ADDITIONAL REMARKS

None

5. TOXICITY

***5.1 ACUTE TOXICITY**

5.1.1 ACUTE ORAL TOXICITY

Type:	LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Rats
Value:	1231 mg/kg b.w.
Method:	Other
GLP:	Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	*National Technical Information Service*, PB214-270

Type:	LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Mice
Value:	1500 mg/kg b.w.
Method:	Other
GLP:	Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	Izmerov N.F. *et al., "Toxicometric Parameters of Industrial Toxic Chemicals Under Single Exposure"*, P25 (1982)

5.1.2 ACUTE INHALATION TOXICITY

Type:	LC_0 **[ ]**; LC_{100} **[ ]**; LC_{50} **[X]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain:	Mice
Exposure time:	2 hours
Value:	390 mg/m^3 (80 ppm)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	Respiratory depression
Reference:	Mikhailova,T.V., *Gig.Tr.Prof.Zabol*., 8, 14-19 (1964)

Type:	LC_0 **[X]**; LC_{100} **[ ]**; LC_{50} **[ ]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain:	Mice
Exposure time:	1 hour
Value:	1970 mg/m^3 (400 ppm)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	Back,K.C., et al., Reclassification of Materials Listed as Transportation, Office of Hazardous Materials, Office of the Assistant Secretary for Safety and Consumer Affairs, Washington, DC (1972)

Type:	LC_0 **[ ]**; LC_{100} **[ ]**; LC_{50} **[X]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain:	Rats
Exposure time:	2 hours
Value:	740 mg/m^3 (150 ppm)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	Respiratory depression
Reference:	Mikhailova,T.V., *Gig.Tr.Prof.Zabol*., 8, 14-19 (1964)

Type:	LC_0 **[X]**; LC_{100} **[ ]**; LC_{50} **[ ]**; LCL_0 **[ ]**; Other **[ ]**

Species/strain:	Rats
Exposure time:	1 hour
Value:	1970 mg/m^3 (400 ppm)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	Back,K.C., et al., Reclassification of Materials Listed as Transportation, Office of Hazardous Materials, Office of the Assistant Secretary for Safety and Consumer Affairs, Washington, DC (1972)

5.1.3 ACUTE DERMAL TOXICITY

No data

5.1.4 ACUTE TOXICITY, OTHER ROUTES OF ADMINISTRATION

Type:	LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Rats
Route of Administration:	i.m. **[ ]**; i.p. **[ ]**; i.v. **[ ]**; infusion **[ ]**; s.c. **[X]**; other **[ ]**
Exposure time:	
Value:	1000 mg/kg b.w. (in oil solution)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	Druckrey,H. *et al., Z.Krebsforsch*., 74, 241-270 (1970)

5.2 CORROSIVENESS/IRRITATION

5.2.1 SKIN IRRITATION/CORROSION

Species/strain:	Rabbits
Results:	Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[X]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**; Not irritating **[ ]; *** Severe skin irritation (EUCLID)
Classification:	Highly corrosive (causes severe burns) **[ ]**; Corrosive (causes burns) **[ ]**; Irritating **[ ]**; Not irritating **[ ]**
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: > 99 %
Remarks:	The inside of rabbit ear was exposed to 0.5 ml benzyl chloride for 24 hours. As a result, severe reddening and swelling occurred, with subsequent necrotic skin changes.
Reference:	Bayer,A.G., EUCLID data sheet alpha-chlorotoluene (1994)

5.2.2 EYE IRRITATION/CORROSION

Species/strain:	Rabbits
Results:	Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**; Not irritating **[ ]**
Classification:	Irritating **[ ]**; Not irritating **[ ]**; Risk of serious damage to eyes **[ ]**
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown

Remarks: Rabbits were exposed 8 hours/day for 6 days at 463 mg/m^3 (95 ppm). Eye and respiratory tract irritation were observed but the extent was not shown.
Reference: DHEW (NIOSH) Pub. No.78-182; NTIS No. PB-81-226-698. National Technical Information Service, Springfield, VA (1978)

Species/strain: Cats
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**; Not irritating **[ ]**
Classification: Irritating **[ ]**; Not irritating **[ ]**; Risk of serious damage to eyes **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Rabbits were exposed 8 hours/day for 6 days at 463 mg/m^3 (95 ppm). Eye and respiratory tract irritation were observed but the extent was not shown.
Reference: DHEW (NIOSH) Pub. No. 78-182; NTIS No. PB-81-226-698. National Technical Information Service, Springfield, VA (1978)

5.3 SKIN SENSITISATION

Type: unknown
Species/strain: Guinea pigs
Results: Sensitizing **[X]**; Not sensitizing **[ ]**; Ambiguous **[ ]**
Classification: Sensitizing **[ ]**; Not sensitizing **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Guinea pigs received intracutaneous doses of 0.01 mg benzyl chloride/animal, twice a week for 12 weeks. The challenge was given two weeks later, by applying one drop of the test substance in olive oil to the shaven skin of the flank.
Reference: Landsteiner,K. and Jacobs,J., *J.Exp.Med.,*64, 625-639 (1936)

*5.4 REPEATED DOSE TOXICITY

Species/strain: Swiss OF_1 mice
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Inhalation
Exposure period: 4, 9, 14 days
Frequency of treatment: 6 hours per day
4-day exposure: four consecutive days.
9-day exposure: five consecutive days for the first week and four consecutive days for the second week.
14-day exposure: five consecutive days for each of the first 2 weeks and four consecutive for the third weeks.
Post exposure observation period:
Dose: 22 ppm (107 mg/m^3), 46 ppm (224 mg/m^3)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[X]**; Concurrent vehicle **[ ]**; Historical **[ ]**
NOEL: 22 ppm (107 mg/m^3)
LOEL: 46 ppm (224 mg/m^3)
Results: Respiratory and olfactory epithelia lesion was observed at 46 ppm. Severity was severe to very severe but not related to exposure duration.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 99 %

Reference: D.Zissu, *J.Appl.Toxicol*. 15, 207-213 (1995)

Species/strain: F344 rats
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage)
Exposure period: 26 weeks
Frequency of treatment: Three times per week
Post exposure observation period:
Dose: 15, 30, 62, 125, 250 mg/kg b.w. (in corn oil)
[calculated daily doses: 6.4, 12.9, 26.6, 53.6, 107.1 mg/kg/day]
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: 15 mg/kg for female (6.4 mg/kg/day),
30 mg/kg for male (12.9 mg/kg/day)
LOEL: 30 mg/kg for female (12.9mg/kg/day),
62 mg/kg for male (26.6mg/kg/day)
Results: At the 250 and 125 mg/kg dose levels, all rats died within 3 weeks. The cause of death was mainly severe acute and chronic gastritis of the forestomach (often with ulcers), and acute myocardial necrosis and edema of the heart at the highest dose. At 62 mg/kg dose levels, there was acute myocardial necrosis and hyperplasia of the forestomach in female rats and there was a statistically significant depression of weight gain in male rats. A few females given 30 mg/kg had hyperkeratosis of the forestomach.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98 %
Reference: W.Lijinsky, *J.Natl.Cancer Inst,* 76, 1231-1237 (1986)

Species/strain: $B6C3F_1$ mice
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage)
Exposure period: 26 weeks
Frequency of treatment: Three times per week
Post exposure observation period:
Dose: 6.3, 12.5, 25.0, 50.0, 100.0 mg/kg b.w. (in corn oil)
[calculated daily doses: 2.7, 5.4, 10.7, 21.4, 42.9 mg/kg/day]
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: Not mentioned
LOEL:
Results: There was no significant depression of body weight gain in all treated groups. At 100 mg/kg dose, there was frequently severe hyperplasia of the liver. At 50 mg/kg and the lower dose levels, the hyperplasia was occasionally severe, but was more usually moderate. No effect level was indicated.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98 %
Reference: W.Lijinsky, *J.Natl.Cancer Inst,* 76, 1231-1237 (1986)

*5.5 GENETIC TOXICITY IN VITRO

A. BACTERIAL IN VITRO TEST

Type: Bacterial mutation study
System of testing: *Salmonella typhimurium* TA98, TA100

Escherichia coli WP2uvrA (pKM101)

Concentration: -S9 mix: 0, 10, 50, 100, 250, 500, 1000, and 2500µg per plate (in Analar dimethyl sulphoxide)
+S9mix: Same as –S9 mix

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

Results:

Cytotoxicity conc: With metabolic activation:
Without metabolic activation:

Precipitation conc:

Genotoxic effects:

	+	?	-
With metabolic activation:	**[X]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other

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

Test substance: purity: unknown

Remarks: Positive in TA 100 and *E. coli*, but negative in TA 98

Reference: Venitt,S. *et al., Mutation. Res*.,100, 39-43 (1982)

B. NON-BACTERIAL IN VITRO TEST

Type: Differential cytotoxicity of a mutant cell

System of testing: *Saccharomyces cerevisiae*

Concentration: 50, 100, 150, 200 and 250 µg/ml

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

Results: Differential cytotoxicity of a mutant cell was produced, depending on the presence of genes regulating DNA repair. Benzyl chloride increased the sensitivity of only a mutant cell that is deficient in many aspects of repair pathways.

Cytotoxicity conc: With metabolic activation:
Without metabolic activation:

Precipitation conc:

Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other

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

Test substance: purity: unknown

Remarks: The assay consists of exposing the wild type cells and four mutant strains to benzyl chloride. Each of three mutant strains is deficient in a different single aspect of repair pathways, and the remainder is defective in all of the above aspects of repair pathways.
DMSO was tested as a control.

Reference: North,T.A. and Parry, J.M., *Mutat.Res.* 100, 113-117 (1982)

Type: Differential cytotoxicity of a mutant cell

System of testing: CHO cell

Concentration: Not indicated

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

Results: Cytotoxicity of the mutant cells was 2 folds sensitive compared to the wild type cells.

Cytotoxicity conc: With metabolic activation:
Without metabolic activation: 25 µg/ml

Precipitation conc:

Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**

Without metabolic activation: **[X] [ ] [ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: The assay consists of exposing the wild type cells and three mutant strains to benzyl chloride. The battery of mutants consists of two UV-sensitive strains (UV4 and UV5) that are deficient in different aspects of nucleotide excision repair, and strain EM9, which is defective in DNA-strand break rejoining.
Reference: Hoy,C.A. et al., *Mutat.Res.* 130, 321-332 (1984)

Type: Micronucleus test
System of testing: Syrian hamster embryo fibroblast
Concentration: 10-1000 μM (in dimethylsulfoxide)
Metabolic activation: With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results:
Cytotoxicity conc:
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98-99 %
Remarks: A considerably weak response (0.85 MN/μmole)
Reference: G.Schmuck *et al*., *Mutat.Res.* 203, 397-404 (1988)

Type: Sister chromatid exchanges
System of testing: CHO cell
Concentration: 10-100 μM (in dimethylsulfoxide)
Metabolic activation: With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results:
Cytotoxicity conc: With metabolic activation:
Without metabolic activation:
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: A weak inducer
Reference: K.Hemminki *et al*., *J.Appl.Toxicol.,* 3, 203-207 (1983)

Type: Chromosomal aberration test
System of testing: Human peripheral lymphocyte
Concentration: 5, 40, 25 μg/ml
Metabolic activation: With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results:
Cytotoxicity conc: With metabolic activation:
Without metabolic activation: 25 μg/ml
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**
Without metabolic activation:	**[ ]**	**[ ]**	**[X]**

Method: Other

GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Mitpmycin C (0.05 μg/ml) was tested as the positive control.
Reference: Hartley,Asp,B., *Mutat.Res.* 100, 295-296 (1982)

Type: Unscheduled DNA assay
System of testing: HeLa S3 cell
Concentration: 10^{-10} - 10^{-3} M
Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[X]**; No data **[ ]**
Results:
Cytotoxicity conc: With metabolic activation:
Without metabolic activation:
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[X]**
Without metabolic activation:	**[ ]**	**[ ]**	**[X]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: 4-Niroquinoline-1-oxide (10^{-6} M) was tested as the positive control without metabolic activation and 3,3'-dichlorobenzidine (5 x 10^{-5} M) as a control with metabolic activation.
Reference: Booth,S.C., et al., *Mutat.Res.* 119, 121-133 (1983)

Type: DNA damage and its repair
System of testing: A549 cell
Concentration: 125, 250, 500 μg/ml
Metabolic activation: With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results: Benzyl chloride induced DNA damage to inhibit cell growth. This damage after treatment at 125 or 250 μg/ml was repaired fully but not at 500 μg/ml, and the repair of DNA damage was inhibited by cytosine arabinoside.
Cytotoxicity conc: With metabolic activation:
Without metabolic activation:
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[ ]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: In order to estimate the repair of any DNA damage, chemically treated cells were either incubated with or without cytosine arabinoside during chemical treatment or for various 4-h periods after the treatment had been terminated.
Reference: Mirzayans,R., et al., *Mutat.Res.* 100, 239-244 (1982)

* 5.6 GENETIC TOXICITY IN VIVO

Type: Micronucleus test
Species/strain: Tuck To (outbred) mice
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Intraperitoneal injection
Exposure period: 24 hours for one dose study and 30 hours for two dose study
Doses: 0 (vehicle; 1 % Tween), 75, 150, 300, 600 mg/kg
Results:
Effect on mitotic

index or P/N ratio:
Genotoxic effects: + ? -
[ ] [ ] [X]
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: not known
Remarks: For two dose study, the second injection of the same dose was given 24 h after the first injection. Mice were killed with CO_2 and the bone marrow of the femurs was analyzed. Mitomycin C of 2.5 mg/kg was used as a positive control.
Because the toxicity of benzyl chloride was greater than originally anticipated, two dose study at 600 mg/kg was not performed.
Reference: N.Danford and J.M.Parry, *Mutat.Res*., 100, 353-356 (1982)

Type: Mutation assay
Species/strain: Drosophila melanogaster
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[ ]**; No data **[X]**
Route of Administration: The test solutions were pipetted directly on to the food surface of the culture bottles on which late embryos and newly hatched larvae (up to 44 h from egg lay) were present. The treated stages were then left to develop into adults in the presence of the compound.
Exposure period:
Doses: 0, 0.5, 1.0, 2.0 mM
Results: The somatic events were expressed as red or white mosaic eye sectors. Benzyl chloride was effective in the inductions of red sectors at all tested doses (0.5-2.0mM). In contrast, the frequencies of the simultaneously scored white sectors were not raised significantly above the controls. The germinal X-chromosome mutations (recessive lethals and visibles) were only induced at the highest tested dose (2.0mM). Specific-locus mutability at the TE w^+ was suggestively positive. Benzyl chloride exerted the highest activity in the induction of somatic alterations of gene expression at the TE w^+ loci relative to the overall germinal X-chromosome mutations.
Effect on mitotic index or P/N ratio:
Genotoxic effects: + ? -
[X] [ ] [ ]
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: not known
Remarks:
Reference: Myrtle,J.Fahmy and O.G.Fahmy, *Mutat.Res*., 100, 339-344 (1982)

5.7 CARCINOGENICITY

Species/strain: F344 rats
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage)
Exposure period: 104 weeks
Frequency of treatment: 3 times/week
Postexposure observation period: 3 to 4 weeks after the last dose
Doses: 15 and 30 mg/kg per dose (in corn oil)
[calculated daily doses: 6.4 and 12.9 mg/kg/day]
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**; Corn oil
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**

Results: No significant differences in survival were seen between treated and control groups. The only statistically significant increase in tumor incidence attributed to treatment was thyroid C-cell adenoma/ carcinoma in the female high-dose group (4/52, 8/51, 14/52 for control, low and high doses, respectively).
Method: Other
GLP: Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance: purity: 98 %
Remarks:
Reference: Lijinsky,W., *J.Natl.Cancer Inst.*, 76, 1231-1236 (1986)

Species/strain: B6C3F1 mice
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage)
Exposure period: 104 weeks
Frequency of treatment: 3 times/week
Postexposure observation period: 3 to 4 weeks after the last dose
Doses: 50 and 100 mg/kg per dose (in corn oil)
[calculated daily doses: 21.4 and 42.9 mg/kg/day]
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**; Corn oil
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: In male mice, statistically significant increases in the following tumor incidences were observed: hemangioma/hemangiosarcoma in the high-dose group (0/52, 0/52, 5/52 for low, medium and high doses, respectively), hepatocellular carcinoma/adenoma in all treated groups (17/52, 28/52, 20/51), forestomach carcinoma in the high-dose group (0/51, 2/52, 8/52) and forestomach carcinoma/papilloma in the high-dose group (0/51, 4/52, 32/52). In female mice, a statistically significant increase in the incidence of forestomach carcinoma/ papilloma was observed in the high-dose group (0/52, 5/50, 19/51). Also, a slightly increased incidence of lung alveolar-bronchiolar adenoma/carcinoma (1/52, 2/51, 6/51) was observed in the high-dose group of females.
Method: Other
GLP: Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance: purity: 98 %
Remarks:
Reference: Lijinsky,W., *J.Natl.Cancer Inst.*, 76, 1231-1236 (1986)

Species/strain: ICR mice
Sex: Female **[X]**; Male **[ ]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Dermal
Exposure period: 40 weeks
Frequency of treatment: 3 times/week for 4 weeks, followed by 2 times/week until termination at 40 weeks.
Postexposure observation period:
Doses: 10 µl (11mg, in benzene)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: No tumors were observed.
Method: Other
GLP: Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Fukuda,K. *et al., Gann*,72, 655-664 (1981)

Species/strain: ICR mice
Sex: Female **[X]**; Male **[ ]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Dermal
Exposure period: 50 weeks
Frequency of treatment: 2 times/week
Postexposure observation period:
Doses: 2.3 µl (2.5 mg, diluted to a final volume of 25 µl with benzene)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: Two of 20 control animals developed lung adenomas, while 5/20 treated mice developed tumors, including 2 lung adenomas and 3 skin carcinomas. Two of the skin carcinomas metastasized to the primary lymphatic organs, liver, or kidneys. But these tumor incidences are not statistically significant.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Authors considered benzyl chloride to be a weak carcinogen.
Reference: Fukuda,K. *et al., Gann*, 72, 655-664 (1981)

Species/strain: T.O. (Swiss-Webster derived Theiler's Original) mice
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Dermal (to the back)
Exposure period: Single application (initiation study)
Frequency of treatment:
Postexposure observation period: 10 months
Doses: 1.0 mg (in toluene)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Positive control (0.4 mg benzo[a]pyrene) and negative control (croton oil alone)
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: No skin tumors were observed, while 8/19 positive controls developed skin tumors.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Single application in skin, followed by twice weekly treatments of croton oil in toluene for 10 months.
Reference: Coombs,M.M., *Mutat.Res*., 100, 403-405 (1982)

Species/strain: Sencar mice
Sex: Female **[ ]; ** Male **[ ]**; Male/Female **[ ]**; No data **[X]**
Route of Administration: Dermal
Exposure period: Single application (initiation study)
Frequency of treatment:
Postexposure observation period: 6 months
Doses: 10, 100, 1000 µg (in acetone)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Positive control (75 µg 7,12-dimethyl benz[a]anthracene)
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: At the end of 11 weeks, all of the positive controls had skin tumors, whereas at 6 months (approximately 12 weeks later), only 20 % of the mice treated with benzyl chloride showed similar changes in concurrent vehicle control.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**

Test substance: purity: unknown
Remarks: Benzyl chloride was applied, followed by twice weekly applications of the promotor 12-O-tetra-3'-decanoyl-phorbol-3'-acetate.
Reference: Coombs,M.M., *Mutat.Res*., 100, 407-409 (1982)

Species/strain: Swiss mice
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]?**
Route of Administration: Dermal (the dorso-lumbar region)
Exposure period: 7.5 months
Frequency of treatment: Twice per week
Postexposure observation period:
Doses: 100 µg (in 5 µg of toluene)
Control group: Yes **[ ]**; No **[ ]**; No data **[ ]**;
Positive control (benzo[a]pyrene)
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: After 7.5 months, none of the treated mice had skin tumors compared with 18/20 of the positive controls.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Ashby,J. *et al*., *Mutat.Res*., 100, 399-401 (1982)

Species/strain: BD rats
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[ ]**; No data **[X]**
Route of Administration: Subcutaneous injection
Exposure period: 51 weeks
Frequency of treatment: Weekly
Postexposure observation period: Not indicated
Doses: 40 or 80 mg/kg/week (in peanut oil)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: Local sarcomas were produced in 3/14 of the low-dose group and in 6/8 of the high-dose group, but not in the control. Metastases to the lung occurred in the high-dose group only.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: The average induction time was 500 days.
Reference: Druckrey,H. *et al*., *Z.Krebsforsch*, 74, 241-273 (1970)

Species/strain: A/He mice
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Intraperitoneal injection
Exposure period: 24 weeks
Frequency of treatment: 3 times per week
Postexposure observation period:
Doses: Total dose: 4.7, 11.8, 15.8 mmoles/kg b.w. (595, 1495, 2000 mg/kg, in tricaprylin)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[X]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: Neoplasms occurred. But the incidence was reported to be not statistically different from that in vehicle control or no treatment.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**

Test substance: purity: more than 98 %
Remarks: The number of i.p. injections was 12 at a dose of 4.7, 11.8 mmoles/kg and 8 at a dose of 15.8 mmoles/kg.
Reference: Poirier,L.A. *et al*., *Cancer Res*., 35, 1411-1415 (1975)

*5.8 TOXICITY TO REPRODUCTION

Type: Fertility **[ ]**; One-generation study **[ ]**; Two-generation study **[ ]**; Other **[X]**
Species/strain: F_1 mice
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Subcutaneous injection
Exposure period: 5 days
Frequency of treatment: Daily
Post exposure observation period: 1 day
Doses: 125, 250, 500 mg/kg b.w.
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: 250 mg/kg
Results: Small increase in sperm-head abnormalities was seen with the lethal doses of 500 mg/kg b.w.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Negative control: 10 ml/kg 0.5 % Tween 80
Positive control: 20 mg/kg cyclophosphamide (i.p. injection)
Reference: K.Scott and J.C.Topham, *Mutat.Res*., 100, 345-350 (1982)

Type: Fertility **[ ]**; One-generation study **[ ]**; Two-generation study **[ ]**; Other **[X]**
Species/strain: F_1 mice
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Intraperitoneal injection
Exposure period: 5 days
Frequency of treatment: Daily
Post exposure observation period: 1 day
Doses: 50, 100, 200, 400 mg/kg b.w.
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: 100 mg/kg
Results: Small increase in sperm-head abnormalities was seen with the lethal doses of 200 and 400 mg/kg b.w. However these abnormalities were reproducible in the second study.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Negative control: 10 ml/kg 0.5 % Tween 80
Positive control: 20 mg/kg cyclophosphamide
Reference: K.Scott and J.C.Topham, *Mutat.Res*., 100, 345-350 (1982)

*5.9 DEVELOPMENTAL TOXICITY/ TERATOGENICITY

Species/strain: Rats/Crj:CD(SD)
Sex: Female **[X]**; Male **[ ]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Oral
Duration of the test: From day 6 through day 20 of gestation
Exposure period: 10 days (from day 6 through day 15 of gestation)

Frequency of treatment: Daily
Doses: 50, 100 mg/kg b.w. (in corn oil)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL Maternal Toxicity:100 mg/kg
NOEL fetal toxicity: 50 mg/kg
NOEL teratogenicity: 100 mg/kg
Results: Any toxicities were not observed in the dams. The number of implantations, resorptions, and live fetuses and the mean fetal weight were not affected at both dosage groups. Only change was the significant reduction of fetal length at 100 mg/kg. Significant abnormalities of fetuses were not observed in all treated animals.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: G.Skowronski *et al., J.Toxicol.Environ.Healt*h, 17, 51-56 (1986)

5.10 OTHER RELEVANT INFORMATION

A. Specific toxicities

Type: Effect on Protein and RNA Synthesis in vitro
Results: Increasing concentrations of benzyl chloride caused progressive inhibition of synthesis of cellular proteins in both acinar and hepatocytes at 37 □. To determine whether the benzyl chloride mediated inhibition of acinar cells and hepatocytes protein synthesis could be attributed to decreased RNA synthesis, both acinar and hepatocytes were incubated with benzyl chloride for 1 hr in a shaking water bath at 37 □. As a result, there was a significant inhibition of ^{3}H-uridine incorporation.
References: S.Saxena and M.S.Abdel-Rahman, *Arch.Environ.Contam. Toxicol*., 18, 669-677 (1989)

Type: Neurotoxicity
Results: Behavioural changes of male Swiss-OF-1 mice were observed after inhalation exposure to 12, 17, 18 or 22 ppm benzyl chloride or fresh air for 4 hours. After exposure, swimming tests were conducted in a cylinder filled with water. Initially, avoidance behaviour was observed, then a resting stage set in, during which they only made movements to keep their heads above water (immobility phase). The duration of the immobility phase was measured, and a change in the length of this phase was considered as the criterion for an effect of benzyl chloride on CNS-controlled behaviour. As a result, benzyl chloride caused a concentration-dependent extension of the immobility phase by 32, 52, 71 and 84 %. The authors considered this result to indicate a neurotoxic effect of benzyl chloride.
References: Ceaurriz,de,J. *et al., Toxicol.Appl.Pharmacol.,*67, 383-389 (1983)

Type: Immunotoxicity
Results: After oral administration of benzyl chloride at doses of 31.0, 0.006, 0.0006 and 0.00006 mg/kg b.w., rats were observed for a complement-binding reaction, basophilic degranulation and plaque formation according to Jerne. An aqueous salt extract from the liver tissue of animals in the highest dose group served as antigen. All of the tests resulted in positive. The lowest effective dose of benzyl chloride in rats was given as 0.0006 mg/kg b.w..
References: Vinogradov,G.I., *Vrach.Delo*, 9, 100-102 (1979)

B. Toxicodynamics, toxicokinetics

Type:	Toxicokinetics
Results:	After oral administration to dogs, benzyl chloride is absorbed through the gastrointestinal tract. The distribution studies of ^{14}C-benzyl chloride after 48 hr of oral administration to rats revealed that the concentration of radioisotopes was the highest in the stomach, gastric content, gastric wash, ileum, and the duodenum. Following benzyl chloride oral administration, approximately 76 % of the initial dose were excreted by kidney during the 72 hr. About 7 % was detected in expired air as $^{14}CO_2$, while less than 1.3 % was present as ^{14}C-benzyl chloride or ^{14}C-benzyl chloride metabolites in expired air during 72 hr. Metabolism studies revealed that mercapturic acid, benzyl alcohol, and benzaldehyde were the metabolites present in urine.
References:	S. Saxena and M.S.Abdel-Rahman, *Arch.Environ.Contam. Toxicol*., 18, 669-677 (1989)

*** 5.11 EXPERIENCE WITH HUMAN EXPOSURE**

(a)

Results:	Source: Benzyl chloride production plant (tank filling) Number of workers exposed: 1 for each operation Frequency and duration of exposure: 235 times/year, 1.5 hours Emission Measured: 4.4 mg/m^3
Remarks:	Workers wear protective gloves and mask during the operations.
Reference:	Japanese Manufacturing Company (confidential) 1997

(b)

Results:	Source: Benzyl chloride production plant (drum filling) Number of workers exposed: 1 for each operation Frequency and duration of exposure: 127 times/year, 2.5 hours Emission Measured: 1.0 mg/m^3
Remarks:	Workers wear protective gloves and mask during the operations.
Reference:	Japanese Manufacturing Company (confidential) 1997

(c)

Results:	Source: Benzoyl chloride production plants Number of workers examined: 41 Frequency and duration of exposure: Duration employed from 6 to 15 years Number of cancer incidents: 4 (2 lung cancers, 1 lymphoma, 1 squamous cell carcinoma of lung)
Remarks:	The number of death from lung cancer was significantly higher than the numbers expected. However, these workers were also exposed to other chlorinated chemicals than benzyl chloride, which is a minor product in benzoyl chloride production. The data on cigarette smoking were incomplete.
Reference:	Sakabe,H. *et al., Ann.N.Y.Acad.Sci*., 271, 67-70 (1976)

(d)

Results:	Source: Benzoyl peroxide and benzoyl chloride production plants Number of workers examined: from 13 (1953) to 40 (1963) Number of cancer incidents: 2 (lung cancer)
Remarks:	The number of deaths expected was not reported. The data on cigarette smoking were incomplete.

Reference: Sakabe,H. and Fukuda,K., *Ind.Health.,*15, 173-174 (1977)

(e)
Results: Source: Chlorinated toluenes production
Number of workers examined: 163 exposed workers and 790 unexposed workers
Frequency and duration of exposure: Duration of employed for more than 6 months (1961-1970)
Number of cancer incidents: 10 (5 digestive system cancers, 5 respiratory cancers)
Remarks: The standardized mortality ratios were significantly higher than expected. However, the exposure was to multiple (toluene, benzotrichloride, benzoyl chloride, benzal chloride and other chemicals), and data on cigarette smoking was lack.
Reference: Sorahan,T. *et al., Ann.Occup.Hyg*., 27, 173-182 (1983)

(f)
Results: Source: Chlorinated toluenes production
Number of workers examined: 664 exposed workers
Frequency and duration of exposure: Duration of employed for more than 1 months (1942-1979)
Remarks: The mortality ratios were significantly higher than the regional death rate. A statistically significant increase of malignant lymphoma/myelomatosis was observed. However, the main handled chemicals were piperazine, urethane, ethylene oxide, formaldehyde and organic solvents, and benzyl chloride was only handled from 1970 to 1976. The data on cigarette smoking was superimposed, but a case-referent study did not reveal any significant association between any specific chemical exposure and cancer morbidity.
Reference: Hagmar,L. *et al., Scand.J.Work Environ.Health*, 12 (ISS 6), 545-551 (1986)

(g)
Results: Source: Chlorination plants
Number of workers examined: 697
Frequency and duration of exposure: Duration of employed for more than 1year
Remarks: The respiratory cancer standardized mortality ratio for the cohort as a whole was greater than expected, but the excess was of borderline statistical significance. The lung cancer mortality excess among the laboratory employees was statistically significant based on only 2 deaths. The sample size (especially for some subcohort analyses) was small, the exposure was to multiple (benzotrichloride, benzyl chloride, benzoyle chloride and other related chemicals.), and data on cigarette smoking was lack.
Reference: Wong,O., *Am.J.Ind.Med.,*14, 417-432 (1988)

(h)
Results: Source: Manufacture of quaternary ammonium chloride
Number of workers examined: 15
Frequency and duration of exposure: Up to twice per month for one worker at a time, for approximately 2 to 3 hours each time
Emission Measured: 0.1-0.12 ppm (in the area of drums decanding)
Remarks: Air pumps and a fully sealed receiving vessel are used during the operation. Benzyl chloride is pumped in below surface of liquid pre-

charged to reactor. Workers wear gloves, overalls, safety boots with an eye protection and personal air pressurized hoods are also available during the operation. In addition, flameproof forklift is used.

Reference: Chemical Assessment & Notification, Australia (1998)

(i)

Results: Source: Manufacture of quaternary ammonium chloride
Number of workers examined: 10
Frequency and duration of exposure: 30 seconds, 3 times/batch, about 48 batches/year
Emission Measured: Typical readings have been 0.5 ppm.
Short tern exposure limit to be kept below 1 ppm.

Remarks: Exposure only occurs when opening drums and changing drums in booth.
Benzyl chloride was monitored with direct reading detector (tube).
Full face, fresh air breathing masks is available for workers during the operation.

Reference: Chemical Assessment & Notification, Australia (1998)

(j)

Results: Source: Manufacture of quaternary ammonium chloride
Number of workers examined: 5
Frequency and duration of exposure: 140 times/year, 1 hour at a time
Emission Measured: 0.735 mg/m^3 (0.16 ppm), 8 hours (TWA)

Remarks: Benzyl chloride was monitored by charcoal tube attached at the front (1997/98 data).
Workers wear respirator, faceshield, gloves, apron, protective clothing and boots.

Reference: Chemical Assessment & Notification, Australia (1998)

6. REFERENCES

APPENDIX 1

Benzylchloride

scenario 1

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	1,000	2.2.E-06	2.2.E+04	99.7	7.7E+02	2.2.E+02
water	0	3.0.E-06	6.1.E+01	0.3	4.2E+00	6.1.E-02
soil	0	3.6.E-06	5.8.E+00	0.0	4.0E-01	
sediment		9.2.E-08	9.2.E-03	0.0	6.4E-04	1.8.E-07
		total amount	2.2.E+04			

scenario 2

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	0	1.2.E-07	1.2.E+03	8.2	4.1.E+01	1.2.E+01
water	1000	6.7.E-04	1.3.E+04	91.8	9.3.E+02	1.3.E+01
soil	0	1.9.E-07	3.1.E-01	0.0	2.2.E-02	
sediment		2.0.E-05	2.0.E+00	0.0	1.4.E-01	4.1.E-05
		total amount	1.5.E+04			

scenario 3

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	0	1.4.E-08	1.4.E+02	1.0	4.8.E+00	1.4.E+00
water	0	2.8.E-07	5.6.E+00	0.0	3.9.E-01	5.6.E-03
soil	1000	9.0.E-03	1.4.E+04	99.0	9.9.E+02	
sediment		8.4.E-09	8.4.E-04	0.0	5.9.E-05	1.7.E-08
		total amount	1.4.E+04			

scenario 4

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	600	1.4.E-06	1.4.E+04	71.4	4.8.E+02	1.4.E+02
water	300	2.0.E-04	4.1.E+03	21.2	2.8.E+02	4.1.E+00
soil	100	9.0.E-04	1.4.E+03	7.5	1.0.E+02	
sediment		6.2.E-06	6.2.E-01	0.0	4.3.E-02	1.2.E-05
		total amount	1.9.E+04			

molecular weight	126.59	Measured	Temp. [^{o}C]	25

melting point °C		-43	Measured
vapor pressure [Pa]		9.30E+02	Measured
water solubility [g/m^3]		1200	Measured
log Kow		2.66	Measured
half life [h]	in air	20	Estimated
	in water	10	Measured
	in soil	10	Estimated
	in sediment	10	Estimated

Environmetal parameter

		volume	depth	area	organic	lipid content	density	residence
		[m^3]	[m]	[m^2]	carbon [-]	[-]	[kg/m^3]	time [h]
bulk air	air	1.0E+13					1.2	100
	particles	2.0E+03						
	total	1.0E+13	1000	1E+10				
bulk water	water	2.0E+10					1000	1000
	particles	1.0E+06			0.04		1500	
	fish	2.0E+05				0.05	1000	
	total	2.0E+10	10	2E+09				
bulk soil	air	3.2E+08					1.2	
	water	4.8E+08					1000	
	solid	8.0E+08			0.04		2400	
	total	1.6E+09	0.2	8E+09				
bulk sediment	water	8.0E+07					1000	
	solid	2.0E+07			0.06		2400	50000
	total	1.0E+08	0.05	2E+09				

Intermedia Transport Parameters [m/h]

air side air-water MTC	5	soil air boundary layer MTC	5
water side air water MTC	0.05	sediment-water MTC	1E-04
rain rate	1E-04	sediment deposition	5E-07
aerosol deposition	6E-10	sediment resuspension	2E-07
soil air phase diffusion MTC	0.02	soil water runoff	5E-05
soil water phase diffusion MTC	1E-05	soil solid runoff	1E-08

EXTRACT FROM IRPTC LEGAL FILES

file: 17.01 LEGAL rn : 100157
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : ARG type : REG

subject	specification	descriptor
AIR	OCC	MPC

8H-TWA: 5MG/M3 (1PPM). POTENTIAL CARCINOGEN.
entry date: OCT 1991 effective date: 29MAY1991

title: LIMIT VALUES FOR CHEMICAL SUBSTANCES IN THE WORKING ENVIRONMENT-RESOLUTION NO. 444/1991 OF THE MINISTRY OF WORK AND SOCIAL SECURITY (AMENDING REGULATION DECREE NO. 351/1979 UNDER LAW NO. 19587/1972: HYGIENE AND SAFETY AT WORK)
original : ARGOB*, BOLETIN OFICIAL DE LA REPUBLICA ARGENTINA(ARGENTIAN OFFICIAL BULLETIN), 24170 , I , 1 , 1979
amendment: ARGOB*, BOLETIN OFICIAL DE LA REPUBLICA ARGENTINA(ARGENTIAN OFFICIAL BULLETIN), 27145 , I , 4 , 1991

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file: 17.01 LEGAL rn : 300520
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : CAN type : REG

subject	specification	descriptor
AIR	OCC	TLV

TWA: 1 ppm, 5 mg/m3. Prescribed by the Canada Occupational Safety and Health Regulations, under the Canada Labour Code (administered by the Department of Employment and Immigration). The regulations state that no employee shall be exposed to a concentration of an airborne chemical agent in excess of the value for that chemical agent adopted by ACGIH (American Conference of Governmental Industrial Hygienists) in its publication entitled: "Threshold Limit Value and Biological Exposure Indices for 1985-86". The regulations also state that the employer shall, where a person is about to enter a confined space, appoint a qualified person to verify by means of tests that the concentration of any chemical agent or combination of chemical agents will not result in the exposure of the person to a concentration in excess of the value indicated above. These regulations prescribe standards whose enforcement will provide a safe and healthy workplace.
entry date: OCT 1994 effective date: 24MCH1994

amendment: CAGAAK, CANADA GAZETTE PART II, 128 , 7 , 1513 , 1994

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file: 17.01 LEGAL rn : 301636
systematic name:Benzene, (chloromethyl)-

common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : CAN type : REG

subject	specification	descriptor
TRNSP		CLASS
LABEL		RQR
PACK		

Schedule II, List II - Dangerous Goods other than Explosives: PIN (Product Identification No.): UN1738. Class (6.1): Poisonous; Class (8): Corrosive; Class (9.2): Hazard to environment. Special provisions: 109. Packing group II, (I=Great danger, III=Minor danger). Passenger Vehicles: 1 L. Passenger Ship: Prohibited. Prescribed by the Transportation of Dangerous Goods Regulations, under the Transportation of Dangerous Goods Act (administered by the Department of Transport). The act and regulations are intended to promote safety in the transportation of dangerous goods in Canada, as well as provide comprehensive regulations applicable to all modes of transport accross Canada. These are based on United Nations recommendations. The act and regulations should be consulted for details. Information is entered under the proper shipping name found in the regulations; this may include general groups of chemical substances.
entry date: OCT 1994 effective date: 02DEC1993

amendment: CAGAAK, CANADA GAZETTE PART II, 127 , 25 , 4056 , 1993

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file: 17.01 LEGAL rn : 302472
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : CAN type : REG

subject	specification	descriptor
USE	OCC	RQR
STORE		
LABEL		

Ingredient Disclosure List - Concentration: 1% weight/weight. The Workplace Hazardous Materials Information System (WHMIS) is a national system providing information on hazardous materials used in the workplace. WHMIS is implemented by the Hazardous Products Act and the Controlled Products Regulations (administered by the Department of Consumer and Corporate Affairs). The regulations impose standards on employers for the use, storage and handling of controlled products. The regulations also address labelling and identification, employee instruction and training, as well as the upkeep of a Materials Safety Data Sheet (MSDS). The presence in a controlled product of an ingredient in a concentration equal to or greater than specified in the Ingredient Disclosure List must be disclosed in the Safety Data Sheet.
entry date: APR 1991 effective date: 31DEC1987

amendment: CAGAAK, CANADA GAZETTE PART II, 122 , 2 , 551 , 1988

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file: 17.01 LEGAL rn : 400201
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzylchloride
cas no :100-44-7 rtecs no :XS8925000
area : CSK type : REG

subject	specification	descriptor
AIR	AMBI	CLASS

THE SUBSTANCE IS CLASSIFIED IN THE FOURTH GROUP OF AIR POLLUTANTS (ORGANIC GASES AND VAPOURS)
entry date: DEC 1994 effective date: 1SEP1992

title: PROVISION OF FEDERAL COMMITTEE FOR ENVIRONMENT TO ACT NO. 309 FROM 9 JULY 1991 ON AIR PROTECTION AGAINST AIR POLLUTANTS
original : SZCFR*, , , 84 , 2061 , 1991
amendment: SZCFR*, , , 84 , 2404 , 1992

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file: 17.01 LEGAL rn : 402315
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : CSK type : REG

subject	specification	descriptor
AIR	EMI	MXL

GENERAL EMISSION LIMIT: 20 MG/M3 (IT APPLIES TO THE SUM OF ACETALDEHYDE, ANILINE, BENZYLCHLORIDE, DIETHYLAMINE, 1,2-DICHLOROETHANE, DICHLOROETHYLENE, DIMETHYLAMINE, ETHANOLAMINE, ETHYLACRYLATE, PHENOL, FORMALDEHYDE, CRESOLS, ACRYLIC ACID, FORMIC ACID, MERCAPTANES, METHYLACRYLATE, METHYLAMINE, NITROBENZENE, NITROPHENOLS, NITROCRESOLS, NITROTOLUENES, PYRIDINE, CARBONDISULFIDE, TETRACHLOROETHANE, TETRACHLOROETHYLENE, TETRACHLOROMETHANE, THIOETHERS, TOLUIDINES, TRICHLOROMETHANE AND TRICHLOROETHYLENE IF THEIR MASS FLOW > 100 G/H).
entry date: DEC 1994 effective date: 1SEP1992

title: PROVISION OF FEDERAL COMMITTEE FOR ENVIRONMENT TO ACT NO. 309 FROM 9 JULY 1991 ON AIR PROTECTION AGAINST AIR POLLUTANTS
original : SZCFR*, , , 84 , 2061 , 1991
amendment: SZCFR*, , , 84 , 2398 , 1992

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file: 17.01 LEGAL rn : 522343
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride

reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : DEU type : REG

subject	specification	descriptor
AQ USE	INDST	CLASS RQR

This substance is classified as severely hazardous to water (Water Hazard Class: WHC 3). (There are 3 water hazard classes: WHC 3 = severely hazardous; WHC 2 = hazardous; WHC 1 = moderately hazardous; and the classification as "not hazardous to water"). The purpose of the classification is to identify the technical requirements of industrial plants which handle substances hazardous to water.
entry date: SEP 2001 effective date: 01JUN1999

title: Administrative Order relating to Substances Hazardous to Water (Verwaltungsvorschrift wassergefaehrdende Stoffe)
original : BUANZ*, Bundesanzeiger, 51 , 98a , 1 , 1999

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file: 17.01 LEGAL rn : 532429
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :.alpha.-Chlorotoluene
cas no :100-44-7 rtecs no :XS8925000
area : DEU type : REG

subject	specification	descriptor
AIR	EMI	MPC

THIS SUBSTANCE BELONGS TO CLASS I. THE AIR EMISSIONS OF ORGANIC COMPOUNDS MUST NOT EXCEED (AS THE SUM OF ALL COMPOUNDS IN ONE CLASS) THE FOLLOWING MASS CONCENTRATIONS: CLASS I - 20 MG/M3 AT A MASS FLOW OF >= 0.1 KG/H; CLASS II - 100 MG/M3 AT A MASS FLOW OF >= 2 KG/H; CLASS III - 150 MG/M3 AT A MASS FLOW OF >= 3 KG/H. IF COMPOUNDS FROM DIFFERENT CLASSES ARE PRESENT, THE MASS CONCENTRATION MUST NOT EXCEED 150 MG/M3 AT A TOTAL MASS FLOW OF >= 3 KG/H.
entry date: JAN 1995 effective date: 01MCH1986

title: Technical Instructions on Air Quality Control (Technische Anleitung zur Reinhaltung der Luft)
original : GMSMA6, Gemeinsames Ministerialblatt, , 7 , 93 , 1986

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file: 17.01 LEGAL rn : 540091
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : DEU type : REC

subject	specification	descriptor
AIR	OCC	MAK

No MAK value established. - Carcinogen category 2: Substance that is considered to be carcinogenic for man because sufficient data from long-term animal studies or limited evidence from animal studies substantiated by evidence from epidemiological studies indicate that it can make a significant contribution to cancer risk. Limited data from animal studies can be supported by evidence that the substance causes cancer by a mode of action that is relevant to man and by results of in vitro tests and short-term animal studies.
entry date: MAY 2001

title: List of MAK and BAT Values 2000. Maximum Concentrations and Biological Tolerance Values at the Workplace. (MAK- und BAT-Werte-Liste 2000. Maximale Arbeitsplatzkonzentrationen und Biologische Arbeitsstofftoleranzwerte.)
original : MPGFDF, Mitteilung der Senatskommission zur Pruefung gesundheitsschaedlicher Arbeitsstoffe, 36 , , , 2000

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file: 17.01 LEGAL rn : 540172
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : DEU type : REC

subject	specification	descriptor
AIR	OCC	MAK

Applies to .alpha.-chlorinated toluenes as a mixture of Benzoyl chloride, Benzyl chloride, Benzyl dichloride and Benzyl trichloride. - No MAK value established. Carcinogen category 1: Substance that causes cancer in man and can be assumed to make a significant contribution to cancer risk. Epidemiological studies provide adequate evidence of a positive correlation between the exposure of humans and the occurence of cancer. Limited epidemiological data can be substantiated by evidence that the substance causes cancer by a mode of action that is relevant to man.
entry date: MAY 2001

title: List of MAK and BAT Values 2000. Maximum Concentrations and Biological Tolerance Values at the Workplace. (MAK- und BAT-Werte-Liste 2000. Maximale Arbeitsplatzkonzentrationen und Biologische Arbeitsstofftoleranzwerte.)
original : MPGFDF, Mitteilung der Senatskommission zur Pruefung gesundheitsschaedlicher Arbeitsstoffe, 36 , , , 2000

****

file: 17.01 LEGAL rn : 601781
systematic name:Benzene, (chloromethyl)-

common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : GBR type : REC

subject	specification	descriptor
AIR	AMBI	RQR
AQ	EMI	PL
WASTE	INDST	GL
MONIT	PESTI	
SAFTY		

These notes are issued under the Environmental Protection Act 1990. It contains reference, conditions and details in the assesment of an application or variation under the Act. References made to the manufacture or formulation the chemical pesticides: A) if the process may result in the release into water of any substance described in schedule 5 of Statutory Instrument 1991 No.472; or B) if the carrying on of the process by the person concerned at the location in question is likely to produce 500 tonnes or more of special waste in any 12 month period. It is necessary to satisfy the requirements of BATNEEC/BPED. All information applies to new plant. The total for class A compounds is 20 mg/m3 in air and 100 g/hr.
entry date: MCH 1995 effective date: 1993

title: Environmental Protection Act, Pesticide Processes.
original : IPRGN*, , IPR 4/8 , , , 1990

****

file: 17.01 LEGAL rn : 606493
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : GBR type : REG

subject	specification	descriptor
TRNSP	MARIN	RQR
AQ	MARIN	RSTR
AQ	EMI	RSTR

CATEGORY B SUBSTANCE: DISCHARGE INTO THE SEA IS PROHIBITED; DISCHARGE OF TANK WASHINGS AND RESIDUAL MIXTURES IS SUBJECT TO RESTRICTIONS.
entry date: 1992 effective date: 06APR1987

title: THE MERCHANT SHIPPING (CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK) REGULATIONS 1987, SCHEDULE 1
original : GBRSI*, STATUTORY INSTRUMENTS, 551 , , 15 , 1987
amendment: GBRSI*, STATUTORY INSTRUMENTS, 2604 , , 2 , 1990

****

file: 17.01 LEGAL rn : 700471

systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : IND type : REG

subject	specification	descriptor
MANUF		RQR
SAFTY		RQR
STORE		RQR
IMPRT		RQR

These rules define the responsabilities of occupiers of any industrial activity in which this toxic and hazardous substance may be involved. These responsabilities encompass: (a) assessment of major hazards (causes, occurrence, frequency); (b) measures to prevent accidents and limit eventual impairment to human health and pollution of the environment; (c) provision of relevant factual knowledge and skills to workers in order to ensure health and environmental safety when handling equipments and the foregoing chemical; (d) notification of the competent authorities in case of major accidents; (e) notification of sites to the competent authorities 3 months before commencing; (f)preparation of an on-site emergency plan as to how major accidents should be coped with; (g) provision of competent authorities with information and means to respond quickly and efficiently to any off-site emergency; (h) provision of information to persons outside the site, liable to be affected by a major accident; (i) labelling of containers as to clearly identify contents, manufacturers, physical, chemical and toxicological data; (j) preparation of a safety data sheet including any significant information regarding hazard of this substance and submission of safety reports to the competent authorities; (k) for the import of a hazardous chemical to India, importers must supply the competent authorities with specified information regarding the shipment.
entry date: SEP 1992 effective date: 27NOV1989

title: THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICALS RULES. 1989
original : GAZIN*, THE GAZETTE OF INDIA, 787 , , , 1989

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file: 17.01 LEGAL rn : 1010129
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : MEX type : REG

subject	specification	descriptor
AIR	OCC	MXL

AT ANY WORKPLACE WHERE THIS SUBSTANCE IS PRODUCED, STORED OR HANDLED A MAXIMUM PERMISSIBLE LEVEL OF 5MG/M3 (1PPM) MUST BE OBSERVED FOR A PERIOD OF 8 HOURS.
entry date: DEC 1991 effective date: 28MAY1984

title: INSTRUCTION NO.10 RELATED TO SECURITY AND HYGIENIC CONDITIONS AT WORKPLACES. (INSTRUCTIVO NO. 10, RELATIVO A LAS CONDICIONES DE SEGURIDAD

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E HIGIENE DE LOS CENTROS DE TRABAJO).
original : DOMEX*, DIARIO OFICIAL, , , , 1984

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file: 17.01 LEGAL   rn : 1120816
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7            rtecs no       :XS8925000
area          : RUS                 type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   MAC    |
|       |             |   CLASS  |
 --------------------------------
CLV : 0.5 MG/M3 (VAPOUR) HAZARD CLASS: I
entry date: MAY 1990                          effective date: 01JAN1989

amendment: GOSTS*, GOSUDARSTVENNYI STANDART SSSR(STATE STANDARD OF
           USSR), 12.1.005 , , , 1988

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file: 17.01 LEGAL   rn : 1122710
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7            rtecs no       :XS8925000
area          : RUS                 type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AQ    |    SURF     |   MAC    |
|       |             |   CLASS  |
 --------------------------------
0.001 MG/L HAZARD CLASS: II
entry date: JUL 1990                          effective date:  1JAN1989

amendment: SPNPV*, SANITARNYE PRAVILA I NORMY OKHRANY POVERKHNOSTNYKH
           VOD OT ZAGRIAZNENIA (HEALTH REGULATION AND STANDARDS OF
           SURFACE WATER PROTECTION FROM CONTAMINATION), 4630-88 , , ,
           1988

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file: 17.01 LEGAL   rn : 1200121
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7            rtecs no       :XS8925000
area          : SWE                 type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   HLV    |
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1D-TWA: 5MG/M3 (1PPM). 15MIN-STEL: 11MG/M3 (2PPM). CARCINOGENIC.
entry date: 1992 effective date: 01JUL1991

title: HYGIENIC LIMIT VALUES.
original : AFS***, ARBETARSKYDDSSTYRELSENS FOERFATTNINGSSAMLING, 1990:13 , , 5-64 , 1990

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file: 17.01 LEGAL rn : 1301096
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
MANUF	REQ	PRMT
USE	OCC	PRMT
SAFTY	OCC	MXL

; Summary - THE FOLLOWING CHEMICAL IS INCLUDED ON A LIST OF CHEMICALS AND MIXTURES FOR WHICH REPORTING IS CURRENTLY REQUIRED UNDER THE TOXIC SUBSTANCES CONTROL ACT SECTION 2607A. THIS TOXIC SUBSTANCE IS SUBJECT TO PRELIMINARY ASSESSMENT INFORMATION RULES ON PRODUCT ION QUANTITIES, USES, EXPOSURES, AND ADVERSE EFFECTS. MANUFACTURERS INCLUDING IMPORTERS MUST SUBMIT A REPORT FOR THIS LISTED CHEMICAL MANUFACTURED AT EACH SITE.
entry date: OCT 1991 effective date: 1982

title: PRELIMINARY ASSESSMENT INFORMATION RULES
original : FEREAC, FEDERAL REGISTER, 47 , , 26998 , 1982
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 712 , 30 , 1990

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file: 17.01 LEGAL rn : 1307106
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
AIR	EMI	RQR

; Summary - FROM A LIST OF POLLUTANTS JUDGED TO BE HAZARDOUS FOR WHICH EMISSION STANDARDS WILL BE DEVELOPED
entry date: SEP 1991 effective date: 1985

title: CLEAN AIR ACT, 112--NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
original : FEREAC, FEDERAL REGISTER, 50 , , 46290 , 1985
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 61 , 1 , 1990

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file: 17.01 LEGAL rn : 1309094
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
CLASS	INDST	RQR
AIR	EMI	RQR
AQ	EMI	RQR

100 (45.4); Summary - RELEASES OF THIS HAZARDOUS SUBSTANCE, IN QUANTITIES EQUAL TO OR GREATER THAN ITS REPORTABLE QUANTITY (RQ), REPORTED AS ›LBS (KG)|, ARE SUBJECT TO REPORTING TO THE NATIONAL RESPONSE CENTER UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT. (#)- RQ IS SUBJECT TO CHANGE
entry date: SEP 1991 effective date: 1990

title: CERCLA: LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES
original : CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990

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file: 17.01 LEGAL rn : 1313056
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
AQ	EMI	RQR
AQ	GRND	RQR
AQ	MARIN	RQR

100 (45.4) LBS (KG); Summary - FOR PURPOSES OF SECTION 311 OF THE CLEAN WATER ACT THE FOLLOWING HAZARDOUS SUBSTANCES IN QUANTITIES GIVEN SHALL NOT BE DISCHARGED INTO OR UPON THE NAVIGABLE WATERS OF THE UNITED STATES OR ADJOINING SHORELINES, WATERS OF THE CONTIGUOUS ZONE, OR OUTER DEEP WATERS WHICH MAY AFFECT NATURAL RESOURCES BELONGING TO THE UNITED STATES.
entry date: SEP 1991 effective date: 1986

title: REPORTABLE QUANTITIES OF HAZARDOUS SUBSTANCES; CLEAN WATER ACT, SECTION 311
original : FEREAC, FEDERAL REGISTER, 51 , , 34547 , 1986
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 117 , 3 , 1991

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file: 17.01 LEGAL rn : 1314133
systematic name:Benzene, (chloromethyl)-

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common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7            rtecs no       :XS8925000
area          : USA                 type          : REG
 ------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| TRNSP |             |   PRMT   |
| PACK  |             |   CNTRL  |
| LABEL |             |   RQR    |
 ------------------------------
FORBIDDEN IN PASSENGER AIRCRAFT AND PASSENGER RAILCAR. MAY BE
TRANSPORTED IN CARGO AIRCRAFT NOT TO EXCEED 1 QUART/PACKAGE. MAY BE
TRANSPORTED IN CARGO VESSELS ON AND BELOW DECK AND IN PASSENGER VESSELS
IN ACCORDANCE TO 49 CFR 173.295. VESSEL SHIPMENTS MUST BE KEPT DRY. ALL
SHIPMENTS MUST BE LABELED CORROSIVE.; Summary - THIS REGULATION LISTS
AND CLASSIFIES THOSE MATERIALS WHICH THE DEPARTMENT OF TRANSPORTATION
HAS DESIGNATED AS HAZARDOUS MATERIALS FOR SHIPPING PAPERS, PACKAGE
MARKING, LABELING, AND TRANSPORT VEHICLE PLACARDING APPLICABLE TO THE
SHIPMENT AND TRANSPORT OF THOSE HAZARDOUS MATERIALS.
entry date: NOV 1991                          effective date:   OCT1991

title: HAZARDOUS MATERIALS REGULATIONS, PART 172--HAZARDOUS MATERIALS
TABLES AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS
original : CFRUS*, CODE OF FEDERAL REGULATIONS, 49 , 172 , 101 , 1984
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 49 , 172 , 101 , 1990


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file: 17.01 LEGAL   rn : 1325120
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7            rtecs no       :XS8925000
area          : USA                 type          : REC
 ------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| SAFTY |    OCC      |   MXL    |
| USE   |    OCC      |   MXL    |
 ------------------------------
10 PPM
entry date: OCT 1991                          effective date:   JUN1990

title: POCKET GUIDE TO CHEMICAL HAZARDS
original : XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 46 ,
           1990
amendment: XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 46 ,
           1990


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file: 17.01 LEGAL   rn : 1332027
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzene,(chloromethyl)-
cas no         :100-44-7            rtecs no       :XS8925000
area          : USA                 type          : REG
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subject	specification	descriptor
WASTE	INDST	CLASS
STORE		RQR
TRNSP	REMOV	RQR

ACUTE HAZARDOUS WASTES (H).; Summary - THIS CHEMICAL, IF DISCARDED, MUST BE TREATED AS AN ACUTE HAZARDOUS WASTE. ACUTE HAZARDOUS WASTES REGULATIONS ARE MORE RESTRICTIVE FOR EXCLUSION. ANY RESIDUE OF THIS CHEMICAL LABELED AS ACUTELY HAZARDOUS AND REMAINING IN A CONTAINER, OR AN INNER LINER R EMOVED FROM A CONTAINER, IS CONSIDERED A HAZARDOUS WASTE IF DISCARDED UNLESS TRIPLE RINSING OR OTHER CLEANING MEASURES ARE TAKEN (40 CFR 261.33E).
entry date: JAN 1992 effective date: 1980

title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
original : FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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file: 17.01 LEGAL rn : 1332032
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
WASTE	INDST	CLASS
STORE		RQR
TRNSP	REMOV	RQR

ACUTE HAZARDOUS WASTES (H).; Summary - THIS CHEMICAL, IF DISCARDED, MUST BE TREATED AS AN ACUTE HAZARDOUS WASTE. ACUTE HAZARDOUS WASTES REGULATIONS ARE MORE RESTRICTIVE FOR EXCLUSION. ANY RESIDUE OF THIS CHEMICAL LABELED AS ACUTELY HAZARDOUS AND REMAINING IN A CONTAINER, OR AN INNER LINER R EMOVED FROM A CONTAINER, IS CONSIDERED A HAZARDOUS WASTE IF DISCARDED UNLESS TRIPLE RINSING OR OTHER CLEANING MEASURES ARE TAKEN (40 CFR 261.33E).
entry date: JAN 1992 effective date: 1980

title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
original : FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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file: 17.01 LEGAL rn : 1335034
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride

cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
SAFTY	INDST	RQR
STORE	INDST	RQR

TPQ=500 RQ=100; Summary - THE PRESENCE OF EXTREMELY HAZARDOUS SUBSTANCES IN EXCESS OF THE THRESHOLD PLANNING QUANTITY (TPQ), IN POUNDS, REQUIRES CERTAIN EMERGENCY PLANNING ACTIVITIES TO BE CONDUCTED. FOR CHEMICALS THAT ARE SOLIDS, THERE MAY BE TWO TPQ'S GIVEN. IN THESE CASES, T HE LOWER QUANTITY APPLIES FOR SOLIDS IN POWDER FORM WITH PARTICLE SIZE LESS THAN 100 MICRONS, OR IF THE SUBSTANCE IS IN SOLUTION OR IN MOLTEN FORM. OTHERWISE, THE HIGHER QUANTITY APPLIES. THESE CHEMICALS ARE ALSO SUBJECT TO REGULATION UNDER SARA 304. RELEASES OF SUBSTANCES, IN QUANTITIES EQUAL TO OR GREATER THAN THEIR REPORTABLE QUANTITY (RQ), IN POUNDS, ARE SUBJECT TO REPORTING TO THE NATIONAL RESPONSE CENTER UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980.
entry date: OCT 1991 effective date: 1987

title: SARA, SECTION 302(A) EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT; LIST OF EXTREMELY HAZARDOUS SUBSTANCES AND THEIR THRESHOLD PLANNING QUANTITIES
original : FEREAC, FEDERAL REGISTER, 52 , , 13395 , 1987
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 355 , , 1990

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file: 17.01 LEGAL rn : 1336142
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : USA type : REG

subject	specification	descriptor
AIR	EMI	RQR
SOIL	EMI	RQR
AQ	EMI	RQR
MANUF	EMI	RQR

; Summary - FACILITIES THAT EXCEEDED A MANUFACTURING, IMPORTATION, OR PROCESSING THRESHOLD OF 25,000 LBS OR THE USE OF 10,000 LBS FOR THIS CHEMICAL MUST REPORT TO EPA ANY RELEASES OF THE CHEMICAL (OR CATEGORY CHEMICAL) TO AIR, LAND, WATER, POTW, UNDERGROUND INJECTIO N, OR OFF SITE TRANSFER. THIS REGULATION COVERS STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES 20-39 ONLY).
entry date: OCT 1991 effective date: 1987

title: SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, TITLE III. EPCRA SECTION 313 LIST OF TOXIC SUBSTANCES
original : CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988

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file: 17.01 LEGAL   rn : 1340014
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7           rtecs no       :XS8925000
area          : USA                type          : REC
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   TLV    |
 --------------------------------
Time Weighted Avg (TWA) 1 ppm, 5.2 MG/M3; Summary - THIS THRESHOLD LIMIT
VALUE IS INTENDED FOR USE IN THE PRACTICE OF INDUSTRIAL HYGIENE AS A
GUIDELINE OR RECOMMENDATION IN THE CONTROL OF POTENTIAL HEALTH HAZARDS.
entry date: DEC 1991                          effective date:      1989

title: THRESHOLD LIMIT VALUES
original : ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL
           HYGIENISTS, , , 11 , 1989
amendment: ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL
           HYGIENISTS, , , 11 , 1991


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file: 17.01 LEGAL   rn : 1470274
         !!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :.alpha.-Chlorotoluene
cas no         :100-44-7           rtecs no       :XS8925000
area          : EEC                type          : REG
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|subject|specification|descriptor|
|-------+-------------+----------|
| MANUF |    INDST    |   CLASS  |
| IMPRT |    INDST    |   CLASS  |
 --------------------------------
The substance is included in a list of existing substances produced or
imported within the Community in quantities exceeding 1000 tonnes per
year. - A system of data reporting by any manufacturer who has produced
or any importer who has imported the substance, as such or in a
preparation, in quanities exceeding 10 tonnes per year is established.
entry date: AUG 1999                          effective date: 04JUN1993

title: Council Regulation (EEC) No 793/93 of 23 March 1993 on the
evaluation and control of the risks of existing substances
original : OJECFC, Official Journal of the European Communities, L84 , ,
           1 , 1993


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file: 17.01 LEGAL   rn : 1477552
         !!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name    :Benzyl chloride
reported name  :Benzyl chloride
cas no         :100-44-7           rtecs no       :XS8925000
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area : EEC type : REG

subject	specification	descriptor
CLASS		CLASS
LABEL		RQR
PACK		RQR

Classification: Carcinogen Category 2; R45. T; R23. Xn: Harmful; R22-48/22. Xi; R37/38-41. - Labelling: T: Toxic. Risk phrases (R): 45-22-23-37/38-41-48/22. May cause cancer (R45). - Harmful if swallowed (R22). - Toxic by inhalation (R23). - Irritating to respiratory system and skin (R37/38). - Risk of serious damage to eyes (R41). - Harmful: danger of serious damage to health by prolonged exposure if swallowed (R48/22). Safety advice phrases (S): 53-45. Avoid exposure - obtain special instructions befor use (S53). - In case of accident or if you fell unwell, seek medical advice immediately (show label where possible) (S45).
entry date: OCT 2001 effective date: 24AUG2001

title: Council Directive of 27 June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (67/548/EEC)
original : OJECFC, Official Journal of the European Communities, 196 , , 1 , 1967
amendment: OJECFC, Official Journal of the European Communities, L225 , , 1 , 2001

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file: 17.01 LEGAL rn : 1660044
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : IMO type : REG

subject	specification	descriptor
AQ	EMI	RSTR
TRNSP	MARIN	RQR

Category B substance: Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a hazard to either marine resources or human health and therefore justify the application of special anti-pollution measures. - Category B substances are bioaccumulated with a short retention of the order of 1 week or less, or are liable to produce tainting of the sea food, or are moderately toxic to aquatic life (TLm of 1 ppm or more, but less than 10 ppm), or are categorized because of other special characteristics. - The discharge into sea of substances in Category B or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited, except when specific conditions are satisfied. - Technical requirements for pumping, piping and unloading arrangements on ships and for reception facilities and cargo unloading terminal arrangements in the ports are given. Requirements on the design, equipment and operation of ships for minimizing accidental pollution are given.

entry date: JUN 1999 effective date: 03MCH1996

title: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (Annex II of MARPOL 73/78)
original : MARPO*, International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), Consolidated Edition, , , , 1997

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file: 17.01 LEGAL rn : 1661594
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : IMO type : REC

subject	specification	descriptor
TRNSP	MARIN	CLASS
LABEL		RQR
PACK		RQR

UN No. 1738. Class: 6.1 = Toxic substance. Subsidiary risk: 8 = Corrosive substance. Packing group: II = Medium danger.
entry date: NOV 2000 effective date: 01JAN2001

title: IMDG Code - Dangerous Goods List
original : IMDGC*, International Maritime Dangerous Goods Code, Amendment 30-00, Volume 2 , , , 2000

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file: 17.01 LEGAL rn : 1760594
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Benzene, (chloromethyl)-
common name :Benzyl chloride
reported name :Benzyl chloride
cas no :100-44-7 rtecs no :XS8925000
area : UN type : REC

subject	specification	descriptor
TRNSP		CLASS
LABEL		RQR
PACK		RQR

UN No. 1738. Class: 6.1 = Toxic substance. Subsidiary risk: 8 = Corrosive substance. Packing group: II = Medium danger.
entry date: NOV 2000

title: UN Orange Book - Dangerous Goods List
original : !RTDGFK, Recommendations on the Transport of Dangerous Goods prepared by the United Nations Committee of Experts on the Transport of Dangerous Goods, 11th revised ed., , , 1999