FOREWORD INTRODUCTION

2-PROPANOL

CAS N°: 67-63-0

SIDS INITIAL ASSESSMENT PROFILE

CAS NO.	67-63-0
CHEMICAL NAME	Isopropanol
STRUCTURAL FORMULA	CH3 - CH - CH3 ½ OH

RECOMMENDATION OF THE SPONSOR COUNTRY

[**X**] currently of low priority for further work
[ ] currently of low priority for further work, but avoid exposure to man and the environment
[ ] requiring further information to assess identified concerns
[ ] candidate for in-depth risk assessment with a view to possible risk reduction activities

SHORT SUMMARY OF THE REASONS WHICH SUPPORT THE RECOMMENDATION

Isopropanol is a high production volume chemical which is used as an industrial solvent, a component of industrial and consumer products and as a disinfectant. There is considerable potential for both occupational and consumer exposure.

There are estimates of significant fugitive emissions. Biodegradation in aquatic and terrestrial habitats, an physical degradation in the troposphere occur rapidly, indicating that isopropanol will not persist in the environment.

The mammalian/human toxicological properties of isopropanol have been well characterized in multiple animal species and humans for a variety of exposure routes, exposure durations and toxicity endpoints. High quality studies have been conducted that evaluate acute toxicity, skin and eye irritation, skin sensitization, subchronic and chronic toxicity, reproductive toxicity, developmental and developmental neurotoxicity, acute and subchronic neurotoxicity, genotoxicity and cancer. In addition, studies are available that characterize the disposition of isopropanol in mammals.

The information obtained from this database allows for the characterization of toxicity hazard of isopropanol for both human/mammalian and environmental effects. Taken together, these considerations support the conclusion that isopropanol is a low priority for further work.

FULL SIDS SUMMARY

CAS NO: 67-63-0		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting point		ASTM D97	90 °C
2.2	Boiling point		ASTM D1078	82 - 83 °C (at 1012 hPa)
2.3	Density		ASTM D4052	0.785 - 0.786 g/cm^3
2.4	Vapor pressure		not known	43 hPa at 20 °C
2.5	Partition coefficient (Log Pow)		not known	0.05 at 25 °C
2.6	Water solubility		not known	100 vol% at 20 °C (miscible)
	pH			at °C
	pKa			
2.7	Flash Point		IP 170	12°C (closed cup)
2.8	Auto Flammability		ASTM D2155	425°C
2.9	Flammability		84 / 449 / EEC, A.10	Highly flammable
2.10	Explosive properties			Explosive
2.11	Oxidizing properties			No oxidizing properties
2.12	Adsorption coefficient (Log Koc)		Calculated	0.03
2.13	Henry's Law constant		calculated	7.52 x 10^{-6}atm • m^3 / mole 0.76 Pa • m^3 / mole
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation			not subject to photolysis
	Atmospheric degradation (OH radical attack)		Various	in air T1 / 2 = 18 to 25 hours
3.1.2	Stability in water			not subject to hydrolysis
3.2	Monitoring data			In air = mg / m^3 In surface water = ug / l In soil / sediment = ug / g In biota = ug / g
3.3	Transport and Distribution		Calculated (Fugacity Level 1 type)	In air 22.3 % In water 77.7% In sediment 0.0 % In soil 0.0 %

			(Mackay)	In biota 0.0 %
3.5	Biodegradation	aerobic	(local exposure) APHA-219	49 % after 5 days at 20 °C
ECOTOXICOLOGY				
4.1	Acute / Prolonged Toxicity to Fish	Pimephales promelas	Veith et al, 1983	LC50 (96 hr) = 9640 mg / l
4.2	Acute Toxicity to Aquatic Invertebrates	Daphnia Magna	Bringmann & Kuehn, 1977	EC50 (24 hr) > 10,000 mg / l
		Crangon Crangon		LC50 (48 hr) = 1400 mg / L
4.3	Toxicity to Aquatic Plants e.g. Algae	Scenedesmus Quadricuada	Bringmann & Kuehn, 1980	Toxicity Threshold = 1800 mg / l
4.4	Toxicity to Microorganisms e.g. Bacteria	Pseudomonas putida		Toxicity Threshold = 1050 mg / L
		Entosiphon Sulcatum		Toxicity Threshold = 4930 mg / L
		Microcystis Aeruginosa		Toxicity Threshold = 1000 mg / L
		Chilomonas paramecium (Protozoa)		Toxicity Threshold = 104 mg / L
4.5.2	Chronic Toxicity to Aquatic Invertebrates (Daphnia)			NOEC (16 day) = 141 mg / L (Growth) NOEC (21 day) = 30 mg / L
4.6.1	Toxicity to Soil Dwelling Organisms			LC50 (d) = mg / kg NOEL (d) = mg / l
4.6.2	Toxicity to Terrestrial Plants	Lactuca Sativa	Reynolds, 1977	EC50 (3 d) = 2100 mg / l (inhibition of seed germination)
4.6.3	Toxicity to Other Non-Mammalian Terrestrial Species (including Birds)	Drosophila	David & Bocquet, 1976	LC50 (48 hr) = 10200 - 13340 ppm
	Bioconcentration factor		calculated	1.0
TOXICOLOGY				
5.1.1	Acute Oral Toxicity	Rat	see Dossier	LD50 range = 4710 - 5840 mg / kg
		Mouse	Guseinov, 1985	LD50 = 4475 mg / kg
		Rabbit		LD50 = 5030 mg / kg

		Dog	Lehman, 1944	LD50 = 4830 mg / kg
5.1.2	Acute Inhalation Toxicity	Rat	Lehman, 1944	LC50 (4 hr) = 72.6 mg / l
		Rat	Guseinov, 1985	LC50 (8 hr) = 51 mg / l
		Mouse	Laham, 1979	LC50 (2 hr) = 53 mg / l
5.1.3	Acute Dermal Toxicity	Rabbit	Guseinov, 1985	LD50 = 12,870 mg / kg
5.2.1	Skin Irritation	Rabbit	Smyth, 1948	Not Irritating
5.2.2	Eye Irritation	Rabbit	Nixon, 1975	Irritating
5.3	Sensitization	Guinea Pig	Draize Test	Not Sensitizing
5.4	Repeated Dose Toxicity	Rat and Mouse, Inhl.	P&G unpubl.	NOEL = 500 ppm (13 weeks) LOEL = 1500 ppm
		Rat, Oral	EPA TSCA	NOEL=1% (870 mg / kg / day) (12weeks) LOEL = 2% (1280 mg / kg / day)
5.5	Genetic Toxicity in Vitro		Pilegaard & Ladefogel, 1993	
	Bacterial Test	Salmonella typhimurium		negative (with and without metabolic activation)
	Non-Bacterial Test	CHO (HGPRT)	see Dossier	negative (with and without metabolic activation)
		V79 (SCE)	EPA TSCA	negative (with and without metabolic activation)
		SA7 / SHE	see Dossier	negative (without metabolic activation)
		Neurospora Crassa	see Dossier	negative (without metabolic activation)
5.6	Genetic Toxicity in vivo	Mouse (Micronucleus)	see Dossier	
5.7	Carcinogenicity	Rat and Mouse, Inhl.	EPA TSCA	negative
5.8	Toxicity to Reproduction	Rats, 2-gen Oral	EPA	negative
			EPA TSCA	NOEL Parental = <500 mg / kg / day (BMDL10 =407 mg / kg / day) (Reproductive Effects) NOEL F1 Offspring = <500 mg / kg / day (BMDL5 = 449 mg / kg / day)
5.9		Rat		NOEL F2 Offspring = <500

5.11	Developmental Toxicity / Teratogenicity Experience with Human Exposure	Rabbit	EPA TSCA EPA TSCA	mg / kg / day (BMDL5 = 418 mg / kg / day) NOEL = 400 mg / kg / day (Maternal) NOEL=400 mg / kg / day(Developmental) NOEL = 1200 mg / kg / day (Developmental neurotoxicity) NOEL = 240 mg / kg / day (Maternal) NOEL=480 mg / kg / day(Developmental) Accidental Exposure Information Voluntary Study Information Epidemiology Information

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1.0 Exposure Assessment

1.1 Production Volumes

Worldwide production of isopropanol in 1995 was reported to be 1.8 million metric tons, with the largest producing regions being North America (771 thousand tons), Western Europe (619 thousand tons), and Asia (280 thousand tons). (World Petrochemicals, SRI International, 1996). US production was 1.4 billion pounds in 1994. (Chem Eng. News, June, 1995).

1.2 Major Uses

Most isopropanol goes into the solvent market either directly or via conversion to acetone or one of acetone's derivatives -- methyl isobutyl ketone, methyl isobutyl carbinol, diacetone alcohol, or isophorone. Isopropanol's major solvent uses include inks, coatings, cosmetics and pharmaceuticals. Small percentages are used for esters and as rubbing alcohol. In Western Europe, some production of the acetone derivatives proceeds directly from isopropanol to the ultimate derivative, without separation of the acetone intermediate. IPA is used as a flavoring agent, foam inhibitor and a deicing agent for windshields in automobiles. IPA is used in the production of acetone, isopropyl acetate, isopropylamine, diisopropyl ether, isopropyl xanthate, herbicidal esters and aluminum isopropoxide. In contrast, Japan does not use isopropanol to produce acetone. The most important uses for isopropanol in Japan are as solvents in surface coatings and in inks. (World Petrochemicals, SRI International, 1996)

1.3 Manufacturing Process

Since the 1940s the dominant manufacturing process is the weak acid process in which propene gas is absorbed in, and reacted with, 60% sulfuric acid and the resulting sulfates hydrolyzed in a single step process. IPA is stripped and refined from the condensate which contains diisopropyl ether, acetone, and polymer oils of low molecular mass. Another major current manufacturing process is catalytic hydration of propene with water. Hydration can be gas-phase with a phosphoric acid catalyst, mixed phase with a cation-exchange resin catalyst or liquid phase using a tungsten catalyst.

1.4 Distribution

Tank cars and tank trucks are used for domestic clients. In plant distribution is via pipeline and tank truck.

1.5 Fugitive Emissions

It was estimated that 1.5% of the total US production in 1976 was lost to the environment (Dorigan et la., 1976). Emission registration data from the Netherlands from 1974-1979 indicated that 3.3% of the production volume was lost to the air and 0.2% was lost to water (IPCS, 2-Propanol, 1990). Approximately 0.6% of the 1985 worldwide production of IPA was estimated to be released to the environment. (DGEP, 1987).

1.6 Workplace Monitoring

Personnel exposures in isopropanol manufacturing facilities are very low because the process, storage and handling operations are enclosed. One Texas manufacturer reported personnel

exposures to be well below 10 ppm based on 1990-95 monitoring data. Workplace monitoring data, gathered from a Louisiana manufacturing facility between 1988-1994, showed most mean exposures to be below 5 ppm with peak part-time exposures below 20 ppm.

Less is known about customer workplace exposures, but they are expected to be higher due to evaporation of isopropanol in the various industrial and consumer product applications. OSHA and ACGIH have established workplace exposure limits for isopropanol of 400 ppm TWA-8hr and 500 ppm STEL.

2.0 Summary of Environmental Fate and Effects

2.1 Environmental Fate

Based on calculated results from a lever 1 fugacity model, isopropanol (IPA) is expected to partition primarily to the aquatic compartment (77.7%) with the remainder to the air (22.3%). IPA has been shown to biodegrade rapidly in aerobic, aqueous biodegradation tests and therefore, would not be expected to persist in aquatic habitats. IPA is also not expected to persist in surface soils due to rapid evaporation to the air. In the air, physical degradation will occur rapidly due to hydroxy radical (OH) attack. Overall, IPA presents a low potential hazard to aquatic or terrestrial biota.

IPA is expected to volatilize slowly from water based on a calculated Henry's Law constant of 7.52 x 10^{-6} atm•m^3/mole. The calculated half-life for the volatilization from surface water (1 meter depth) is predicted to range from 4 days (from a river) to 31 days (from a lake). Hydrolysis is not considered a significant degradation process for IPA. However, aerobic biodegradation of IPA has been shown to occur rapidly under non-acclimated conditions, based on a result of 49% biodegradation from a 5 day BOD test. Additional biodegradation data developed using standardized test methods show that IPA is readily biodegradable in both freshwater and saltwater media (72 to 78% biodegradation in 20 days).

IPA will evaporate quickly from soil due to it's high vapor pressure (43 hPa at 20°C), and is not expected to partition to the soil based on a calculated soil adsorption coefficient (log K_{OC}) of 0.03. IPA has the potential to leach through the soil due to it's low soil adsorption.

In the air, isopropanol is subject to oxidation predominantly by hydroxy radical attack. The room temperature rate constants determined by several investigators are in good agreement for the reaction of IPA with hydroxy radicals. The atmospheric half-life is expected to be 10 to 25 hours, based on measured degradation rates ranging from 5.1 to 7.1 x 10^{-12} cm^3/molecule-sec, and an OH concentration of 1.5 x 10^6 molecule/cm^3, which is a commonly used default value for calculating atmospheric half-lives. Using OH concentrations representative of polluted (3 x 10^6) and pristine (3 x 10^5) air, the atmospheric half-life of IPA would range from 9 to 126 hours, respectively. Direct photolysis is not expected to be an important transformation process for the degradation of IPA.

2.2 Toxicity to Aquatic Organisms

IPA has been shown to have a low order of acute aquatic toxicity. Results from 24- to 96-hour LC50 studies range from 1,400 to more than 10,000 mg/L for freshwater and saltwater fish and invertebrates. In addition, 16-hour to 8-day toxicity threshold levels (equivalent to 3% inhibition in

cell growth) ranging from 104 to 4,930 mg/L have been demonstrated for various microorganisms. Chronic aquatic toxicity has also been shown to be of low concern, based on 16- to 21-day NOEC values of 141 to 30 mg/L, respectively, for a freshwater invertebrate. Bioconcentration of IPA in aquatic organisms is not expected to occur based on a measured log octanol/water partition coefficient (log K_{ow}) of 0.05, a calculated bioconcentration factor of 1 for a freshwater fish, and the unlikelihood of constant, long-term exposures.

2.3 Toxicity to Plants

Toxicity of IPA to plants is expected to be low, based on a 7-day toxicity threshold value of 1,800 mg/L for a freshwater algae, and an EC50 value of 2,100 mg/L from a lettuce seed germination test.

3.0 Summary of Health Effects

3.1 Acute Toxicity and Primary Irritancy

Isopropanol has a low order of acute toxicity. It is irritating to the eyes, but not to the skin. Very high vapor concentrations are irritating to the eyes, nose, and throat, and prolonged exposure may produce central nervous system depression and narcosis. Human volunteers reported that exposure to 400 ppm isopropanol vapors for 3 to 5 min. caused mild irritation of the eyes, nose and throat. Although isopropanol produced little irritation when tested on the skin of human volunteers, there have been reports of isolated cases of dermal irritation and/or sensitization. The use of isopropanol as a sponge treatment for the control of fever has resulted in cases of intoxication, probably the result of both dermal absorption and inhalation. There have been a number of cases of poisoning reported due to the intentional ingestion of isopropanol, particularly among alcoholics or suicide victims. These ingestions typically result in a comatose condition. Pulmonary difficulty, nausea, vomiting, and headache accompanied by various degrees of central nervous system depression are typical. In the absence of shock, recovery usually occurred.

3.2 Effects Resulting from Repeated Exposure

The systemic (non-cancer) toxicity of repeated exposure to isopropanol has been evaluated in rats and mice by the inhalation and oral routes. The only adverse effects-in addition to clinical signs-identified from these studies were to the kidney. Rats exhibited an accumulation in hyaline (protein) droplets in kidney proximal tubule cells (males only, subchronic exposure) and an exacerbation of chronic progressive nephropathy, a spontaneous disease of unknown etiology common in aged rats (males and females, chronic exposure). In the mouse, minimal to mild effects to the kidney including renal tubular proteinosis and tubular dilation were observed following chronic exposure. The incidence of renal tubular proteinosis was generally significantly increased for all male and female treatment groups relative to controls; however, the majority of affected animals showed minimal degrees of tubular proteinosis (i.e., only a few tubules affected), there was no concentration-related gradient in either the frequency of severity of this change, and there was no corresponding evidence of alterations to the glomeruli. Mild to moderate degrees of tubular dilation were observed in a small number of females in the 2500 and 5000 ppm groups (significantly increased only for the 5000 ppm group). This finding, however, was not duplicated in male mice (a

significant increase was only seen for the 500 ppm group) nor was it accompanied by evidence of tubular cell degeneration or urinary outflow obstruction.

3.3 Effects on Reproductive Capabilities

A recent two-generation reproductive study characterized the reproductive hazard for isopropanol associated with oral gavage exposure. This study found that the only reproductive parameter apparently affected by isopropanol exposure was a statistically significant decrease in male mating index of the F_1 males. It is possible that the change in this reproductive parameter was treatment-related and significant, although the mechanism of this effect could not be discerned from the results of the study. However, the lack of a significant effect of the female mating index in either generation, the absence of any adverse effect on litter size, and the lack of histopathological findings of the testes of the high-dose males suggest that the observed reduction in male mating index may not be biologically meaningful. Additional support for this conclusion is provided by the fact that most of the females became pregnant. Furthermore, male and female fertility, and female fecundity indices of rats dosed with isopropanol were not different from those of controls by statistical analysis and were within, or relatively close to, historical control values. No reproductive effects were noted in other studies in which rats were dosed up to 2% in the drinking water. Exposure to 1000 mg/kg/day and to a lesser extent 500 mg/kg/day did result in a reduction in postnatal survival in both F1 and F2 litters. Derivation of an appropriate NOAEL for offspring effects was made difficult because of conflicting interpretations of the reductions in postnatal survival for the 500 mg/kg/day treatment group. The U.S. EPA (1992) and Tyl (1996) concluded the reductions were treatment- and dose-related, a conservative interpretation that supports a NOAEL of 100 mg/kg/day. Alternatively, Bevan *et al.* (1995) and Harris (1995) deemed the observations not to be biologically significant and concluded the NOAEL to be 500 mg/kg/day. In order to clarify this issue a benchmark dose (BMD) assessment was conducted for the study's developmental and reproductive findings (Shipp *et al.*, 1996). For the offspring developmental effects, BMD dosages ($BMDL_5$) of 449 and 418 mg/kg/day were estimated for the F1 and F2 generations, respectively. Based upon the decrease in male mating index observations in the P2 males, a $BMDL_{10}$ of 407 mg/kg/day was estimated for reproductive effects.

3.4 Effects on Developmental Toxicity

The developmental toxicity of isopropanol has been characterized in rat and rabbit developmental toxicity studies and in a rat developmental neurotoxicity study. The rats were dosed by oral gavage at 400, 800 or 1200 mg/kg from gestational days 6 through 15. The rabbits were dosed by oral gavage at 120, 240 or 480 mg/kg from gestational days 6 through 18. These studies indicate that isopropanol is not a selective developmental hazard. Isopropanol produced developmental toxicity in rats, but not in rabbits. In the rat, the developmental toxicity occurred only at maternally toxic doses and consisted of decreased fetal body weights, but no teratogenicity. These data suggest the developmental NOAEL is 400 mg/kg/day for rats and 480 mg/kg/day for rabbits.

Isopropanol has also been tested for developmental toxicity in rats via oral gavage. The rats were dosed at 200, 700 and 1200 mg/kg from gestational days 6 through 21. No exposure-related effects were noted on motor activity, weights of the four regions of the brain, developmental landmarks, or morphological changes to the tissues of the central nervous tissue. These data suggest the developmental neurotoxicity NOAEL for rats is 1200 mg/kg.

3.5 Genotoxic Effects

All genotoxicity assays reported for isopropanol have been negative. Characterization of the genotoxicity hazard for isopropanol is provided by both in vitro and in vivo mutation/chromosomal studies. Isopropanol was found to be negative in an in vitro CHO/HGPRT assay, was negative in vitro for aneuploidy in *Neurospora crassa*, and did not increase micronuclei in an in vivo micronuclei assay in mice. Mutagenicity studies also showed that isopropanol was not mutagenic in various Ames assays both in the presence or absence of an S9 metabolic activation system. In vitro sister chromatic exchange (SCE) assays on isopropanol using cultured V79 cells both with and without S9 activation, were also negative. Isopropanol did not induce transformation in Syrian hamster embryos infected with Simian SA7 virus. These studies demonstrate that isopropanol is not a hazard for genotoxic effects.

3.6 Carcinogenicity

Two recent chronic exposure, rodent inhalation studies were conduct to evaluate isopropanol for cancer potential. One study was performed exposing Fischer 344 rats to 500, 2500 and 5000 ppm of IPA for 6 hours/day, 5 days/week for 24 months. The only tumor rate increase seen was for interstitial (Leydig) cell tumors in the male rats. Interstitial cell tumors of the testis is typically the most frequently observed spontaneous tumor in aged male Fischer 344 rats (Haseman et al., 1990). Nearly all male Fischer rats will develop these proliferative tumors if they are allowed to complete their lifespan (Boorman et al., 1990). A mouse inhalation study was performed exposing CD-1 mice to 500, 2500 and 5000 ppm of IPA for 6 hours/day, 5 days/week for 18 months. There was no increased frequency of neoplastic lesions in any of the treated groups. These studies demonstrate that isopropanol does not exhibit carcinogenic potential relevant to humans. Furthermore, there was no evidence from this study to indicate the development of carcinomas of the testes in the male rat, nor has isopropanol been found to be genotoxic. Thus, the testicular tumors seen in the isopropanol-exposed male rats are considered of no significance in terms of human cancer risk assessment.

4.0 Conclusions

Isopropanol (IPA) is a high production volume chemical which has wide use as an industrial solvent and as a component in numerous industrial and consumer products. It has a potential for widespread exposure to both workers and consumers.

Based upon physical and chemical properties, isopropanol is not expected to persist in the environment. Aerobic biodegradation of isopropanol occurs rapidly. IPA is not expected to persist in soil due to low soil adsorption and rapid evaporation to air. In the air, isopropanol is subject to rapid oxidation by hydroxyl radical attack. IPA has a low order of toxicity to aquatic organisms and plants, and bioconcentration in aquatic organisms is not expected to occur.

The mammalian/human toxicological properties of IPA have been well characterized in multiple animal species and humans for a variety of exposure routes, exposure durations and toxicity endpoints. High quality studies have been conducted that evaluate acute toxicity, skin and eye irritation, skin sensitization, subchronic and chronic toxicity, reproductive toxicity, developmental and developmental neurotoxicity, acute and subchronic neurotoxicity, genotoxicity and cancer. In addition, studies are available that characterize the disposition of IPA in mammals.

The information obtained from this database allows for the characterization of toxicity hazard of IPA for both human/mammalian and environmental effects. Taken together, these considerations support the conclusion that IPA is a low priority for further work.

5.0 References

Bevan C., Tyler T.R., Gardiner T.H., Kapp Jr. R.W., Andrews L. and Beyer B.K. (1995). Two-generation reproductive toxicity study with isopropanol in rats. *J. Appl. Toxicol.* 15(2):117-123.

Boorman, G.A., Chapin, R.E., and Mitsumori, K. (1990) Chapter 24. Testis and Epididymis. In: Pathology of the Fischer Rat, (Boorman, R.A., Eustis, S.L., Elwell, M.R., Montgomery, C.A., Jr., and Mackenzie, W.F., eds.), pp. 405-418, Academic Press, CA

Chemical and Engineering News, June 26, 1995, p.40.

DGEP - Review of literature data on 2-propanol, Leidschendam, Netherlands, Directorate General of Environmental Protection, Ministry of Housing, Physical Planning and Environment. (1987)

Dorigan, J., Fuller, B. and Duffy, R. Scoring of organic air pollutants. Chemistry production and toxicity of selected synthetic organic chemicals. The MITRE Corporation -- MITRE Technical Report MTR-7248, Rev. 1, Appendix III (1976)

Harris S.B. (1995). A review of the EPA comments regarding the study entitled "Multi generation rat reproduction study with isopropanol". Report prepared for the Chemical Manufacturers Association Isopropanol Panel.

Haseman, J.K., and Arnold, J. (1990) Chapter 35. Tumor Incidences in Fischer 344 Rats: NTP Historical Data. In: Pathology of the Fischer Rat., (Boorman, G.A., Eustis, S.L., Elwell, M.R., Montgomery, C.A., Jr., and MacKenzie, W.F., eds.), pp. 555-564, Academic Press, CA

IPCS - International Programme on Chemical Safety - Environmental Health Criteria 103 - 2-Propanol, World Health Organization (1990).

Shipp A.M., Allen B.C., Van Landingham C., Gentry P.R. and Crump K.S. (1996). Quantitative dose-response analysis - Application of the benchmark method to the multi-generation rat reproduction study for isopropanol. Report prepared for the Chemical Manufacturers Association Isopropanol Panel.

Tyl R.W. (1996). February 12, 1996 Letter to the Chemical Manufacturers Association Isopropanol Panel.

US EPA, Draft Final RM1 Risk Assessment of Isopropanol, OPPT,1996. TSCA Public Docket Number AR-141.

SIDS DOSSIER

ON THE HPV CHEMICAL

ISOPROPANOL

CAS. No. 67-63-0

DATE OF LAST UPDATE: March 1997

CONTENTS

1. GENERAL INFORMATION

1.01 Substance Identification

CAS-No.:	67-63-0
EINECS-No.:	200-661-7
IUPAC-Name:	Propan -2- ol
Molecular Formula:	C3H8O
Molecular Weight:	60
Smiles Code:	CC(OH)C

1.02 OECD Information

Sponsor Country:	United States
Lead Organization:	Environmental Protection Agency
Contact Person:	Mr. Charles Auer
Name of Responder:	Chemical Manufacturers Association
Name:	Ms. Marion K. Stanley
Address:	1300 Wilson Boulevard Arlington, VA 22209

1.1 General Substance Information

Substance Type	Physical Status	Purity
organic	liquid	>99.7 % w/w

1.2 Synonyms

IPA
Isopropyl Alcohol
Isopropanol
2-propanol

1.3 Impurities

CAS-No.	EINECS-No.	IUPAC-Name	Value
		water	< 0.15 % w/w

1.4 Additives

CAS-No.	EINECS-No.	IUPAC-Name	Value
		none	

1.5 Quantity

Production:	1.8 million metric tons: North America: 771 metric tons, Western Europe: 619 metric tons, Asia: 280 metric tons
Reference:	World Petrochemicals, 1996

1.7 Use Pattern

Category	Type of Use
Industrial Sectors/General Use	adhesive automotive construction cosmetics electrical products leather industry metalurgical mining ceramics/glass industrial organic chemicals paints photography pigments and dyes plating and surface finishing printing and publishing petroleum refining soap production textiles water and waste treatment
Medical	disinfectant

1.8 Occupational Exposure Limit Values

Type of Limit	TLV (US)
Value	983 mg/m^3
Short Term Exposure Limit Value	1230 mg/m^3
Time Schedule Frequency	15 minute
Reference	1995-1996 Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs). American Conference of Governmental Industrial Hygienists (ACGIH), Cinncinati, OH (1995).

1.9 Sources of Exposure

Remark	Primary production process is the weak acid process in which propene gas is absorbed in, and reacted with, 60% sulfuric acid and the resulting sulfates hydrolyzed in a single step process. IPA is stripped and refined from the condensate which contains diisopropyl ether, acetone and polymer oils of low molecular mass.
Reference	US NIOSH Criteria for a recommended standard: occupational exposure to isopropyl alcohol, Cincinnati, OH. US NIOSH, US Dept of Health Education and Welfare, Public Health Service, Center for Disease Control (DHEW Publication No. NIOSH 76-142.

Remark	Emission registration data from the Netherlands from 1974-1979 indicated that 3.3% of the production volume was lost to the air and 0.2% was lost to water
Reference	IPCS, 2-Propanol WHO (1990)
Remark	Approximately 0.6% of the 1985 worldwide production of IPA was estimated to be released to the environment.
Reference	DGEP (1987).

2 PHYSICO-CHEMICAL DATA

2.1 Melting Point

Value	= -90 degree C
Decomposition	
Sublimation	
Method	other
Year	
GLP	no
Test condition	Method is ASTM D 97
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.2 Boiling Point

Value	ca. 82 - 83 degree C
Pressure	1012 hPa
Decomposition	no
Method	other
Year	
GLP	no
Test condition	ASTM D1078, standard method for distillation range
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.3 Density

Type	density
Value	ca. 0.785 - 0.786 g/cm3
Temperature	20 degree C
Method	other
Year	
GLP	no
Test condition	ASTM D4052, Standard method for density
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.4 Vapor Pressure

Value	= 43 hPa
Temperature	20 degree C

Method	other
Year	
GLP	
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.5 Partition Coefficient

log Pow	= 0.05
Temperature	25 degree C
Method	other (measured)
Year	1973
GLP	no data
Reference	Dillingham, E.O. et al., J.Pharm.Sci., 62, 1973, 22. In Pomona Data File on Log P and related parameters.

2.6 Water Solubility

Value	= 100 vol% at 20 degree C
pH	Concentration at degree C
pKa	at 25 degree C
Descr.	miscible
Method	other
Year	
GLP	
Reference	Shell Chemicals Data sheet IS 3.2.4 dated June 1992

2.7 Flash Point

Value	= 12 degrees C
Type	closed cup
Method	other
Year	
GLP	no
Test condition	IP 170, Standard method for flash point
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.8 Auto Flammability

Value	= 425 degree C
Pressure	
Method	other
Year	
GLP	no
Test condition	ASTM D2155, Standard method for autoignition
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.9 Flammability

Result	highly flammable
Method	Directive 84/449/EEC, A.10

Year	
GLP	no
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.10 Explosive Properties

Result	explosive
Method	
Year	
GLP	
Remark	Vapor can form an explosive mixture with air at room temperature
Reference	Shell Chemicals data sheet IS 3.2.4 dated June 1992

2.11 Oxidizing Properties

Result	no oxidizing properties
Method	
Year	
GLP	
Reference	Shell Chemicals Data sheet IS 3.2.4 dated June 1992

3 ENVIRONMENTAL FATE AND PATHWAYS

3.1.1 Photodegradation

Type	air
Light Source	Sun light
Light Spect.	ca. 290 - 900 nm
Rel. Intens.	= 100 based on Intensity of Sunlight
Spectrum of Substance	
	lambda (max) [>295nm] nm epsilon (max) epsilon (295)
Conc. of Substance	Temperature _____degree C_____

========== D I R E C T P H O T O L Y S I S ==========

Halflife t1/2	
Degradation	% after
Quantum yield	

========== I N D I R E C T P H O T O L Y S I S ==========

Type	air
Indirect photolysis	
Sensitizer	NO3
Rate Constant	<= .0000000000000023 cm^3/(molecule*sec)
Method	other (measured): Flash-Photolysis-Visible Absorption
Year	1987

GLP	no data
Testsubstance	other TS: >= 99% pure
Remark	Estimated troposphere half-life of 2-propanol for a "clean" troposphere with 10 ppt (approximately 2.4* 10E8 radicals/cm^3 of NO3 radicals during night-time hours, t1/2 >= 14.5 d.
Test condition	25 degrees C, total pressure of 133.3 hPa of NO2 diluent
Reference	Wallington, T.J. et al. (1987): Int J Chem Kinet 19, 243-249.
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .0000000000051 cm3/(molecule*sec)
Method	OECD Guide-line draft "Photochemical Oxidative Degradation in the
Year	1987
GLP	no data
Testsubstance	no data
Remark	Estimated troposheric half-life of 2-propanol with an average tropospheric OH radical concentration of 5*10E5 radicals/cm^3, t1/2 = 3.1 d.
Test condition	smog-chamber: 27 degrees C, 0.105 - 0.110 Mpa, UV-A lamps (1.5 m long, 65 W Hg low pressure lamps, TL 65-80 W/05), maximum volume-averaged UV intensity (k1 of NO2 photolysis amounted to about k1 = 0.9 min-1) corresponding to twice the solar UV intensity at sea level and midlatitudes, OH source: HONO photolysis.
Reference	Kloepffer, W. et al. (1988): Ecotoxicol Environ Safety 15, 298-319.
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .00000000000521 cm3/(molecule*sec)
Method	other (measured): Photodegradation by Indirect Photolysis
Year	1990
GLP	no data
Testsubstance	no data
Remark	Estimated tropospheric half-life of 2-propanol, with an OH radical concentration of 5*10E5 radicals/cm3, t1/2 = 3.1 d.
Test condition	25 degrees C
Reference	Atkinson, R. (1990): J Phys Chem Ref Data (1992), 21(6):1125-1568
Type	air
Indirect photolysis	
Sensitizer	OH
Conc. of Sensitizer	500000 molecules/cm3
Rate constant	= .00000000000521 cm3/(molecule*sec)
Degradation	= 50% after 6.2 days
Method	other (measured): AOP Computer Program, Vers. 1.53, Syracuse Research Center (based upon reference).
Year	1994
GLP	no data
Testsubstance	no data

Remark	Half-life refers to 12 hour-days
Reference	Atkinson, R.: A structure-activity relationship for the estimation of rate constants for the gas-phase reactions of OH radicals with organic compounds. Int J Chem Kinet 19, 799-828 (1987)
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .00000000000532 cm3/(molecule*sec)
Method	other (calculated): Prediction of the OH reaction rate constant by correlation of the negative logarithm of OH reaction rate constants with the first vertical ionisation energy of organic compounds in the gas phase.
Year	1984
GLP	no data
Testsubstance	no data
Remark	The correlation of the negative logarithm of OH reaction rate constants with the first vertical ionisation energy of organic compounds in the gas phase enables the prediction of kOH with a probability of about 90%; estimated tropospheric half-life of 2 propanol, assessing a global diurnal mean of OH radical concentration of 5*10E5 radicals/cm3, t1/2 = 3.0 d.
Test condition	27 degrees C
Reference	Guesten, H. et al. (1984): J Atmos Chem 2, 83-93.
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .00000000000548 cm3/(molecule*sec)
Method	other (measured): Flash-Photolysis Resonance-Asorption Technique
Year	1978
GLP	no data
Testsubstance	no data
Remark	Estimated tropospheric half-life of 2 propanol, with an OH radical concentration of 5*10E5 radicals/cm3, t1/2 = 2.9 d.
Test condition	23 degrees C, 200 hPa
Reference	Overend, R., Paraskevopoulos, G. (1978): J Phys Chem 82, 1329-1333.
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .0000000000062 cm3/(molecule*sec)
Method	other (measured): Photodegradation by Indirect Photolysis
Year	1985
GLP	no data
Test substance	no data
Remark	Estimated tropospheric half-life of 2-propanol, with an OH radical concentration of 5*10E5 radicals /cm3, t1/2 = 2.6 d.
Test condition	room temperature

Reference	Atkinson, R. (1985): Chem Rev 85, pp. 69-75, 135-153, 182-201.
Type	air
Indirect photolysis	
Sensitizer	OH
Rate constant	= .0000000000071 cm3/(molecule*sec)
Method	other (measured): Environmental Chamber Photooxidation Study
Year	1976
GLP	no data
Testsubstance	no data
Remark	Estimated atmospheric half-life of 2 propanol, with an average ambient OH radical concentration of 5/10E6 radicals/cm3, t1/2 - 5.4 h.
Test condition	Smog-chamber: ca. 32 degrees C, 1013 hPa, OH source: HONO photolysis and the reaction of NO2 with NO.
Reference	Lloyd, A.C. et al. (1976): Chem Phys Lett. 42, 205-209.

3.1.2 Stability in Water

Type	abiotic
Remark	Propan-2-ol is not susceptible to hydrolysis.
Reference	P.H. Howard, Handbook of Environmental Fate and Exposure Data for OrganicChemicals, Lewis Publishers Inc., Chelsea Michigan USA, 1990, p.304 -309.
Type	biotic
t1/2 pH4	at degree C
t1/2 pH7	= 5 days at 20 degree C
t1/2 pH9	at degree C
t1/2 pH	at degree C
Degradation pH 7	at 20 degree C: = 50 % after 5 days
Method	other
Year	1979
GLP	no data
Test substance	as prescribed by 1.1 - 1.4
Test condition	APHA-219 (1971) at 20 degree C.
Reference	Bridie, A.L., Wolff, C.J.M. & Winter, M., Water Research, 13, 1979, 627 - 630.

3.3.1 Transport between Environ. Compart.

Type	volatility
Media	water - air
Method	other
Year	1982
Result	The evaporation half-life of propan-2-ol in a model river with a depth of 1 m and a current of 1 m/s at a wind velocity of 3 m/s is calculated to be 85.2 hours.
Reference	Lyman, W.J. et al., Chemical Property Estimation Methods.

	Environmental behavior of organic compounds. McGraw-Hill Book Company, New York (USA), 1982,Chpt 15.
Type	volatility
Media	soil - air
Method	other
Year	1990
Result	Propan-2-ol is relatively volatile and would therefore readily evaporate from dry soil and surfaces.
Reference	Howard, P.H., Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Vol. 2. Lewis Publishers, Inc. Chelsea, Michigan (USA), 1990, p. 304 309.
Method	OECD Guide-line draft
Year	1990
GLP	no data
Test substance	as prescribed by 1.1 - 1.4
Type	volatility
Medium	other: domestic waste - air
Method	other: Evaporation Study
Year	1978
GLP	no data
Remark	The rate of evaporation of diluted (1:1 v/v mixture with water) and undiluted 2-propanol from pulverized domestic waste (0.5 m deep, 1 m2) over the first 10 min was 1.90 and 3.22 kg.m2 per h, and from 200-440 min 0.65 and 0.15 kg/m2 per h respectively
Test condition	2-Propanol (1:1 v/v mixture with water): initial weight of 2-propanol 7.2 kg, initial weight of water 10 kg, weight of waste 174 kg, waste surface temperature 24-37 degrees C, ambient air temperature ca. 22 degrees C, mean wind speed ca. 4.5 m/sec 2-Propanol (undiluted): initial weight of 2-propanol 19.5 kg, weight of waste 177 kg. waste surface temperature ca. 18 degrees C, ambient air temperature ca. 12 degrees C, mean wind speed ca. 0.5 m/sec
Test substance	technical grade
Reference	Jones, C.J. McGugan, P.J. (1977/78): J Hazard Mater. 2, 235-251.
Type	volatility
Medium	water-air
Method	other: Evaporation Study
Year	1978
GLP	no data
Remark	The rate of evaporation of diluted (1:1 v/v mixture with water) and undiluted 2-propanol from a shallow pool (1 m2) was 1.5 and 1.1 kg/m2 per h, respectively.
Test condition	2-Propanol (1:1 v/v mixture with water): initial weight of 2-propanol 7.2 kg, initial weight of water 10 kg, pool temperature ca. 20 degrees C, ambient air temperature ca. 22 degrees C, mean wind speed ca. 4.5 m/sec.

	2-Propanol (undiluted): initial weight of 2-propanol 18.25 kg, pool temperature ca. 13 degrees C, ambient air temperature ca. 12 degrees C, mean wind speed ca. 0.5 m/sec.
Test substance	technical grade
Reference	Jones, C.J. McGugan, P.J. (1977/78): J Hazard Mater. 2, 235-251**3.3.2**

3.2.2 Distribution

Media	air - biota - sediment(s) - soil - water	
Method	Calculation according Mackay, Level I	
Year	1981	
Result	Air	22.3 %m;
	Water	77.7 %m;
	Soil	0.0 %m;
	Sediment	0.0 %m;
	Biota	0.0 %m.
Reference	Mackay, D. & Paterson, S., Calculating Fugacity, Environm. Sci. Technol., 15(9), 1981, 1006 -1014.	

3.4 Mode of Degradation in Actual Use

1	10/05/94 RS:1 RE:1
Result	In air propan-2-ol will be rapidly transformed through reaction with OH-radicals.
Reference	P.H. Howard, Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Lewis Publishers Inc., Chelsea Michigan USA, 1990, p 304 - 309
2	10/05/94 RS:1 RE:1
Result	In water propan-2-ol will be lost by biodegradation.
Reference	P.H. Howard, Handbook of Envirnmental Fate and Exposure Data for Organic Chemicals. Lewis Publishers Inc., Chelsea Michigan USA, 1990, p. 304 - 309.

3.5 Biodegradation

Type	aerobic
Inoculum	predominantly domestic sewage, non-adapted
Concentration	1.5 mg/l related to Test substance
Degradation	= 49 % after 5 day
Results	readily biodegradable
Kinetic	
Method	other
Year	1979
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	APHA-219 (1971) at 20 degree C.

Reference	A) Bridie, A.L., Wolff, C.J.M., & Winter, M. BOD and COD of some Petrochemicals, Water Research, 13, 1979, p. 627 -630. B) Idem, Shell Group Research Report, AMGR.0224.74
Type	aerobic
Inoculum	domestic sewage, non-adapted
Concentration	3, 7 and 10 mg/l related to Test substance
Degradation	= 77 % after 10 day
Results	readily biodegradable
Kinetic	5 day = 28 10 day = 77 15 day = 80 20 day = 78
Method	other
Year	1974
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Reference	Price, K.S. Waggy, G.T. & Conway, R.A., Brine Shrimp Bioassay and Seawater BOD of Petrochemicals, J. Water Pollut. Contr. Fed., 46,1974, 63 - 77.
Type	aerobic
Inoculum	domestic sewage, non-adapted
Concentration	3, 7 and 10 mg/l related to Test substance
Degradation	= 42 % after 10 day
Results	
Kinetic	5 day = 13 10 day = 42 15 day = 60 20 day = 72
Method	other
Year	1974
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference. The test medium is artificial seawater.
Reference	Price, K.S., Waggy, G.T. & Conway, R.A., Brine Shrimp Bioassay and Seawater BOD of Petrochemicals, J. Water Pollut. Contr. Fed., 46, 1974, 63 - 77.

4. ECOTOXICITY

4.1 Acute/Prolonged Toxicity to Fish

Type	flow through
Species	Pimephales promelas
Unit	mg/l
Exposure Period	96 hour
NOEC	
LC0	

LC50	= 9640
LC100	
Analyt. Monitoring	yes
Method	other
Year	1983
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Reference	Veith, G.D., Call, D.J. & Brooke, L.T., Estimating the Acute Toxicity of Narcotic Industrial Chemicals to Fathead Minnows. In: Bishop, W.E., Cardwell, R.D. & Heidolph, B.B. Eds. Aquatic Toxicology and Hazard Assessment: 6th Symp., ASTM STP 802, Philadelphia (USA), 1983, 90 - 97.

4.2 Acute Tox. to Aquatic Invertebrates

Species	Daphnia magna
Unit	mg/l
Exposure Period	24 hour
NOEC	
EC0	
EC50	> 10000
EC100	
Analyt. Monitoring	no
Method	other
Year	1977
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Reference	Bringmann, G. & Kuehn, R., Results of the Damaging Effect of Water Pollutants on Daphnia magna, Z. Wasser Abwasser Forsch., 10(5), 1977, 161 - 166.

Species	Crangon crangon
Unit	mg/l
Exposure Period	48 hour
NOEC	
EC0	
EC50	
EC100	
LC50	= 1400
Analyt. Monitoring	no
Method	other
Year	1974
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The species is a marine invertebrate.
Test condition	As described in reference. Renewal.

Reference	Blackman, R.A.A., Toxicity of Oil-Sinking Agents, Mar. Pollut. Bull., 5, 1974, 116 - 118.

4.3 Toxicity to Aquatic Plants e.g. Algae

Species	Scenedesmus quadricauda
Endpoint	growth rate
Unit	mg/l
Exposure Period	7 day
NOEC	
LOEC	
EC0	
EC10	
EC50	
Analyt. Monitoring	no
Method	other
Year	1980
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Remark	Toxicity threshold concentration = 1800 mg/l.
Reference	Bringmann, G. & Kuehn, R., Comparison of the Toxicity Thresholds of Water Pollutants to Bacteria, Algae and Protozoa in the Cell Multiplication Inhibition Test, Water Research, 14, 1980, 231 - 241.

4.4 Tox. to Microorganisms e.g. Bacteria

Type	aquatic
Species	Pseudomonas putida
Unit	mg/l
Exposure Period	16 hour
EC0	
EC10	
EC50	
LOEC	
Analyt. Monitoring	no
Method	other
Year	1980
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Remark	Toxicity threshold concentration = 1050 mg/l.
Reference	Bringmann, G. & Kuehn, R. Water Research, 14, 1980, 231 - 241.

Type	aquatic
Species	Entosiphon sulcatum
Unit	mg/l
Exposure Period	72 hour
EC0	
EC10	
EC50	

LOEC	
Analyt. Monitoring	no
Method	other
Year	1980
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Remark	Toxicity threshold concentration = 4930 mg/l.
Reference	Bringmann, G. & Kuehn, R., Water Research, 14, 1980, 231 - 241.

Type	aquatic
Species	Microcystis aeruginosa
Unit	mg/l
Exposure Period	8 day
EC0	
EC10	
EC50	
LOEC	
Analyt. Monitoring	
Method	other
Year	1978
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Test condition	As described in reference.
Remark	Toxicity threshold concentration = 1000 mg/l.
Reference	Bringmann, G. & Kuehn, R., Grenzwerte der Schadwirkung wassergefaehdender Stoffe gegen Blaualgen (Microcystis aeruginosa) und Gruenalgen (Scenedesmus quadricauda) im Zellvermehrungshemmtest, Vom Wasser, 50, 1978, 45 - 60.

Type	aquatic
Species	Chilomonas paramecium (Protozoa)
Exposure period	48 h
Unit	mg/l
Analytical monitoring	no
TT:	= 104
Method	other: Cell Multiplication Inhibition Test
Year	1980
GLP	no data
Testsubstance	no data
Remark	TT = toxicity threshold
Test condition	pH 6.9; 20 degrees C
Reference	Bringmann, G. et al. (1980): Z. Wasser Abwasser Forsch. 13, 170-173.

4.5.2 Chronic Toxicity to Aquatic Invertebrates (Daphnia)

Species	Daphnia magna (Crustacea)
Exposure period	16 day
Unit	mg/l
Analyt. monitioring	yes

NOEC	= 141
Method	other: Prolonged Toxicity Test
Year	1985
GLP	no data
Testsubstance	no data
Remark	NOEC on growth: highest concentration which did not result in a significant reduction in growth at $p < 0.001$.
Reference	Hermens, J. et al (1985): Aquatic Toxicol. 6, 209-217.

Species	Daphnia magna (Crustacea)
Exposure period	21 day
Unit	mg/l
Analyt. Monitoring	no
NOEC	= 30
EC50	> 100
EC29	= 100
Method	other: UBA-Verfahrensvorschlag: Verlaengerter Toxizitaetstest bei Daphnia magna
Year	1984
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Huel-Bericht DL 106, 1988 (unveroeffentlicht)

4.6.2 Toxicity to Terrestrial Plants

Species	Lactuca sativa
Endpoint	other
Unit	mg/l
Exposure Period	3 day
NOEC	
EC50	= 2100
LC50	
Method	other
Year	1977
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The effect parameter reported is inhibition of seed germination.
Test condition	As described in reference.
Reference	Reynolds, T. An Anomalous Effect of Isopropanol on lettuce germination. Plant Sci. Lett., 15, 1977, 25 - 28.

4.6.3 Tox. to Other Non-mamm. Terr. Species

Species	other
Endpoint	mortality
Unit	ppm
Exposure Period	48 hour
NOEC	
LC0	
LC50	10200 - 13340
LC100	

Method	other
Year	1976
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The insects are exposed to the propan-2-ol in nutrient medium.
Remark	The test species reported are Drosophila simulans and Drosophila melanogaster
Test condition	As described in reference.
Reference	David, J. & Bocquet, C. Compared Toxicities of Different Alcohols for Two Drosophila Sibling Species. Comp. Biochem. Physiol., 54C, 1976, 71 - 74.

5. TOXICITY

5.1.1 Acute Oral Toxicity

Type	LD50
Species	rat
Value	= 5280 mg/kg
Method	other
Year	1944
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Lehman, A. J., Chase, H.F., (1944) J. Lab. Clin. Med. 29: 561 - 567.

Type	LD50
Species	rat
Value	= 5840 mg/kg
Method	other
Year	1948
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Smyth, H.F., Carpenter, C.P., (1948), J. Ind. Hyg. Toxicol.,30: 63-70.

Type	LD50
Species	rat
Value	= 4710 mg/kg
Method	other
Year	1971
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Three LD50 values presented: 5.6, 6.0 and 6.8 ml/kg for neonates, young adult and old rats respectively. Quoted value is a mean of the three as presented in IPCS EHC document on 2-propanol (1990).
Reference	Kimura, E.T., Ebert, D.M., Dodge, P.W., (1971), Toxicol. Appl. Pharmacol., 19: 699 -703.

Type	LD50
Species	rat

Value	= 5500 mg/kg
Method	other
Year	1985
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Guseinov, V.G., (1985), Gig. Tr. Prof. Zabol. (7): 60-62.

Type	LD50
Species	mouse
Value	= 4475 mg/kg
Method	other
Year	1985
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Guseinov, V.G., (1985), Gig. Tr. Prof. Zabol., (7): 60-62.

Type	LD50
Species	rabbit
Value	= 5030 mg/kg
Method	other
Year	1944
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Lehman, A.J., Chase, H.F. (1944), J. Lab. Clin. Med., 29: 561 - 567.

Type	LD50
Species	rabbit
Value	= 7990 mg/kg
Method	other
Year	1972
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Munch, J.C., (1972), Ind. Med. 41: 31 - 33.

Type	LD50
Species	dog
Value	= 4830 mg/kg
Method	other
Year	1944
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Lehman, A.J., Chase, H.F., (1944), J. Lab. Clin. Med., 29: 561 - 567.

5.1.2 Acute Inhalation Toxicity

Type	LC50
Species	rat
Exposure Time	4 hour
Value	= 72.6 mg/l
Method	other
Year	1985

GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Guseinov, V.G., (1985), Gig. Tr. Prof. Zabol. (7): 60 - 62.

Type	LC50
Species	rat
Exposure Time	8 hour
Value	= 51.045 mg/l
Method	other
Year	1979
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Laham, S., Potvin, M., Schrader, K., Marino, I. (1979), Drug. Chem. Toxicol. 3: 343 -360.

Type	LC50
Species	mouse
Exposure Time	2 hour
Value	= 53 mg/l
Method	other
Year	1985
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Guseinov, V.G., (1985), Gig. Tr. Prof. Zabol, (7), 60-62.

5.1.3 Acute Dermal Toxicity

Type	LD50
Species	rabbit
Value	= 12870 mg/kg
Method	other
Year	1948
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Smyth, H.F., Carpenter, C.P., (1948), J. Ind. Hyg. Toxicol.,30: 63 -70.

5.1.4 Acute Toxicity, Other Routes

Type	LC50
Species	rat
Route of Administration	i.v.
Exposure Time	
Value	= 1088 mg/kg
Method	other
Year	1985
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Tichy, M., Trcka, V., Roth, Z., Krivucova, M., (1985), Environ. Health. Perspect., 61: 321 328.

Type	LC50
Species	rat
Route of Administration	i.p.
Exposure Time	
Value	= 2830 mg/kg
Method	other
Year	1985
GLP	no data
Testsubstance	as prescribed by1.1 - 1.4
Reference	Tichy, M., Trcka, V., Roth, Z., Krivocova, M., (1985), Environ. Health. Perspect., 61: 321 328.

5.2.1 Skin Irritation

Species	rabbit
Result	not irritating
Classification	not irritating
Method	other
Year	1975
GLP	no
Testsubstance	as prescribed by1.1 - 1.4
Reference	Nixon, G.A., Tyson, C.A., Wertz, W.C., (1975), Toxicol. Appl. Pharmacol. 31: 481 -490.

5.2.2 Eye Irritation

Species	rabbit
Result	irritating
Classification	irritating
Method	Draize-Test
Year	1973
GLP	no
Testsubstance	as prescribed by1.1 - 1.4
Reference	Marzulli, F.N., Ruggles, D.I., (1973), J. Assoc. Off. Anal. Chem., 56: 905 - 914.

Species	rabbit
Result	moderately irritating
Classification	irritating
Method	Draize-Test
Year	1980
GLP	no
Testsubstance	as prescribed by1.1 - 1.4
Reference	Griffith, J.F., Nixon, G.A., Bruce, R.D., Reer, P.J., Bannan, E.A., (1980), Toxicol. Appl. Pharmacol. 55: 501 - 513.

Species	rabbit
Result	irritating

Classification	R36
Method	Draize-Test
Year	1986
GLP	Yes
Testsubstance	as prescribed by 1.1-1.4
Reference	Exxon Biomedical Sciences Inc. (1986) Ocular Irritation Study in Rabbits (Isopropanol). EBSI Document No. 86MRL272.

Species	rabbit
Result	moderate irritating
Classification	irritating
Method	Draize-Test
Year	1987
GLP	no data
Testsubstance	as prescribed by1.1 - 1.4
Remark	Study gives maximum Draize score of 37 (out of 110) and provided conflicting data from 2 tests, one moderate and the other severely irritating.
Reference	Morgan, R.L., Sorenson, S.S., Castles, T.R., (1987), Food. Chem. Toxicol., 25: 609 -613.

5.3 Sensitization

Type	Buehler-Test
Species	guinea pig
Result	not sensitizing
Classification	not sensitizing
Method	other
Year	1980
GLP	no
Testsubstance	as prescribed by1.1 - 1.4
Remark	Result given as "No sensitisation (0/20)". No other data on sensitisation have been found.
Reference	P & G, Unpublished data.

5.4 Repeated Dose Toxicity

Species	rat
Strain	Fischer 344
Sex	male/female
Route of Administration	inhalation
Exposure Period	13 weeks
Frequency of Treatment	6 hours/day, 5 days/week
Post Exposure Observ. Period	none
Doses	0, 100, 500, 1500 and 5000 ppm
Control Group	yes
NOEL	500
LOEL	1500
Method	other (US EPA TCSA Test Guidelines)

Year	1994
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	No exposure-related mortalities occurred. Narcotic effects were noted during exposures to 1500 and 5000 ppm. Ataxia was observed following exposure to 5000 ppm. Decreases in body weight were also observed at the end of the first week of exposure to 5000 ppm. The only microscopic change observed was hyaline droplets within the kidneys of all male rats (including controls). The size and frequency of these droplets were increased in the exposed groups. Thus, repeated exposures produced toxic effects only at the highest concentration (5000 ppm) and a kidney change in male rats of unknown biological significance.
Reference	Burleigh-Flayer, H.D., et al. (1994). Fundam. Appl. Toxicol. 23, 421-428.

Species	rat
Strain	Wistar
Sex	male
Route of Administration	inhalation
Exposure Period	13 or 20 weeks
Frequency of Treatment	4 hours/day, 5 days/week.
Post Exposure Observ. Period	none
Doses	400, 1000,4000, 8000 ppm for 12 weeks; 1000 and 8000ppm for 20 weeks
Control Group	yes
NOEL	= 400 ppm
LOEL	= 1000 ppm
Method	other
Year	1991
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Remark	No significant differences appeared between the groups exposed to 400 ppm and the control group in body weight and in hematological and serum chemistry tests. There was inhibition of body weight and marked local irritation in groups given 1000 ppm or more, decrease in erythrocyte and hemoglobin values in groups given 4000 ppm or more, and increases in serum GOT and GPT, and total cholesterol in the 8000 ppm group. Nakaseko et al. also exposed rats to 1000 and 8000 ppm isopropanol for 20 weeks for nerve conduction studies, which was reported separately (see also section 5.10).
Reference	Nakaseko, H., Teramoto, K., Horiguchi, S., Wakitani, F., Yamanoto, T., Adachi, M., Tanaka, H., Hozu, S., Jpn. J. Ind.Hlth. 33(3): 200-201, 1991.

Species	rat
Strain	F-344
Sex	female
Route of Administration	Inhalation
Exposure period	90 days or 63 days

Ferquency of exposure	1/2 6 hours/day for 5 days /week for 13 weeks 1/2 6 hours/day for 5 days /week for 9 weeks
Post exposure observation period	2 weeks post exposure
Doses	5000 ppm
Control group	yes
NOEL	NA
LOEL	5000 ppm
Method	other
Year	1994
GLP	yes
Testsubstance	as prescribed in 1.1-1.4
Remark	Increases in motor activity were seen following exposure to 5000 ppm of isopropanol. After 9 weeks of exposure, complete recovery was noted two days post exposure. After 13 weeks of exposure, complete reversibility was noted at 2 weeks post exposure.
Reference	Gill, M., Burleigh-Flayer, H., Bevan. C., Gardiner, T., Kapp, R., Isopropanol Ninety-Day Vapor Inhalation Neurotoxicity Study in Female F-344 Rats. (Abstract) The Toxicologist, Vol. 14 (1), 1994.

Species	rat
Strain	no data
Sex	male/female
Route of Administration	drinking water
Exposure Period	27 weeks
Frequency of Treatment	continuous
Post Exposure Observ. Period	none
Doses	600 & 2300 mg/kg for males, 1000 & 3900 mg/kg for females
Control Group	yes
NOEL	= 600 - 1000 mg/kg bw d
LOEL	= 2300 - 3900 mg/kg bw d
Method	other
Year	1944
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The male rats showed some decreased body weight gains during the first thirteen weeks of the study, and then increased body weight gain for the reminder of the study. The female rats showed decreased body weight gain throughout the study. No gross or microscopic abnormalities were noted.
Reference	Lehman, A.J., Chase, H.F., (1944), J. Lab. Clin. Med. 29: 561 - 567.

Species	rat
Strain	no data
Sex	male
Route of Administration	drinking water
Exposure Period	12 weeks
Frequency of Treatment	continuous
Post Exposure Observ. Period	none

Doses	1,2,3 and 5 percent
Control Group	yes
NOEL	= 1% (870 mg/kg/day)
LOEL	= 2% (1280 mg/kg/day)
Method	other
Year	1993
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The relative organ weights of liver, kidneys, and adrenals were significantly increased in a dosedependent manner. No histological alterations could be attributed to the dosing, apart from a dose-dependent increase in formation of hyaline casts and droplets in the proximal tubules of the kidneys. Dorsal hippocampal glial fibrillary acidic protein (GFAP) was unaffected after treatment.
Reference	Pilegaard, K. and Ladefoged, O. (1993) In Vivo 7:325-330

Species	mouse
Strain	CD-1
Sex	male/female
Route of Administration	inhalation
Exposure Period	13 weeks
Frequency of Treatment	6 hours/day, 5 days/week
Post Exposure Observ. Period	none
Doses	0, 100, 500, 1500 and 5000 ppm
Control Group	yes
NOEL	= 500 ppm
LOEL	= 1500 ppm
Method	other (US EPA TCSA Test Guidelines)
Year	1994
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	No exposure-related mortalities occurred. Narcotic effects were noted during exposures to 1500 and 5000 ppm. No exposure-related effects were noted on body weight of the male mice, but increased body weight and body weight gain were observed for the 5000 ppm female mice. No treatmentrelated effects were noted at gross necropsy or at histopathologic examination.
Reference	Burleigh-Flayer, H.D., et al. (1994). Fundam. Appl. Toxicol. 23, 421-428.

Species	rat
Strain	Fischer 344
Sex	male/female
Route of Administration	inhalation
Exposure Period	13 weeks
Frequency of Treatment	6 hours/day, 5 days/week
Post Exposure Observ. Period	none
Doses	0, 500, 1500 and 5000 ppm
Control Group	yes

NOEL	= 1500
LOEL	= 5000
Method	other (US EPA TCSA Test Guidelines)
Year	1994
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Neurobehavioral evaluations included a functional observation battery (FOB), motor activity, and neuropathology. There were no changes in FOB, but increased motor activity was noted in female rats of the 5000 ppm group at week 9 and 13. Neuropathological examination revealed no exposure-related lesions in the nervous system.
Reference	Burleigh-Flayer, H.D., et al. (1994). Fundam. Appl. Toxicol. 23, 421-428.

5.5 Genetic Toxicity in Vitro

Type	Salmonella typhimurium reverse mutation assay
System of Testing	TA 98, 100, 1535, 1537
Concentr.	180 mmol/plate
Metabolic Activation	with and without
Result	negative
Method	other
Year	1980
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Remark	A report on screening of many chemicals which could be constituents of tobacco smoke.
Reference	Florin, I., Rutberg, L., Curvall, M., and Enzell, O.R. Toxicology 15:219-232, 1980

Type	Sister chromatid exchange assay
System of Testing	Chinese hamster V79 fibroblasts
Concentr.	3.3, 10, 33.3 and 100 mmol/l
Metabolic Activation	with and without
Result	negative
Method	other
Year	1987
GLP	no data
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Von der Hude, W., Scheutwinkel, M., Gramlich, U., Fissler, B., Busler, A., In Vitro Environ. Mutagen., (1987), 9: 401 - 410.

Type	Salmonella typhimurium reverse mutation assay
System of Testing	TA 97, 98, 100, 102, 104, 1535, 1537, 1538
Concentr.	100 mmol/plate
Metabolic Activation	with and without
Result	negative
Method	other
Year	1992
GLP	Yes
Testsubstance	as prescribed by 1.1 - 1.4

Reference	Zeiger, E. et al, Env. Mol. Mut., 19 (Suppl.21): 2 - 141, 1992.
Type	HGPRT assay
System of Testing	Chinese hamster ovary
Concentr.	0.5 - 5.0 mg/ml
Metabolic Activation	with and without
Result	negative
Method	other (US EPA TCSA Test Guidelines)
Year	1993
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Kapp, R.W. et al. (1993). Environ. Mol. Mutagen., 22: 93-100.
Type	Meiotic nondisjunction
System of Testing	Neurospora crassa (Strain I x I)
Concentr.	no data
Metabolic Activation	without
Result	negative
Method	other
Year	1980
GLP	no data
Test substance	as prescribed by 1.1 - 1.4
Remark	
Reference	Griffiths A.J.F. (1980). NIEHS 263-77-C0604CC, Progress Report. (Cited In: Brockman H.E., de Serres F.J., Ong T-M., DeMarini D.M., Katz A.J., Griffiths A.J.F. and Stafford R.S. (1984). Mutation tests in *Neurospora crassa*. A report of the U.S. Environmental Protection Agency Gene-Tox Program. *Mutat. Res.* 133:87-134.)
Type	Cell transformation
System of Testing	SA7/Syrian Hamster Embryo
Concentr.	62 - 1000 µg/ml
Metabolic Activation	without
Result	negative
Method	other
Year	1978
GLP	no data
Test substance	as prescribed by 1.1 - 1.4
Remark	
Reference	Casto B.C. and Hatch G.G. (1978). Progress Report NIH-NCI-N01-CP-45615. pp. 62-75. (Cited In: Heidelberger C., Freeman A.E., Pienta R.J., Sivak A., Bertram J.S., Casto B.C., Dunkel V.C., Francis M.W., Kakunaga T., Little J.B. and Schechtman L.M. (1983). Cell transformation by chemical agents - a review and analysis of the literature. A report of the U.S. Environmental Protection Agency Gene-Tox Program. *Mutat. Res.* 114:283-385.)

5.6 Genetic Toxicity in Vivo

Type	Micronucleus Assay
Species	mouse

Strain	ICR random bred
Sex	male/female
Route of Administration	i.p.
Exposure Period	once, bone marrow examined after 24, 48 and 72 hours.
Doses	350, 1173, 2500 mg/kg
Result	negative
Method	other (US EPA TCSA Test Guidelines)
Year	1993
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Reference	Kapp, R.W. et al. (1993). Environ. Mol. Mutagen., 22: 93-100.

5.7 Carcinogenicity

Species	mouse
Strain	C3H
Sex	male/female
Route of Administration	inhalation
Exposure Period	5 - 8 months
Frequency of Treatment	3 - 7 hours/day, 5 days/week.
Post Exposure Observ. Period	none
Doses	7700 mg/m3
Control Group	yes
Method	other
Year	1952
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Two other strains used as well, ABC and C57/BL.
Result	No excess of lung tumo rs noted among treated mice.
Reference	Weil, C.S., Smyth, H.F., Nale, T.W., Arch. Ind. Hyg. Occup. Med. (1952), 5: 535 -547.

Species	mouse
Strain	other
Sex	no data
Route of Administration	dermal
Exposure Period	52 weeks
Frequency of Treatment	3 times/week.
Post Exposure Observ. Period	none
Doses	as supplied
Control Group	yes
Method	other
Year	1976
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Result	No treatment related skin tumo rs reported.
Reference	US NIOSH (1976), Cincinnati, Ohio, US National Institute of Occupational Safety and Health, US Dept. of Health, Education and

	Welfare, Public Health Services, Centre for Disease Control (DHEW publication no. (NIOSH)76-142).
Species	mouse
Strain	C3H
Sex	male
Route of Administration	s.c.
Exposure Period	20 - 40 weeks.
Frequency of Treatment	once/week
Post Exposure Observ. Period	none
Doses	20 mg
Control Group	yes
Method	other
Year	1952
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Two other strains used as well, ABC and C57/BL.
Result	No excessive incidence of lung tumo rs was noted in treated groups, although incidence of lung tumours in control groups was high.
Reference	Weil, C.S., Smyth, H.F., Nale, T.W., Arch. Ind. Hyg. Occup. Med. (1952), 5: 535 -547.
Species	rat
Strain	Fischer 344
Sex	male/female
Route of Administration	inhalation
Exposure Period	24 months
Frequency of Treatment	6 hours/day, 5 days/week
Post Exposure Observ. Period	none
Doses	500, 2500, 5000 ppm
Control Group	yes
NOEL(onco)	>5000 ppm for oncogenetici effects
NOEL(toxicity)	500 ppm
Method	other (US EPA TCSA Test Guidelines)
Year	1995
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	The main cause of death for the 5000 ppm rats (both sexes) was chronic renal disease. Chronic renal disease also accounted for much of the mortality of the 2500 ppm male rats. In contrast, the main cause of death for the control animals was large granular lymphocyte leukemia. During exposure, some male and female rats at 5000 ppm showed signs of hypoactivity, lack of startle reflex, and narcosis. Hypoactivity was also observed in some animals at 2500 ppm. Body weight and body weight gain were increased for animals in the 2500 and 5000 ppm groups. Urine chemistry changes indicative of impaired kidney function were noted in the 2500 (males) and 5000 (males and females) ppm groups. In the 2500 and 5000 ppm males and/or females, liver weights were increased, probably as a result of a

	metabolic response (enzyme induction), although there was no histopathological changes noted. There was also a concentration-related increase in absolute and relative testes weight seen in males. An excerbation of chronic renal disease was observed in the IPA-exposed rats. Observations included mineralization, tubular dilation, glomerulosclerosis, interstitial nephritis and fibrosis, hydronephrosis, and transitional cell hyperplasia. These changes are common in aging rats. An increased incidence of interstitial cell adenomas occurred in the testes of male rats. The frequency of interstitial (Leydig) cell tumors of the testis was also increased in a concentration-related pattern for male rats in the study. The incidence of these tumors in IPA exposed groups was similar to that reported for unexposed rats in the National Toxicology Program and previous studies at this laboratory, while the incidence of these tumors in unexposed rats in this study was well below historical levels. There were no increases in the incidence of other tumor types in the exposed animals compared to the controls.
Reference	Garman, R. Bevan, C., Burleigh-Flayer, H., Gardiner, T., Kapp, R., Neptun, D., Tyler, T. and Wright, G. Isopropanol (IPA) Vapor Inhalation Oncogenicity Study in Fisher 344 Rats.(Abstract No. 979) The Toxicologist, Vol. 15 (1), 1995.
Species	mouse
Strain	CD-1
Sex	male/female
Route of Administration	inhalation
Exposure Period	18 months
Frequency of Treatment	6 hours/day, 5 day/week
Post Exposure Observ. Period	None
Doses	500, 2500, 5000 ppm
Control Group	yes
NOEL(onco)	> 5000 ppm for oncogenetic effects
NOEL(toxicity)	500 ppm (see remarks)
Method	other (US EPA TCSA Test Guidelines)
Year	
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Narcosis was observed during exposure in the 2500 and 5000 ppm groups, and following exposure in the 5000 ppm groups. There was no differences in mortality rate or mean survival time between IPA-exposed and control animals. Clinical signs were observed for some male and female mice during exposures to 2500 and 5000 ppm and included hypoactivity, lack of a startle reflex, narcosis, ataxia (5000 ppm only), and prostration (5000 ppm only). Ataxia was the only exposure-related clinical sign that was noted for the 5000 ppm male and female animals following exposure. Increased body weight and/or body weight gain were observed for both sexes in the 2500 and 5000 ppm groups. The 2500 and 5000 ppm male mice from the recovery group continued to increase body weight and body weight gain to study termination even in the absence of IPA exposure. Absolute and

	relative liver weights were increased in both male and female mice; relative testes weights were decreased in all IPA-exposed male mice; and absolute and relative brain weights were decreased in the 5000 ppm females. The only organ weight change noted for the recovery animals was a concentration-related absolute and relative increase in liver weight for the male mice. Hematologic parameters were unaffected by IPA exposure. The only gross lesion noted at study termination was seminal vesicle enlargement in the 5000 ppm males. However, microscopic evaluation showed increased incidence of dilation of the seminal vesicles in both the 2500 and 5000 ppm male mice. These effects were not present in the recovery group males. Since the seminal vesicles did not have any associated inflammatory or degenerative changes, the enlargement may have been a result of hormonal imbalance. It is not known whether the narcotic effects of isopropanol could have affected the secretion of the seminal vesicles. Minimal to mild effects to the kidney including renal tubular proteinosis and tubular dilation were observed following 78 weeks of exposure. The incidence of renal tubular proteinosis was generally significantly increased for all male and female treatment groups relative to controls; however the majority of affected animals showed minimal degrees of tubular proteinosis (i.e., only a few tubules affected), there was no concentration-related gradient in either the frequency of severity of this change, and there was no corresponding evidence of alterations to the glomeruli. Mild to moderate degrees of tubular dilation were observed in a small number of females in the 2500 and 5000 ppm groups (significantly increased only for the 5000 ppm group). This finding, however, was not duplicated in male mice (a significant increase was only seen for the 500 ppm group) nor was it accompanied by evidence of tubular cell degeneration or urinary outflow obstruction The increased incidence of kidney effects was not increased in animals in the recovery group. There was no increased frequency of neoplastic lesions in any of the IPA exposed groups, indicating a lack of carcinogenic activity by IPA. Thus, while the kidney findings may be considered treatment-related effects (female mice), their toxicological significance is unclear at this time. The uncertainty about kidney effects, in particular male mice, leatd to a NOEL of 500 ppm, and a LOEL of 2500 ppm (clinical signs), for non-cancer effects for this study.
Reference	Burleigh-Flayer, H., Bevan, C., Gardiner, T., Garman, R., Kapp, R., Neptun, D., Tyler, T. and Wright, G. Isopropanol Vapor Inhalation Oncogenicity Study in CD-1Ò Mice. (Abstract No. 1219) The Toxicologist, Vol. 14 (1), 1994.

5.8 Toxicity to Reproduction

Type	One generation study
Species	rat
Strain	Wistar
Sex	male/female
Route of Administration	drinking water

Exposure Period	To weaning (day 21 after birth).
Frequency of Treatment	continuous
Premating Exposure Period	
male	70 days
female	21 days
Duration of Test	To weaning
Doses	0.5, 1.0 and 2.0%
Control Group	yes
NOEL Parental	= 1 %
NOEL F1 Offspring	= 1 %
NOEL F2 Offspring	
Method	other
Year	1986
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Parental rats dosed with 2% isoproanol had decreased body weight gain and corresponding reduced pup weight gain and decreased survival compared with controls. There was also a dose-related increase in relative liver weights of the F1 animals. There was no effect on reproductive parameters. There was no macroscopic or histopathological changes assoicated with isopropanol treatment. The reproductive NOEL of 1% corresponds to 825 and 625 mg/kg/day for females and males respectively. A further study by Lehman et al (J. Exp. Pharmacol. Expt. Therapy, 85, 61-69, 1945) studied the effects of IPA in drinking water. No effects were found at 2.5% but the reported data are scant.
Reference	British Industrial Biological Research Assoc., Report 0570/3/86.

Type	Two generation study
Species	rat
Strain	Sprague-Dawley
Sex	male/female
Route of Administration	gavage
Exposure Period	Prior to mating and to lactation and weaning of F1 and F2 generations.
Frequency of Treatment	daily
Premating Exposure Period	
male	10 weeks
female	10 weeks
Duration of Test	to lactation and weaning
Doses	100, 500 and 1000 mg/kg/day
Control Group	yes
NOEL Parental	< 500 mg/kg bw/day (BMDL10 = 407 mg/kg/day)(see remarks below)
Reproduction	
NOEL F1 Offspring	< 500 mg/kg bw/day(BMDL5 = 449 mg/kg/day)(See remarks below)
NOEL F2 Offspring	< 500 mg/kg bw/day (BMDL5 = 418 mg/kg/day)(See remarks below)
Method	other (US EPA TCSA Test Guidelines)
Year	1995
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4

Remark	Thirty rats of each sex per group (P1) were dosed once daily by oral gavage with 0, 100, 500 or 1000 mg of isopropanol kg-1 for at least 10 weeks prior to mating. Findings in the parental animals included increased lactation body weight gain in the 500 and 1000 mg/kg females, increased liver and kidney weights in the 500 and 1000 mg/kg groups of both sexes, and centrilobular hepatocyte hyperthrophy in some P2 males. There was microscopic findings in the kidneys from the mid- and high-dose P1 males and from all treated groups of the P2 males. Exposure to 1000 mg/kg day and to a lesser extent 500 mg/kg day resulted in a reduction in postnatal survival in both F1 and F2 litters . In addition, offspring body weight was reduced during the early postnatal period in the 1000 mg/kg F1 males and in the 1000 mg/kg F2 pups of both sexes. In the 1000 mg/kg group 18/70 F1 weanlings or were euthanized prior to P2 selection. No treatment-related postmortem findings were observed in the offspring from either generation. A statistically significant reduction was observed in the male mating index of the 1000 mg/kg P2 males compared to controls. However, no treatment-related microscopic changes in reproductive tissues or biologically meaningful differences in other reproductive parameters were noted.
Remark	The study-derived NOELs for the F1 and F2 offspring are contingent upon the biological significance ascribed to the effects observed for the 500 mg/kg /day treatment group. There are two perspectives on the interpretation of these observations. A conservative perspective is that the reductions in postnatal survival are treatment- and dose-related effects (U.S. EPA, 1992 U.S. EPA, 1996; Tyl, 1996). Consequently, the NOEL based on this interpretation would be set at 100 mg/kg/day. On the other hand, the NOEL may be set at 500 mg/kg/day if these observations are not deemed biologically significant (Bevan *et al*., 1995; Harris, 1995). A benchmark dose (BMD) assessment was conducted as a way of clarifying issues surrounding the derivation of effect levels for this study. As described below, this assessment resulted in calculated BMD dosages of 449 and 418 mg/kg low/day for the F1 and F2, respectively as appropriate descriptors for this endpoint. (See Benchmark study below.).
Reference	Bevan, C., Tyler, T.R., Gardiner, T.H., Kapp, R.W., Jr., Andrews, L. and Beyer, B.K. Journal of Applied Toxicology, Vol. 15(2) pp. 117-123 (1995). Harris S.B. (1995). A review of the EPA comments regarding the study entitled “Multi-generation rat reproduction study with isopropanol”. Report prepared for the Chemical Manufacturers Association Isopropanol Panel. Tyl R. W. (1996) February 12, 1996 Letter to the Chemical Manufacturers Association Isopropanol Panel. US EPA (1992). Review of Section 4 Data - A Two Generatio Reproductive Toxicity Study in Rats with Isopropanol.

	US EPA, Draft Final RM1 Risk Assessment of Isopropanol, OPPT, 1996. TSCA Public Docket Number AR-141.
Remark	Quantitative Dose-Rsponse Analysis -- Application of the Benchmark Method to the Multi-Generation Rat Reproduction Study for Isopropanol.
Remark	Chemical Manufacturers Association Isopropanol Panel conducted a quantitative dose-response analysis of the bioassay data from the multi-generation rat reproduction study noted above using the benchmark dose method to identify the relevant dosage to derive a toxicity value that may contribute in part to safety assessment decisions for isopropanol.
Remark	The reproductive/developmental effects were reported to have NOAEL between 100 mg/kg/day (USEPA 1992) and 500 mg/kg/day (Bevan et al., 1995). Based upon decrease in mating index observed in the P2 males, a BMDL10 of 407 mg/kg/day was estimated for reproductive effects. A BMDL5 of 418 mg/kg/day was estimated for developmental effects based upon the F2 generation 4-day survival. For the F1 generation 4-day survival, 449 mg/kg bw/day was estimated as BMDL5. The corresponding MLE dosages were 786 (Polynomial model) and 771 mg/kg bw/day (Weibell model) for the reproductive effects, 656 mg/kg bw/day for the F1 postnatal effects, and 804 mg/kg bw/day for the F2 postnatal effects.
Reference	Shipp, A.M., Allen, B.C., Van Landingham, C., Gentry, P.R. and Crump, K.S., Quantitative Dose-Response Analysis -- Application of the Benchmark Method to the Multi-Generation Rat Reproduction Study for Isopropanol. Final Report prepared by ICF Kaiser, KS Crump Division, 602, East Georgia Avenue, Ruston, Louisiana for Chemical Manufactureres Association Isopropanol Panel, April 1996.

Type	One generation study
Species	rat
Strain	Wistar
Sex	male/female
Route of Administration	drinking water
Exposure Period	prior to mating and to lactation and weaning of F1 and generation
Frequency of Treatment	continuous
Premating Exposure Period	
male	8 weeks
female	8 weeks
Duration of Test	
Doses	2 and 3% isopropanol in drinking water
Control Group	yes
NOEL Parental	= 2%
NOEL F1 Offspring	= 2%
NOEL F2 Offspring	
Method	other
Year	1977
GLP	no
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Isopropanol was administered as a 3% solution in the drinking water. Reduced parental body weight gain, food and water consumption

	were observed in the isopropanol-treated animals compared with controls. In addition, fertility, litter size, and pup weights at postnatal days 4 and 21 were reduced in the 3% treatment group compared with the controls. The dose was dropped to 2% isopropanol and the parental animals were re-mated to provide litters for a developmental toxicity evaluation. No parental toxicity or reproductive toxicity was noted.
Reference	Gallo, M.A., Oser, B.I., Cox, G.E., and Bailey, D.E. (1977) Toxicol. Appl. Pharmacol. 41:35

5.9 Developmental Toxicity/Teratogenicity

Species	rat
Strain	Wistar
Sex	female
Route of Administration	drinking water
Exposure Period	Days 6 - 16 of pregnancy.
Frequency of Treatment	continuous
Duration of Test	To day 20 of pregnancy.
Doses	0.5, 1.25, 2.5%
Control Group	yes
NOEL Maternal Toxicity	= 0.5 %
NOEL Teratogenicity	= 0.5 %
Method	other
Year	1986
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	Maternal body weights were significantly decreased from gestational days 7-16. Animals in the 1.25% and 2.5% dose groups exhibited reduced food and water consumption during the treatment period. In the 1.25% and 2.5% dose groups, fetal body weights were reduced on a per fetus basis, but not on a per litter basis. No teratogenic effects were observed; but, delayed ossification of the skeleton was noted in the 1.25% and 2.5% dose groups, consistent with retarded development as a result of maternal toxicity.
Reference	British Industrial Biological Research Assoc., Report no. 0570/2/86.

Species	rat
Strain	Sprague-Dawley
Sex	female
Route of Administration	gavage
Exposure Period	6 - 15 of gestation
Frequency of Treatment	daily
Duration of Test	To day 20 of pregnancy
Doses	0, 400, 800 and 1200 mg/kg/day
Control Group	yes
NOAEL Maternal Toxicity	= 400 mg/kg bw/day
NOAEL Developmental Toxicity	= 400 mg/kg bw/day
Method	other (US EPA TCSA Test Guidelines)
Year	1994

GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	No dams aborted or delivered early. Two dams died at 1200 mg/kg and one dam died at 800 mg/kg. Reduced maternal gestational weight gain on gestational days 0 to 20 associated with significantly reduced gravid uterine weights were noted in the high-dose animals. All gestational parameters were equivalent across groups. Fetal body weights per liter were significantly reduced at the two highest doses. There were no adverse maternal or developmental effects at 400 mg/kg. No evidence of increased teratogenicity was observed at any dose tested. Therefore, isopropanol was not teratogenic to CD rats.
Reference	Tyl, R.W., Masten, L.W., Marr, M.C., Myers, C.B., Slauter, R.W., Gardiner, T.H., Strother, D.E., McKee, R.H., and Tyler, T.R. (1994) Fundam. Appl. Toxicol. 22:139- 151.

Species	rabbit
Strain	New Zealand white
Sex	female
Route of Administration	gavage
Exposure Period	Days 6 - 18 of pregnancy
Frequency of Treatment	daily
Duration of Test	to day 28 of pregnancy
Doses	120, 240 and 480 mg/kg/day
Control Group	yes
NOAEL Maternal Toxicity	= 240 mg/kg bw/day
NOAEL Developmental Toxicity	= 480 mg/kg bw/day
Method	other (US EPA TCSA Test Guidelines)
Year	1994
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	No does aborted or delivered early. Four does died at 480 mg/kg. Maternal body weights were significantly reduced during treatment and clinical signs of toxicity were observed at 480 mg/kg. No adverse maternal effects were noted at 120 or 240 mg/kg. All gestational parameters were equivalent across groups. No evidence of increased teratogenicity was observed at any dose tested. Therefore, isopropanol was not teratogenic to NZW rabbits.
Reference	Tyl, R.W., Masten, L.W., Marr, M.C., Myers, C.B., Slauter, R.W., Gardiner, T.H., Strother, D.E., McKee, R.H., and Tyler, T.R. (1994) Fundam. Appl. Toxicol. 22:139- 151.

Species	rat
Strain	Sprague-Dawley
Sex	female
Route of Administration	gavage
Exposure Period	day 6 of pregnancy to day 21 postnatal.
Frequency of Treatment	daily
Duration of Test	Day 68 post natal.
Doses	200, 700 and 1200 mg/kg/day
Control Group	yes
NOEL Maternal Toxicity	= 700 mg/kg bw/day

NOEL Developmental Neurotoxicity = 1200 mg/kg bw/day

Method	other (US EPA TCSA Test Guidelines)
Year	1994
GLP	yes
Testsubstance	as prescribed by 1.1 - 1.4
Remark	This study was specifically designed to investigate developmental neurotoxicity. One high-dose dam died on postnatal day 15, but there were no other clinical observations or effects on maternal weight, food consumption, or gestation length. Pup survival, weight, sex ratio, and sexual maturation were unaffected. There were no biologically significant findings in the behavioral tests, no changes in organ weights, and no pathological findings that could be attributed to isopropanol exposure.
Reference	Bates, H.K., McKee, R.H., Bieler, G.S., Gardiner, T.H., Gill, M.W., Strother, D.E., and Masten, L.W. (1994) Fundam. Appl. Toxicol. 22:152-158.

Species	rat
Strain	Sprague-Dawley
Route of Administration	inhalation
Exposure Period	gestational days 1-19
Frequency of Treatment	7 hours/day
Duration of Test	gestational day 20
Doses	3500, 7000 and 10000 ppm
Control Group	yes
NOEL Maternal Toxicity	= 3500 ppm
NOEL Teratogenicity	< 3500 ppm
Method	not specified
GLP	yes
Remark	The animals showed unsteady gait and narcotization during initial exposures in the mid- and high-dose groups; reduced food consumption and reduced weight gain were also noted in both the mid- and high-dose groups. Fetal body weights per litter were reduced in all dose groups. Exposure to 10000 ppm also resulted in failure of implantation, fully resorbed litters, increased resportions per litter and increased incidence of cervical ribs.
Reference	Nelson, B.K., Brightwell, W.S., MacKenzie-Taylor, D.R., Khan, A., Burg, J.R., and Weigel, W.W. (1988) Fd. Chem. Toxicol. 26: 247-254.

5.10 Other Relevant Information

Type	METABOLISM
Remark	Numerous studies on the absoption, distribution, metabolism and excretion of IPA have been performed. These indicate that IPA is readily absorbed in animals and man through the lungs, skin and GI tract. There is evidence for a delay in absorption through the GI tract at high dose levels and an extension in half life suggesting limited metabolic capability. IPA is rapidly distributed throughout the body and has been shown to cross the blood/brain barrier. Elimination from

	the blood follows first order kinetics. Approximately 64 - 84% of an intravenous dose has been shown to be oxidised to acetone in rabbit. Elimination of IPA is retarded by ethanol and it has been shown that IPA is a poorer substrate for alcohol dehydrogenase than ethanol. Excretion occurs mainly through the expired air either as unchanged IPA or as acetone. Quantities of acetone and IPA are excreted in the urine together with the glucuronide conjugate of IPA. There is evidence in man that sulphonation may occur.
Reference	World Health Organisation, Environmental Health Criteria 103, 2-Propanol, WHO, Geneva, 1990.
Remark	In rats, a similar relationship was established for excretion of acetone and IPA in expired air following a single IP injection of 0.1 ml IPA. 2% of the administered dose was excreted in the expired air as IPA and 38.8% as acetone.
Reference	Teramoto, K., Horiguchi, S., Adachi, M., Wakitani, F., Fukui, M., Osaka City Med. J., 33 (2): 153 - 160, 1987.
Remark	IPA has been shown to be readily absorbed and distributed through rat tissue following intravenous, gavage or inhalation routes of exposure. IPA is mainly metabolised to acetone by a saturable pathway. The main route of excretion is via the expired air as acetone, CO2 and unchanged IPA. Over 80% of a radiolabel was excreted in expired air following these routes of exposure. There were no substantial differences between males and females.
Reference	Slauter, R. W. et al. Disposition and Pharmacokinetics of Isopropanol in F-344 Rats and B6C3F1 Mice. (Abstract 809) The Toxicologist Vol 12 (1) 1992.
Remark	"The absorption, metabolism, disposition, and excretion of isopropanol (IPA) were studied in male and female rats and mice. Animals were exposed by i.v. (300 mg/kg) and inhalation (500 and 5000 ppm for 6 hours) routes; additionally IPA was given by gavage to rats only in single and multiple 300 and 3000 mg/kg doses. In the rat approximately 81-89% of the administered dose was exhaled (as acetone, CO2, and unmetabolized IPA); approximately 76% of the dose in mice was exhaled after iv bolus but 92% was exhaled following inhalation. Approximately 3-8% of the administered dose was excreted in urine as IPA, acetone, and a metabolite tentatively identified as isopropyl glucuronic acid. Small amounts of radiolabel were found in feces and in the carcass. There were no major differences in the rates or routes of excretion observed either between sexes or between routes of administration. Additionally, repeated exposure had no effect on excretion. However, both the route of administration and the exposure or dose level influenced the form in which material was exhaled. Following exposure to 5000 ppm, a greater percentage of unmetabolized IPA was recovered in the expired air than following exposure to 500 ppm, implying saturation of metabolism".
Reference	Slauter, R.W. et al, (1994). Fundam. Appl. Toxicol. 23, 407-420.
Type	PHARMACOKINETICS
Remark	Male and female rats and mice were exposed to 300 mg/kg isopropanol intravenously, and to 500 and 5000 ppm isopropanol by

	inhalation for 6 hours. Additionally, isopropanol was given to rats by gavage (300 and 3000 mg/kg) in single and multiple doses. Exhalation was the major route of excretion with acetone as the major metabolite along with unmetabolized isopropanol and CO2. Urinary excretion accounted for 5-8% of the administered dose which included isopropanol, acetone, and the glucuronide conjugate of isopropanol. A small amount was excreted in the feces. Excretion and distribution patterns were similar by all routes of administration. High doses exceeded the metabolic threshold as evidenced by greater proportion of isopropanol excretion. There was no bioaccumulation, and distribution was similar for single and repeated administration. No major differences in absorption, distribution, metabolism, and excretion between species were observed.
Reference	Slauter, R.W., Coleman, D.P., Gaudette, N.F., McKee, R.H., Masten, L.W., Gardiner, T.H., Marino, D.J., Tyler, T.R., and Jeffcoat, A.R. (1992) Toxicologist 12: 219.
Remark	Following inhalation exposure of rats to isopropanol for 4 hours, blood levels of isopropanol and its metabolite acetone were directly related to airborne concentrations in the range of 500 and 8000 ppm. Following inhalation, the acetone/isopropanol ratio in blood decreased indicating saturation of the oxidative metabolic pathway above 4000 ppm.
Reference	Laham, S., Potvin, M., Schrader, K., and Marino, I. (1980) Drug Chem. Toxicol. 3: 343-360.
Type	NEUROTOXICITY
Remark	Groups of male and female rats (Fischer 344) received a single inhalation exposure of IPA at dose levels of 0, 500, 1500, 5000 or 10000 ppm for 6 hours. A spectrum of behavioral effects indicative of narcosis, defined as a generalized loss of neuromotor and reflex function, was observed in animals of the 10000 ppm group, and to a lesser extent in the 5000 ppm animals. Recovery from these effects was observed by 24 hours for the 10000 ppm animals, and by 6 hours for the 5000 ppm animals. A concentration-dependent decrease in motor activity was observed for males exposed to > 1500 ppm and for females exposed to > 5000 ppm. The results showed that exposure of rats to isopropanol vapor produces transient, concentration-related narcosis and/or CNS sedation. A NOEL for clinical signs of intoxication (narcosis and neurobehavioural function) was 1500 ppm. A NOEL for neurobehavioural effects was 500 ppm.
Reference	(1) Gill, M.W., Burleigh-Flayer, H.D., Marino, D.J., Masten, L.W., McKee, R.H., Tyler, T.R. and Gardiner, T. Isopropanol Single Exposure Vapor Unhalation Neurotoxicity Sttudy in Rats. (Abstract 862) The Toxicologist Vol. 12 (1), 1992. (2) Gill, M.W., Burleigh-Flayer, H.D., Strother, D.E., Masten, L.W., McKee, R.H., Tyler, T.R. and Gardiner, T.H. Isopropanol: Acute Vapor Inhalation neuroticity Study in Rats. J. Appl. Toxicol. 15 (2) 77-84, 1995.
Remark	A vapor inhalation study was performed on isopropanol on F-344 rats and CD-1Ò Mice. Exposures were 0, 100, 500, 1500, or 5000 ppm for

	6 hours/day, 5 days per week, for 13 weeks. Effects of narcosis were observed only during exposure to 5000 ppm. Neurobehavioural evaluations indicated no changes in the functional observation battery; however, increased motor activity was noted in female rats of the 5000 ppm group at Weeks 9 and 13. Neuropathological examination revelaed no exposure-related lesions in the nervous system.
Reference	Burleigh-Flayer, H.D., Gill, M.W., Marino, D.J., Masten, L.W., McKee, R.H., Tyler, T.R., and Gardiner, T.H. (Abstract No. 1057) Toxicologist Vol. 12 (1) 1992.
Remark	See M. Gill's review of case studies for an overview of neurotixicty testing of isopropsanol.
Reference	Gill, M.W., "Case Studies in Industrial Neurotoxicology" In Neurobehavioral Toxicity: Analysis and Interpretation, B. Weiss and J. O'Donoghue (Eds.) Raven Press, New York, 1994.
Remark	See Section 5.4 for details of 12 week study in rats receiving isopropanol in drinking water. No indication of neurotoxicity, as assayed as GFAP in the dorsal hippocampal region, was detected.
Remark	Jcl-Wistar rats were exposed to 1000 and 8000 ppm isopropanol 8 hours/day, 5 days/week for 20 weeks. Sensory nerve conduction velocity was reported to have been affected in the 8000 ppm dose group.
Reference	Teramoto, K., Wakitani, F., Horiguch, S., Jo, T., Yamamoto, T., Misutake, H., and Nakaseko, H. (1993) Environ.Res 62:148
Type	NERVE CONDUCTION STUDY
Remark	Jcl-Wistar rats were exposed to 1000 and 8000 ppm isopropanol 8 hours/day, 5 days/week for 20 weeks. Sensory nerve conduction velocity was reported to have been affected in the 8000 ppm dose group.
Reference	Teramoto, K., Wakitani, F., Horiguchi, S., Jo, T., Yamamoto, T., Mitsutake, H., and Nakaseko, H. (1993) Environ. Res. 62: 148.
Type	IMMUNOTOXICITY
Remark	It has been suggested that IPA may interfere with the normal inflammatory response. Inhibition of histamine induced increase in vascular permeability has been demonstrated as has experimentally induced plasma exudation into the pleuralcavity. Administration of antiinflammatory drugs however increased the pleural inflammatory reaction.
Reference	Kasuga, F., Inoue, S., Asano, T., Kumagi, S., Fd. Cos. Tox. 30 (7): 631-634, 1992.
Type	IMMUNOHISTOCHEMISTRY
Remark	Kidney section prepared from paraffin blocks of kidney tissues obtained following a 9- day vapor inhalation study were examined for immunohistochemical staining with alpha2u-globulin. The section examined included 5/sex from the control and 5000 ppm exposure groups and 5 males from a 10,000 ppm exposure group. There were no substantive differences noted between the exposure groups for the male rats in either intensity or distribution of the alpha2u-globulin

	reactivity. The females did not have any alpha2u-globulin positive reaction in the kidney sections.
Reference	Fowler, E.H. and Martin, C. Immunohistochemical Evaluation of Alpha2u-Globulin in Kidneys of Fischer 344 Rats from the Isopropanol Nine-Day Vapor Inhalation Study. BRRC Report No. 93N1229 dated April 29, 1994.
Type	SENSORY IRRITATION
Remark	Isopropanol produced sensory irritation in mice, with RD50 values of 5000 ppm and 17693 ppm.
Reference	(1) DeCeaurriz et al, 1981. (2) Kane et al, 1980.
Remark	Guinea pigs exposed by inhalation to 400 ppm isopropanol for 24 hours showed epithelial changes in the respiratory mucosa and a decline in tracheal ciliary activity which returned to normal within 2 weeks following exposure. Recovery did not occur within 2 weeks in animals exposed to 5500 ppm for 24 hours.
Reference	(1) Ohashi et al, 1987a. (2) Ohashi et al, 1987b.
Type	DERMAL ABSORPTION
Remark	Dermal absorption and Pharmacokinetics of Isopropanol in the Male and Female F-344 Rat.
Remark	Chemical Manufacturers Association Isopropanol Panel conducted a dermal absorption study in which the rats were exposed dermally for a period of 4 hours. First order elimination half-lives for IPA was 0.8 hours and 2.6 hours for acetone. ^{14}C-IPA studies showed excellent agreement with dermal absorption rates found via the analytical method. The study showed that IPA is rapidly absorbed through rat skin when applied under occlusion.
Reference	Boatman, R.J., Perry, L.G., Fiorica, L.A., English, J.C., Kapp, R.W., Jr., Bevan, C., Tyler, T.R., Banton, M.I. and Wright, G.A.. Dermal Absorption and PharmacoKinetics of Isopropanol in the Male and Female F-344 Rats. The Toxicologist (Abstract) Vol 30, No.1, (2) No. 210 (1996).
Type	HAZARD IDENTIFICATION
Remark	US EPA, Draft Final RM1 Risk Assessment of Isopropanol, OPPT, 1996. TSCA Public Docket Number AR-141.
Type	OTHER
Remark	Deaths occurred in 6 of 10 rats following aspiration of 0.2 ml of 100% isopropanol and in 1 of 10 rats following aspiration of 70% isopropanol.
Reference	Gerarde, H.W., and Ahlstrom, D.B. (1986) Arch. Environ. Health 13: 457-461.
Remark	Acute or chronic treatment of rats with isopropanol caused a significant increase in hepatic and renal cytochrome P450 content.
Reference	(1) Uneng, T.H., Moore, L., Elves, R.G., and Alvares, A.P. (1983) Toxicol. Appl. Pharmacol. 71: 204-214.

(2) Zahlsen, K., Aasted, K., and Nilsen, O.G. (1985) Toxicology 34: 57-66.

Remark Acute oral pretreatment of rats with isopropanol resulted in a dose-related potentiation of carbon tetrachloride hepatotoxicity.

Reference Plaa, G.L., Hewitt, W.R., du Souich, R., Caille, G., and Lock, S. (1982) J. Toxicol. Environ. Health 9: 235-250.

Remark The cutaneous penetration of IPA was evaluated usinf excised, full-thickness skin from male and female F-344 rats, B6C3F1 mice and female humans in a flow-through in vitro skin penetration apparatus. Steady state penetration rates were 1.3, 1.88 and 1.65 mg/cm2 for rat, mouse and human, respectively. Permeability constants were similar among the three tissue types while over a 6 hour treatment period, more IPA penetrated the mouse skin (11.6%) than through rat (6.4%) or through human (7.1%). The rat skin was determined to be a good human skin model while the mouse skin was found to be the most permeable.

Reference Morris, E.M., Sun, J.D., Frantz, S.W., Beskitt, J.L, Bevan, C., Gardiner, T., Kapp, R., Tyler, T. and Wright, G. (Abstract No. 1727) The Toxicologist Vol. 15 (1), 1995.

5.11 Experience with Human Exposure

Type ODOR THRESHOLD

Remark The air odor threshold for isopropanol has been reported as 22 ppm.

Reference Amoore, J.E., and Hautala, E. (1983) J. Appl. Toxicol. 3: 272-290.

Type ACCIDENTAL EXPOSURE

Remark Intoxications have been reported following ingestion, rectal administration and, in children, following inhalation and skin absorption. Signs of intoxication are CNS depression, leading to coma, respiratory arrest and death. GI effects and hypothermia may occur. Cardiac effects include severe hypotension, shock and cardiac arrest with tachycardia as a secondary effect. The lowest dose reported to be life threatening was 170 ml in an 18 month old child. Acetone can be detected in the blood, breath and urine after intoxication with IPA, but acidosis does not usually occur. Occasional reports of allergic reaction to IPA have appeared in the literature.

Reference World Health Organisation, Environmental Health Criteria 103, 2-Propanol WHO, Geneva, 1990.

Type VOLUNTEER STUDIES

Remark 2.6 or 6.4 mg/kg/day IPA for 6 weeks was well tolerated by human male volunteers, there being no adverse effects on hematology, blood chemistry, urinalysis or ophthalmoscopy. Application of 0.5 ml undiluted IPA in an open patch test did not result in skin irritation. 10 minute covered patches produced transient erythema following immersion in water. Premature infants however were found to be particularly susceptible.

Reference World Health Organisation, Environmental Health Criteria 103, 2-Propanol, WHO, Geneva, 1990.

Remark	Although isopropanol was found to produce little irritation when tested on the skin of six human subjects, there have been reports of dermal irritation and/or skin sensitization. With the exception of three reports, the positive reactions were observed on patch testing of patients with a contact dermatitis due to ethanol. These patients also had a positive reaction to ethanol.
Reference	Lington, A.W., and Bevan, C. (1994) Patty's Industrial Hygiene and Toxicology, 4th Edition.
Remark	Exposure to 400 ppm isopropanol vapors for 3 to 5 min caused mild irritation of the eyes, nose and throat of human volunteers. At 800 ppm, the effects were not severe but the majority felt the atmosphere was unsuitable.
Reference	Nelson, K.W., Ege, J.F., Jr., Ross, M., Woodman, L.E., and Silverman, L. (1943) J. Ind. Hyg. Toxicol. 9:93-97
Remark	The production of acetone following IPA ingestion in man was demonstrated in a study involving three human volunteers. There was a correlation between blood levels of IPA and acetone with the initial peak of IPA recorded half an hour after dosing and reducing as the acetone levels increased over a 24 hour period.
Reference	Lacouture, P.G., Heldreth, D.D., Vet. Hum. Toxicol., 29 (6): 486, 1987.
Type	EPIDEMIOLOGY
Remark	There is epidemiological evidence indicating that the manufacture of isopropanol by the strong-acid process is associated with an excess of upper respiratory tract cancer in workers. IARC has concluded that there is sufficient evidence for carcinogenicity to humans in the manufacture of isopropanol by this process. Although the use of this strong-acid process has raised carcinogenicity concerns, these are related to sulfuric acid and to by-products such as dialkyl sulfates that are formed during this manufacturing process, not to isopropanol itself.
Reference	(1) World Health Organisation, Environmental Health Criteria 103, 2-Propanol, WHO, Geneva, 1990. (2) International Agency for Research on Cancer, Monographs on the evaluation of carcinogenic risk to man, No. 15, IARC,Lyon, France, 1977 and update, 1987. (3) Weil, C.S., Smyth, H.F., Jr., and Nale, T.W. (1952) Arch. Ind. Hyg. Occup. Med. 5:535-547. (4) Lynch, J., Hannis, N.M., Bird, M.G., Murray, K.J., and Walsh, J.P. (1979) J. Occup. Med. 21:333341. (5) Soskolne, C.L., Zeighami, E.A., Hanis, N.M., Kupper, L.L., Herrman, N., Amsel, J., Mausner, J.S., and Stellman, J.S. (1984) Am. J. Epidemiol. 120:358-369
Remark	A single study was reported showing that IPA was associated with a higher risk of breast cancer. However, there was a combined exposure with freon and solder flux and aspects of lifestyle (such as smoking habits and alcohol consumption) were not taken into account.
Reference	Spiritas, R., Stewart, P.A., Lee, J.S., Marano, D.E., Forbes, C.D., Grauman, D.J., Pettigrew, H.M., Blair, A., Hoover, R.N., Cohen, J.L., Brit. J. Ind. Med., 48: 515 - 530, 1991.

Remark	In a population based referent study, the occupational experince of 86 men with oral or oropharyngeal cancer and 373 referents was analyzed with respect to employment and exposure to 16 chemicals, including IPA, as estimated by a job exposure matrix. There was no evidence of association between IPA exposure and oral or oropharangeal exposure in this study.
Reference	Merletti, F., Boffetta, P., Ferro, G., Pisani, P., Terrachini, B., Scand. J. Work. Env. Hlth., 17: 248 - 254, 1991.
Remark	The lung uptake was studied in 12 printing workers exposed to workplace levels in the range of 8 to 647 mg/m3 (3.3 to 264 ppm) isopropanol. The alveolar isopropanol concentration was highly correlated with the exposure level at any time of exposure. Acetone, but not isopropanol, was detected in the blood or urine. The acetone concentration ranged between 0.76 and 15.6 mg/liter in the blood and between 3 and 93 mg/m3 in the alveolar air. The acetone levels in the alveolar air and blood increased with the increasing exposure period and were linearly related to the alveolar isopropanol levels. Elimination of acetone was mainly via the lungs, varying from 10.7 to 39.8% of the uptake, and was inversely related to the exposure level.
Reference	Brugnone, F., Perbellini, L., Apostoli, P., Bellomi, M., and Caretta, D. (1983) Br. J. Ind. Med. 40:160-168.

6. REFERENCES

- Atkinson, R. A structure-activity relationship for the estimation of rate constants Amoore, J.E., and Hautala, E. (1983) J. Appl. Toxicol. 3: 272-290.
- Atkinson, R. (1985): Chem Rev 85, pp. 69-75, 135-153, 182-201.
- for the gas=phase reactions of OH radicals with organic compounds. Int J Chem Kinet 19, 799-828 (1987).
- Atkinson, R. (1990): J Phys Chem Ref Data (1992), 21(6):1125-1568
- Bates, H.K., McKee, R.H., Bieler, G.S., Gardiner, T.H., Gill, M.W., Strother, D.E., and Masten, L.W. (1994) Fundam. Appl. Toxicol. 22:152-158.
- Bevan, C., Tyler, T.R., Gardiner, T.H., Kapp, R.W., Jr., Andrews, L. and Beyer, B.K. Journal of Applied Toxicology, Vol. 15(2) pp. 117-123 (1995).
- Blackman, R.A.A., Toxicity of Oil-Sinking Agents, Mar. Pollut. Bull., 5, 1974, 116-118.
- Boatman, R.J., Perry, L.G., Fiorica, L.A., English, J.C., Kapp, R.W., Jr., Bevan, C., Tyler, T.R., Banton, M.I. and Wright, G.A.. Dermal Absorption and PharmacoKinetics of Isopropanol in the Male and Female F-344 Rats. The Toxicologist (Abstract) Vol 30, No.1, (2) No. 210 (1996).
- Bridie, A.L., Wolff, C.J.M. & Winter, M., Water Research, 13, 1979, 627-630.
- Bridie, A.L., Wolff, C.J.M., & Winter, M. BOD and COD of some Petrochemicals, Water Research, 13, 1979, p.627- 630.
- Bringmann, G. & Kuehn, R., Comparison of the Toxicity Thresholds of Water Pollutants to Bacteria, Algae and Protozoa in the Cell Multiplication Inhibition Test, Water Research, 14, 1980, 231-241.
- Bringmann, G. et al. (1980): Z. Wasser Abwasser Forsch. 10, 87-98.
- Bringmann, G. & Kuehn, R., Grenzwerte der Schadwirkung waserfefaehdender Stoffe gegen Blaualgen (Microcystis aeruginosa) und Gruenalgen (Scenedesmus quadricauda) im Zellvermehrungshemmtest, Vom Wasser, 50, 1978, 45-60.

- Bringmann, G. & Kuehn, R., Results of the Damaging Effect of Water Pollutants on Daphnia magna, Z. Wasser Abwasser Forsch., 10(5), 1977, 161-166.
- British Industrial Biological Research Assoc., Report 0570/3/86.
- British Industrial Biological Research Assoc., Report 0570/2/86.
- Brugnone, F., Perbellini, L., Apostoli, P., Bellomi, M., and Caretta, D. (1983) Br. J. Ind. Med. 40:160-168.
- Burleigh-Flayer, H.D., Gill, M.W., Marino, D.J., Masten, L.W., McKee, R.H., Tyler, T.R., and Gardiner, T.H. (1992) Toxicologist 12: 227
- Burleigh-Flayer, H., Bevan, C., Gardiner, T., Garman, R., Kapp, R., Neptun, D., Tyler, T. and Wright, G. Isopropanol Vapor Inhalation Oncogenicity Study in CD-1 Mice.(Abstract No. 1219) The Toxicologist, Vol. 14 (1), 1994.
- Burleigh-Flayer, H.D., et al. (1994). Fundam. Appl. Toxicol. 23, 421-428.
- David, J. & Bocquet, C. Compared Toxicities of Different Alcohols for Two Drosophila Sibling Species. Comp. Biochem. Physiol., 54C, 1976, 71-74.
- DeCeaurriz, J.C., Micillino, J.C., Bonnet, P., and Guenier, J.P. (1981) Toxicol. Lett. 9: 137-144..
- Dillingham, E.O. et al., J. Pharm. Sci., 62, 1973, 22. In Pomona Data File on Log P and related parameters. DGEP - Review of literature data on 2-propanol, Leidschendam, Netherlands, Directorate-General of Environmental Protection, Ministry of Housing, Physical Planning and Environment. (1987)
- Exxon Biomedical Sciences Inc. (1986) Ocular Irritation Study in Rabbits (Isopropanol). EBSI Document No. 86MRLZ72.
- Fowler, E.H. and Martin, C. Immunohistochemical Evaluation of Alpha2u-Globulin in Kidneys of Fischer 344 Rats from the Isopropanol Nine-Day Vapor Inhalation Study.BRRC Report No. 93N1229 dated April 29, 1994.
- Gallo, M.A., Oser, B.I., Cox, G.E., and Bailey, D.E. (1977) Toxicol. Appl. Pharmacol. 41:35.
- Garman, R. Bevan, C., Burleigh-Flayer, H., Gardiner, T., Kapp, R., Neptun, D., Tyler, T. and Wright, G. Isopropanol (IPA) Vapor Inhalation Oncogenicity Study in Fisher 344 Rats.(Abstract No. 979) The Toxicologist, Vol. 15 (1), 1995.
- Gerarde, H.W., and Ahlstrom, D.B. (1986) Arch. Environ. Health 13: 457-461.
- Gill, M.W., Burleigh-Flayer, H.D., Marino, D.J., Masten, L.W., McKee, R.H., Tyler, T.R. and Gardiner, T. Isopropanol Single Exposure Vapor Inhalation Neurotoxicity Sttudy in Rats. (Abstract 862) The Toxicologist Vol. 12 (1), 1992.
- Gill, M., Burleigh-Flayer, H., Bevan. C., Gardiner, T., Kapp, R., Isopropanol Ninety-Day Vapor Inhalation Neurotoxicity Study in Female F-344 Rats. (Abstract) The Toxicologist, Vol. 14 (1), 1994.
- Gill, M.W., Burleigh-Flayer, H.D., Strother, D.E., Masten, LW., McKee, R.H., Tyler, T.R. and Gardiner, T.H. Isopropanol: Acute Vapor Inhalation neuroticity Study in Rats. J. Appl. Toxicol. 15 (2) 77-84, 1995.
- Griffith, J.F., Nixon, G.A., Bruce, R.D., Reer, P.J., Bannan, E.A, (1980), Toxicol. Appl. Pharmacol. 55: 501-513.
- Guesten, H et al. (1984): J Atmos Chem 2, 83-93.
- Guseinov, V.G., (1985), Gig. Tr. Prof. Zabol. (7): 60-62.
- Harris, S.B. (1995). A review of the EPA comments regarding the study entitled "Multigeneration rat reproduction study with isopropanol". Report prepared for the Chemical Manufacturers Association Isopropanol Panel.
- Howard, P.H., Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Lewis Publishers, Inc., Chelsea Michigan USA, 1990, p.304-309.

- Huels-Bericht DL 106, 1988 (unveroeeffentlicht). Idem, Shell Group Research Report, AMGR.0224.74
- International Agency for Research on Cancer, Monographs on the evaluation of carcinogenic risk to man, No. 15, IARC, Lyon, France, 1977 and update, 1987.
- IPCS - International Programme on Chemical Safety - Environmental Health Criteria 103 - 2-Propanol, World Health Organization (1990).
- Jones, C.J., McGugan, P.J. (1977/78): J Hazard Mater. 2, 235-251.
- Kane, L.E., Dombroske, R., and Alerie, Y. (1980) Am. Ind. Hyg. Assoc. J. 41: 451-455.
- Kapp, R.W. et al. (1993). Environ. Mol. Mutagen., 22: 93-100.
- Kasuga, F., Inoue, S., Asano, T., Kumagi, S., Fd. Cos. Tox. 30(7):631-634, 1992.
- Kimura, E.T., Ebert, D.M., Dodge, P.W., (1971), Toxicol. Appl. Pharmacol., 19: 699-703.
- Kloepffer, W. et al. (1988): Ecotoxicol Environ Safety 15, 298-319.
- Laham, S., Potvin, M., Schrader, K., Marino, I. (1979), Drug. Chem. Toxicol. 3: 343-360.
- Laham, S., Potvin, M., Schrader, K., and Marino, I. (1980) Drug Chem. Toxicol. 3: 343-360.
- Lacouture, P.G., Heldreth, D.D, Vet. Hum. Toxicol., 29 (6):486, 1987
- Lehman, A.J., Chase, H.F., (1944) J. Lab. Clin. Med. 29: 561-567.
- Lington, A.W., and Bevan, C. (1994) Patty's Industrial Hygiene and Toxicology, 4th Edition.
- Lloyd, A.C. et al. (1976): Chem Phys. Lett 42, 205-209.
- Lyman, W.J. et al., Chemical Property Estimation Methods. Environmental behaviour of organic compounds. McGraw-Hill Book Company, New York (USA), 1982, Chpt. 15.
- Lynch, J., Hannis, N.M., Bird, M.G., Murray, K.J., and Walsh, J.P. (1979) J. Occup. Med. 21:333341.
- Mackay, D. & Paterson, S., Calculating Fugacity, Environm. Sci. Technol,. 15(9), 1981, 1006-1014.
- Marzulli, F.N., Ruggles, D.I., (1973), J. Assoc. Off. Anal. Chem., 56: 905-914.
- Merletti, F., Boffetta, P., Ferro, G., Pisani, P., Terrachini, B., Scand. J. Work. Env. Hlth., 17:248-254, 1991.
- Morgan, R.L., Sorenson, S.S., Castles, T.R., (1987), Food. Chem. Toxicol., 25: 609-613.
- Morris, E.M., Sun, J.D., Frantz, S.W., Beskitt, J.L, Bevan, C., Gardiner, T., Kapp, R., Tyler, T. and Wright, G. (Abstract No. 1727) The Toxicologist Vol. 15 (1), 1995.
- Munch, J.C., (1972), Ind. Med. 41: 31-33.
- Nakaseko, H., Teramoto, K., Horiguchi, S., Wakitani, F., Yamanoto, T., Adachi, M., Tanaka, H., Hozu, S., Jpn. J. Ind. Hlth. 33(3): 200-201, 1991.
- Nelson, K.W., Ege, J.F., Jr., Ross, M., Woodman, L.E., and Silverman L. (1943) J. Ind. Hyg. Toxicol. 9:93-97.
- Nelson, B.K., Brightwell, W.S., MacKenzie-Taylor, D.R., Khan, A., Burg, J.R., and Weigel, W.W. (1988) Fd. Chem. Toxicol. 26: 247-254.
- Nixon, G.A., Tyson, C.A., Wertz, W.C., (1975), Toxicol. Appl. Pharmacol. 31: 481-490.
- Ohashi, Y., Nakai, Y., Ikeoka, H., Koshimo, H., Esaki, Y., Horiguchi, S., Teramoto, K., and Nakaseko, H. (1987a) J. Appl. Toxicol. 8: 67-71.
- Ohashi, Y., Nakai, Y., Ikeoka, H., Koshimo, H., Esaki, Y., Horiguchi, S., Teramoto, K., and Nakaseko, H. (1987b) Arch. Toxicol. 61: 12-20.
- Overend, R., Paraskevopoulos, G. (1978): J phys Chem 82, 1329-1333..
- P&G, Unpublished data. For further information, contact Dr. C. Lally, Proctor & Gamble, Brussels. Phone 32-2-456-3056, Fax 32-2-456-2845.
- Pilegaard, K. and Ladefoged, O. (1993) In Vivo 7:325-330.
- Plaa, G.L., Hewitt, W.R., du Souich, R., Caille, G., and Lock, S. (1982) J. Toxicol. Environ. Health 9: 235-250.

- Price, K.S., Waggy, G.T. & Conway, R.A., Brine Shrip Bioassay and Seawater BOD of Petrochemicals, J. Water Pollut. Contr. Fed., 46, 1974, 63-77.
- Reynolds, T. An Anomalous Effect of Isopropanol on lettuce germination Plant Sci. Lett., 15, 1977, 25-28.
- Shell Chemicals data sheet IS 3.2.4 dated June 1992.
- Shipp A.M., Allen B.C., Van Landingham C., Gentry P.R. and Crump K.S. (1996). Quantitative dose-response analysis - Application of the benchmark method to the multigeneration rat reproduction study for isopropanol. Report prepared for the Chemical Manufacturers Association Isopropanol Panel.
- Slauter, R.W., Coleman, D.P., Gaudette, N.F., McKee, R.H., Masten, L.W., Gardiner, T.H., Strother, D.E., Tyler, T.R. and Jeffcoat, A.R. (1994). Disposition and Pharmacokinetics of Isopropanol in F-344 Rats and B6C3F1 Mice, Fundam. Appl. Toxicol. 23, 407-420.
- Slauter, R.W., Coleman, D.P., Gaudette, N.F., McKee, R.H., Masten, L.W., Gardiner, T.H., Marino, D.J., Tyler, T.R., and Jeffcoat, A.R. (1992) Toxicologist 12:219.
- Slauter, R. W. et al. Disposition and Pharmacokinetics of Isopropanol in F-344 Rats and B6C3F1 Mice. (Abstract 809) The Toxicologist Vol 12 (1) 1992.
- Soskolne, C.L., Zeighami, E.A., Hanis, N.M., Kupper, L.L., Herrman, N., Amsel, J., Mausner, J.S., and Stellman, J.S. (1984) Am. J. Epidemiol. (120:358-369.
- Smyth, H.F., Carpenter, C.P., (1948), J. Ind. Hyg. Toxicol., 30: 63-70.
- Spiritas, R., Sewart, P.A., Lee, J.S., Marano, D.E., Forbes, C.D., Grauman, D.J., Pettigrew, H.M., Blair, A., Hoover, R.M., Cohen, J.L., Brit. J. Ind. Med., 48:515-530, 1991.
- Teramoto, K., Horiguchi, S., Adachi, M., Wakitani, F., Fukui, M., Osaka City Med. J., 33(2): 153-160, 1987.
- Teramoto, K., Wakitani, F., Horiguch, S., Jo, T., Yamamoto, T., Misutake, H., and Nakaseko, H. (1993) Environ. Res. 62:148.
- Tichy, M., Trcka, V., Roth, Z., Krivucova, M., (1985), Environ. Health. Perspect., 61: 321-328.
- 1995-1996 Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs). American Conference of Governmental Industrial Hygienists (ACGIH), Cinncinati, OH (1995).
- Tyl, R.W., Masten, L.W., Marr, M.C. Myers, C.B., Slauter, R.W., Gardiner, T.H., Strother, D.E., McKee, R.H., and Tyler, T.R. (1994) Fundam. Appl. Toxicol. 22:139-151.
- Tyl R.W. (1996). February 12, 1996 Letter to the Chemical Manufacturers Association Isopropanol Panel.
- Uneng, T.H., Moore, L., Elves, R.G., and Alvares, A.P. (1983) Toxicol. Appl. Pharmacol. 71: 204-214.
- U.S. EPA, Draft Final RM1 Risk Assessment of Isopropanol, OPPT, 1996. TSCA Public Docket AR-141.
- U.S. EPA (U.S. Environmental Protection Agency). (1992). Review of Section 4 Data - A two Generation Reproductive Toxicity Study in Rats with Isopropanol.
- US NIOSH (1976), Cincinnati, Ohio, US National Institute of Occupational Safety and Health, US Dept. of Health, Education and Welfare, Public Health Services, Centre for Disease Control (DHEW publication no. (NIOSH) 76-142).
- Veith, G.D., Call, D.J. & Brooke, L.T., Estimating the Acute Toxicity of Narcotic Industrial Chemicals to Fathead Minnows. In: Bishop, W.E., Cardwell, R.D. & Heidolph, B.B. Eds. Aquatic Toxicology and Hazard Assessment: 6th Symp., ASTM STP 802, Philadelphia (USA), 1983, 90-97.
- Von der Hude, W., Scheutwinkel, M., Gramlich, U., Fissler, B., Busler, A., In Vitro Environ. Mutagen., (1987), 9:401-410.
- Wallington, T.J. et al. (1987): Int J Chem Kinet 19, 243-249.

- Weil, C.S., Smyth, H.F., Nale, T.W., Arch. Ind. Hyg. Occup. Med. (1952), 5:535-547.
- World Petrochemicals, SRI International, 1996.
- Zahlsen, K., Aasted, K., and Nilsen, O.G. (1985) Toxicology 34: 57-66.
- Zeiger, E. et al, Env. Mol. Mut., 19 (Suppl.21):2-141, 1992.

EXTRACT FROM IRPTC LEGAL FILES

File: 17.01 LEGAL rn : 6729

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : AUS type : REC

subject	specification	descriptor
AIR	OCC	TLV

TWA: 980MG/M3 (400PPM) STEL: 1225MG/M3 (500PPM)
entry date: MCH 1985

original : ILO , , , , ,
amendment: AOHGN*, APPROVED OCCUPATIONAL HEALTH GUIDE THRESHOLD LIMIT VALUES, , , , 1983

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File: 17.01 LEGAL rn : 15004

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : BEL type : REC

subject	specification	descriptor
AIR	OCC	TLV

TWA: 980MG/M3 (400PPM); STEL: 1225MG/M3 (500 PPM). SKIN ABSORPTION.
entry date: JUL 1987

original : ILO , , , , ,
amendment: TLVBE*, THRESHOLD LIMIT VALUES(TOLERABLE LIMIT VALUES), , , , 1984

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File: 17.01 LEGAL rn : 15640

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : FIN type : REC

subject	specification	descriptor
AIR	OCC	MPC

TWA: 500MG/M3 (200PPM) STEL: 625MG/M3 (250PPM) (SKIN) (APPLIES TO ALL ISOMERS)
entry date: MAY 1989

original : ILO , , , , ,
amendment: APWFI*, HTP-ARVOT (LIST OF LIMIT VALUES FOR CONCENTRATIONS OF TOXIC SUBSTANCES KNOWN TO BE HARMFUL TO HEALTH), 25 , , 10 ,

1988

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File: 17.01 LEGAL rn : 16325
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : ITA type : REC

subject	specification	descriptor
AIR	OCC	TLV

500MG/M3 (200PPM) (SKIN ABSORPTION)
entry date: MCH 1985

original : ILO , , , , ,
amendment: TLVIT*, VALORI LIMITE PONDERATI(APPRAISED LIMIT VALUES), , ,

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File: 17.01 LEGAL rn : 16707
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : NLD type : REC

subject	specification	descriptor
AIR	OCC	MXL

TWA: 980MG/M3 (400PPM) (SKIN ABSORPTION)
entry date: JUN 1987

original : ILO , , , , ,
amendment: NMACN*, NATIONALE MAC-LIST(NATIONAL MAC-LIST), , , , 1986

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File: 17.01 LEGAL rn : 17374
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : ROM type : REG

subject	specification	descriptor
AIR	OCC	MPC

TWA: 400MG/M3; CLV: 600MG/M3
entry date: MCH 1985

original : ILO , , , , ,
amendment: OMHRO*, ORDINANCE OF THE MINISTRY OF HEALTH, 60 , , , 1975

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File: 17.01 LEGAL rn : 17824
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : CHE type : REG

subject	specification	descriptor
AIR	OCC	MAK

TWA: 980MG/M3 (400PPM)
entry date: DEC 1987

original : ILO , , , , ,
amendment: ZWACH*, ZULAESSIGE WERTE AM ARBEITSPLATZ(PERMITTED VALUES IN THE WORKPLACE), , , , 1987

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File: 17.01 LEGAL rn : 18341
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : YUG type : REG

subject	specification	descriptor
AIR	OCC	MAC

TWA: 980MG/M3 (400PPM)
entry date: MCH 1985

original : ILO , , , , ,
amendment: ORYUG*, ORDINANCE, 24-3698/1 , , , 1971

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File: 17.01 LEGAL rn : 50882
systematic name:2-Propanol
common name :2-propanol
reported name :2-Propanol
cas no :67-63-0 rtecs no :NT8050000
area : IMO type : REG

subject	specification	descriptor
AQ	EMI	PRMT
AQ	MARIN	PRMT

This substance is presently considered to present no harm to human health, marine re sources, amenities or other legitimats uses of the sea when discharged into the sea from tank cleaning or deballasting operations (applies to n-propyl alcohol)
entry date: APR 1993

original : IMODC*, , , , , 1992

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File: 17.01 LEGAL rn : 100030
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : ARG type : REG

subject	specification	descriptor
AIR	OCC	MPC

8H-TWA: 980MG/M3 (400PPM); 15MIN-STEL: 1225MG/M3 (500PPM) (MAXIMUM 4 TIMES/DAY WITH INTERVALS OF AT LEAST 60 MINUTES).
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(Argentinian Official Bulletin), 24170 , I , 1 , 1979
amendment: ARGOB*, Boletin Oficial de la Republica Argentina(Argentinian Official Bulletin), 27145 , I , 4 , 1991

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File: 17.01 LEGAL rn : 300124
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : CAN type : REG

subject	specification	descriptor
AIR	OCC	TLV

TWA: 400 PPM, 980 MG/M3; STEL: 500 PPM, 1,225 MG/M3. PRESCRIBED BY THE CANADA OCCUPATIONAL SAFETY AND HEALTH REGULATIONS, UNDER THE CANADA LABOUR CODE (ADMINISTERED BYTHE DEPARTMENT OF LABOUR). 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 ITSPUBLICATION ENTITLED: "THRESHOLD LIMIT VALUE AND BIOLOGICAL EXPOSURE INDICES FOR 1985-86".
entry date: MCH 1991 effective date: 13MCH1986

amendment: CAGGAK, , 120 , 6 , 1105 ,

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File: 17.01 LEGAL rn : 300832

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : CAN type : REG

subject	specification	descriptor
PACK LABEL USE	AGRIC PESTI	CLASS

HISTORICAL STATUS. DATE OF LAST OCCURRENCE: 1988. CODE IAL. THE PEST CONTROL PRODUCTS ACT AND REGULATIONS ARE ADMINISTERED BY THE DEPARTMENT OF AGRICULTURE. THEY ESTABLISH A REGISTRATION, CLASSIFICATION, PACKAGING AND LABELLING SYSTEM FOR PEST CONTROL PRODUCTS. ONLY PEST CONTROL PRODUCTS THAT ARE CURRENTLYREGISTERED WITH THE DEPARTMENT OF AGRICULTUREAND PRODUCTS THAT HAVE BEEN REMOVED FROM THATLIST SINCE 1983 ARE INCLUDED; OTHER HISTORICAL RECORDS ARE NOT.
entry date: JUN 1991 effective date: 11AUG1988

amendment: CAGAAK, Canada Gazette Part II, 122 , 18 , 3601 ,

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File: 17.01 LEGAL rn : 302142

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : CAN type : REG

subject	specification	descriptor
TRNSP LABEL PACK		CLASS RQR

PIN (PRODUCT IDENTIFICATION NO.): UN1219. CLASS (3.2): FLAMMABLE LIQUID. PACKING GROUPII, (I=GREAT DANGER,III=MINOR DANGER). MAXIMUM AMOUNT PER PACKAGE THAT MAY BE TRANSPORTED ON A PASSENGER AIRCRAFT OR VEHICLE: 5 L. MAXIMUM AMOUNT PER PACKAGE THAT MAY BE TRANSPORTED ON A CARGO AIRCRAFT: 60 L. 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 ONE COMPREHENSIVE SET OF RULES APPLICABLE TO ALL MODES OF TRANSPORT ACCROSS CANADA. THESE ARE BASED ON UNITED NATIONS RECOMMENDATIONS. THE ACT AND REGULATIONS SHOULD BE CONSULTED FOR DETAILS. RECORDS ARE ENTERED UNDER THE PROPER SHIPPINGNAME FOUND IN THE REGULATIONS; THIS MAY INCLUDE VERY GENERAL GROUPS OF CHEMICAL SUBSTANCES.
entry date: OCT 1991 effective date: 06DEC1990

amendment: CAGAAK, Canada Gazette Part II, 124 , 26 , ,

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File: 17.01 LEGAL rn : 303389
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : CAN type : REG

subject	specification	descriptor
USE / STORE / LABEL	OCC	RQR

INGREDIENT DISCLOSURE LIST CONCENTRATION 1% WEIGHT/WEIGHT. THE WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) IS A NATIONAL SYSTEM TO PROVIDE 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 FORTHE USE, STORAGE AND HANDLING OF CONTROLLED PRODUCTS AND 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 ,

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File: 17.01 LEGAL rn : 401113
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : CSK type : REG

subject	specification	descriptor
FOOD		MPC

LIMIT OF ADDITIVE PRESENT DUE TO PRODUCTION, PACKING, TRANSPORT AND STORAGE OF FOOD PRODUCTS: 5G/KG.
entry date: DEC 1991 effective date: 1JUL1986

title: DIRECTIVE NO. 50/1978 ON FOREIGN SUBSTANCES IN FOODSTUFFS
original : HPMZC*, HYGIENICKE PREDPISY MINISTERSTVA ZDRAVOTNICTVI CSR(HYGIENIC REGULATIONS OF MINISTRY OF HEALTH OF CSR), 43 , , , 1978
amendment: HPMZC*, HYGIENICKE PREDPISY MINISTERSTVA ZDRAVOTNICTVI CSR(HYGIENIC REGULATIONS OF MINISTRY OF HEALTH OF CSR), 61 , , , 1986

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File: 17.01 LEGAL                                                rn : 402145
     systematic name:2-Propanol
     common name    :2-propanol
     reported name  :ISOPROPANOL
     cas no         :67-63-0            rtecs no       :NT8050000
     area          : CSK                type          : REG
      -------------------------------
     |subject|specification|descriptor|
     |-------+-------------+----------|
     | MANUF |    OCC      |   CLASS  |
     |       |             |   RQR    |
     |       |             |   RSTR   |
      -------------------------------
     PRODUCTION OF ISOPROPANOL BY SULFONATION IS CLASSIFIED AS PROCESS WITH
     OCCUPATIONAL CARCINOGENIC RISK. REQUIREMENTS AND RESTRICTIONS ON THE
     PROCESS ARE GIVEN.
     entry date: DEC 1991                          effective date:  1APR1985

     title: DIRECTIVE NO. 4/1985 ON HYGIENIC PRINCIPLES FOR WORK WITH
     CHEMICAL CARCINOGENS
     original : VMZSR*, Directive no 4/1985 on hygiene principles for work
                with chemicalcarcinogens, , 3 , , 1985
     amendment: VMZSR*, Directive no 4/1985 on hygiene principles for work
                with chemicalcarcinogens, , 10 , 98 , 1990

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File: 17.01 LEGAL                                                rn : 500482
     systematic name:2-Propanol
     common name    :2-propanol
     reported name  :ISOPROPANOL
     cas no         :67-63-0            rtecs no       :NT8050000
     area          : DEU                type          : REC
      -------------------------------
     |subject|specification|descriptor|
     |-------+-------------+----------|
     | AQ    |             |   CLASS  |
     | USE   |    INDST    |   RQR    |
      -------------------------------
     THIS SUBSTANCE IS CLASSIFIED AS SLIGHTLY HAZARDOUS TO WATER
     (WATER-HAZARD CLASS: WGK 1). (THE DIFFERENT CLASSES ARE: WGK 3 = VERY
     HAZARDOUS; WGK 2 = HAZARDOUS; WGK 1 = SLIGHTLY HAZARDOUS; WGK 0 = IN
     GENERAL NOT HAZARDOUS.) THE CLASSIFICATION FORMS THE BASIS FOR
     WATER-PROTECTION REQUIREMENTS FOR INDUSTRIAL PLANTS IN WHICH
     WATER-HAZARDOUS SUBSTANCES ARE HANDLED.
     entry date: DEC 1991

     title: ADMINISTRATIVE RULES CONCERNING WATER-HAZARDOUS SUBSTANCES
     (VERWALTUNGSVORSCHRIFT WASSERGEFAEHRDENDE STOFFE)
     original : GMSMA6, Gemeinsames Ministerialblatt. Joint Ministerial
                Papers, , 8 , 114 , 1990

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File: 17.01 LEGAL                                                rn : 502805
     systematic name:2-Propanol
     common name    :2-propanol
     reported name  :ISOPROPYL ALCOHOL
     cas no         :67-63-0            rtecs no       :NT8050000
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area : DEU type : REC

subject	specification	descriptor
AIR	OCC	MAK

8H-TWA: 400 ML/M3 (PPM); 980 MG/M3 (20C, 101.3 KPA). SUBSTANCE WITH SYSTEMIC EFFECTS. ONSET OF EFFECT <= 2H. HALF-LIFE < 2H. 30MIN-STEL: 800 ML/M3 (PPM); 1960 MG/M3; AVERAGE VALUE; 4X/SHIFT. PREGNANCY GROUP D: AVAILABLE DATA ARE NOT SUFFICIENT FOR A FINAL EVALUATION WITH REGARD TO EMBRYOTOXIC AND/OR FETOTOXIC EFFECTS. VAPOUR PRESSURE: 4.0 KPA AT 20C.
entry date: JAN 1992

title: MAXIMUM CONCENTRATIONS AT THE WORKPLACE AND BIOLOGICAL TOLERANCE VALUES FOR WORKING MATERIALS (MAXIMALE ARBEITSPLATZKONZENTRATIONEN UND BIOLOGISCHE ARBEITSSTOFFTOLERANZWERTE)
original : MPGFDF, MITTEILUNG DER SENATSKOMMISSION ZUR PRUEFUNG GESUNDHEITSSCHAEDLICHER ARBEITSSTOFFE (DEUTSCHE FORSCHUNGSGEMEINSCHAFT), XXVII , , 17 , 1991

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File: 17.01 LEGAL rn : 503265

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : DEU type : REC

subject	specification	descriptor
AIR	OCC	BAT

BLOOD: 50 MG/L, AS ACETONE. URINE: 50 MG/L, AS ACETONE. SAMPLING TIME: END OF EXPOSURE OR END OF SHIFT.
entry date: FEB 1992

title: MAXIMUM CONCENTRATIONS AT THE WORKPLACE AND BIOLOGICAL TOLERANCE VALUES FOR WORKING MATERIALS (MAXIMALE ARBEITSPLATZKONZENTRATIONEN UND BIOLOGISCHE ARBEITSSTOFFTOLERANZWERTE)
original : MPGFDF, MITTEILUNG DER SENATSKOMMISSION ZUR PRUEFUNG GESUNDHEITSSCHAEDLICHER ARBEITSSTOFFE (DEUTSCHE FORSCHUNGSGEMEINSCHAFT), XXVII , , 99 , 1991

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File: 17.01 LEGAL rn : 613032

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : GBR type : REG

subject	specification	descriptor
TRNSP LABEL		CLASS RQR

LABELLING OF ROAD TANKERS: FLAMMABLE LIQUID. EMERGENCY ACTION CODE: 2(S)E
entry date: JAN 1983 effective date: 28MCH1979

title: HAZARDOUS SUBSTANCES (LABELLING OF ROAD TANKERS) REGULATIONS 1978
original : GBRSI*, STATUTORY INSTRUMENTS, 1702 , , , 1978

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File: 17.01 LEGAL rn : 650703
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : GBR type : REG

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

CLASSIFIED AS A NON-POLLUTING LIQUID SUBSTANCE. DOCUMENTARY EVIDENCE OF ASSESSMENT AND APPROVAL REQUIRED BY A CARRIER. DISCHARGE INTO THE SEA IS NOT PROHIBITED.
entry date: 1992 effective date: 06APR1987

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

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File: 17.01 LEGAL rn : 800152
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : JPN type : REC

subject	specification	descriptor
AIR	OCC	MAC

CLV: 980MG/M3 (400PPM). TENTATIVE VALUE.
entry date: DEC 1991

title: MAXIMUM ALLOWABLE CONCENTRATIONS RECOMMENDED BY THE JAPANESE ASSOCIATION OF INDUSTRIAL HEALTH.
original : SAIGBL, Sangyo Igalu (Japanese Journal of Industrial Health), 33 , 4 , 277-287 , 1991

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File: 17.01 LEGAL rn : 911959
systematic name:2-Propanol

common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : KEN type : REG

subject	specification	descriptor
FOOD	ADDIT	PRMT

FOOD ADDITIVE PERMITTED FOR EXTRACTING MOISTURE, FAT AND OTHER SOLUBLE COMPONENTS FROM FISH. FOOD PRODUCTS IN OR UPON WHICH IT IS PERMITTED AND MAXIUM LEVELS OF USE ARE LISTED
entry date: SEP 1982

title: THE FOOD, DRUGS AND CHEMICAL SUBSTANCES (FOOD LABELLING, ADDITIVES AND STANDARDS) REGULATIONS, 1978
original : GSKEN*, KENYA GAZETTE SUPPLEMENT NO. 40, SPECIAL ISSUE (LEGISLATIVE SUPPLEMENT NO. 27), 40 , , 363 , 1978

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File: 17.01 LEGAL rn : 1010068
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
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 980MG/M3 (400PPM) MUST BE OBSERVED FOR A PERIOD OF 8 HOURS OR 1225MG/M3 (500PPM) FOR 15 MINUTES FOUR TIMES A DAY WITH INTERVALS OF A LEAST 1 HOUR.
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 E HIGIENE DE LOS CENTROS DE TRABAJO).
original : DOMEX*, Diario Oficial, , , , 1984
amendment: DOMEX*, Diario Oficial, , , , 1989

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File: 17.01 LEGAL rn : 1122015
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : RUS type : REG

subject	specification	descriptor
AIR	AMBI	MAC

0.6MG/M3 1X/D, 0.6MG/M3 AV/D.
entry date: SEP 1985 effective date: AUG1984

amendment: PDKAV*, PREDELNO DOPUSTIMYE KONTSENTRATSII (PDK) ZAGRYAZNYAYUSHCHIKH VESHCHESTV V ATMOSFERNOM VOZDUKHE NASELENNYKH MEST (MAXIMUM ALLOWABLE CONCENTRATIONS (MAC) OF CONTAMINANTS IN THE AMBIENT AIR OF RESIDENTIAL AREAS), 3086-84 , , , 1984

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File: 17.01 LEGAL rn : 1122514
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : RUS type : REG

subject	specification	descriptor
AIR	OCC	MAC CLASS

CLV: 10.0MG/M3 (VAPOUR) HAZARD CLASS: III
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 : 1123251
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : RUS type : REG

subject	specification	descriptor
AQ	SURF	MAC CLASS

0.25MG/L HAZARD CLASS: IV
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 : 1200149
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000

area : SWE type : REG

subject	specification	descriptor
AIR	OCC	HLV

1D-TWA: 350MG/M3 (150PPM); 15MIN-STEL: 600MG/M3 (250PPM). (APPLIES TO ALL ISOMERS OF PROPANOL).
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 : 1301002

systematic name:2-Propanol
common name :2-propanol
reported name :2-Propanol
cas no :67-63-0 rtecs no :NT8050000
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 : 1302342

systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REG

subject	specification	descriptor
FOOD	ADDIT	RSTR
TRANS		RSTR
STORE		RSTR
PACK		RSTR

; Summary - THIS SUBSTANCE IS INCLUDED ON A LIST OF SUBSTANCES USED TO PREPARE ADHESIVES WHICH MAY BE SAFELY USED AS COMPONENTS OF ARTICLES INTENDED FOR USE IN PACKAGING, TRANSPORTATION, OR HOLDING FOOD IN

ACCORDANCE WITH THE FOLLOWING PRESCRIBED CONDITIONS: SUBSTA NCE MUST BE SEPARATED FROM THE FOOD BY A FUNCTIONAL BARRIER, MUST NOT EXCEED LIMITS OF GOOD MANUFACTURING PRACTICE USED WITH DRY FOODS, OR NOT EXCEED TRACE AMOUNTS AT SEAMS AND EDGE EXPOSURES WHEN USED WITH FATTY AND AQUEOUS FOODS. ALSO REGULATED BY SEA M INTEGRITY, LABELING STANDARDS, AND ANY PROVISION UNDER 21 CFR 175
entry date: NOV 1991 effective date: 1977

title: SUBSTANCES FOR USE ONLY AS COMPONENTS OF ADHESIVES
original : FEREAC, Federal Register, 42 , , 14534 , 1977
amendment: CFRUS*, Code of Federal Regulations, 21 , 175 , 105 , 1988

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File: 17.01 LEGAL rn : 1314568
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REG

subject	specification	descriptor
TRNSP PACK LABEL		PRMT CNTRL RQR

MAY BE TRANSPORTED IN PASSENGER AIRCRAFT AND PASSENGER RAILCAR NOT TO EXCEED 1 QUART/PACKAGE. MAY BE TRANSPORTED IN CARGO AIRCRAFT NOT TO EXCEED 10 GALLONS/PACKAGE. MAY BE TRANSPORTED IN CARGO VESSELS ON AND BELOW DECK AND IN PASSENGER VESSELS ON DECK. ALL SHIPMENTS MUST BE LABELED FLAMMABLE LIQUID.; 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 : 1323007
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REG

subject	specification	descriptor
CLASS	PESTI	RQR
MANUF	PESTI	PRMT
FOOD	ADDIT	RQR

CASE NAME ALIPHATIC ALCOHOLS, C1-C5; Summary - THIS SUBSTANCE IS

INCLUDED ON A LIST OF ACTIVE INGREDIENTS CONTAINED IN A PRODUCT FIRST REGISTERED BEFORE NOVEMBER 1, 1984, FOR WHICH A REGISTRATION STANDARD HAS NOT BEEN ISSUED. PUBLICATION OF THIS LIST INITIATES AN ACCELERATED REREGISTRATION AND DATA C ALL-IN FOR PRODUCTS CONTAINING THE LISTED ACTIVE INGREDIENTS.
entry date: JAN 1992 effective date: 1989

title: FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT PESTICIDES REQUIRED TO BE REREGISTERED; LIST D
original : FEREAC, Federal Register, 54 , 204 , 43388 , 1989
amendment: FEREAC, Federal Register, 54 , 204 , 43388 , 1989

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File: 17.01 LEGAL rn : 1325037
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REC

subject	specification	descriptor
SAFTY USE	OCC	MXL
	OCC	MXL

12000 PPM
entry date: OCT 1991 effective date: JUN1990

title: POCKET GUIDE TO CHEMICAL HAZARDS
original : XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 132 , 1990
amendment: XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 132 , 1990

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File: 17.01 LEGAL rn : 1336031
systematic name:2-Propanol
common name :2-propanol
reported name :2-Propanol
cas no :67-63-0 rtecs no :NT8050000
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 : 1340603
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REC

subject	specification	descriptor
AIR	OCC	TLV

Time Weighted Avg (TWA) 400 ppm, 985 MG/M3; Short Term Exposure Limit (STEL) 500 ppm, 1230 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*, Threshold Limit Values and Biological Exposure Indices, , , 11 , 1989
amendment: ACGIH*, Threshold Limit Values and Biological Exposure Indices, , , 11 , 1991

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File: 17.01 LEGAL rn : 1345002
systematic name:2-Propanol
common name :2-propanol
reported name :2-Propanol
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REG

subject	specification	descriptor
MONIT		RQR

; Summary - THIS IS A CHEMICAL OR MIXTURE FOR WHICH REPORTING IS CURRENTLY REQUIRED UNDER THE TOXIC SUBSTANCE CONTROL ACT HEALTH AND SAFETY STUDIES SECTION 2607D. PERSONS WHO CURRENTLY MANUFACTURE OR PROCESS CHEMICAL SUBSTANCES OR MIXTURES FOR COMMERCIAL PURPOSES, THOSE WHO PROPOSE TO DO SO, AND THOSE WHO ARE NOT CURRENTLY INVOLVED WITH A LISTED CHEMICAL BUT WHO MANUFACTURED OR PROCESSED IT OR PROPOSED TO DO SO ANY TIME DURING THE TEN YEAR PERIOD PRIOR TO THE TIME IT BECAME LISTED MUST SUBMIT TO THE ADMINISTRATOR OF THE U.S. EPA STUDIES OR LISTS OF HEALTH AND SAFETY STUDIES CONDUCTED ON THIS SUBSTANCE FOR EVALUATION.
entry date: OCT 1991 effective date: 1986

title: HEALTH AND SAFETY DATA REPORTING RULES SECTION 8(D)
original : FEREAC, Federal Register, 51 , , 32726 , 1986

amendment: CFRUS*, Code of Federal Regulations, 40 , 716 , 120 , 1990

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File: 17.01 LEGAL rn : 1346073
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : USA type : REG

subject	specification	descriptor
FOOD	ADDIT	RSTR
PACK	ADDIT	RSTR
MANUF	ADDIT	GL
USE		RSTR

; Summary - THIS SUBSTANCE INCLUDED ON A LIST OF SUBSTANCES USED TO PREPARE BASE SHEET OR COATING SUBSTANCES FOR CELLOPHANE MUST BE OF A GRADE OF PURITY SUITABLE FOR USE IN FOOD PACKAGING TO IMPART THE DESIRED TECHNOLOGICAL PROPERTIES. ACRYLONITRILE COPOLYMER SUBST ANCES MUST ABIDE UNDER THE CONDITIONS GIVEN IN 21 CFR 180.22 1988.
entry date: NOV 1991 effective date: 1977

title: INDIRECT FOOD ADDITIVES; POLYMERS-CELLOPHANE.
original : FEREAC, Federal Register, 42 , , 14572 , 1977
amendment: CFRUS*, Code of Federal Regulations, 21 , 177 , 1200 , 1988

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File: 17.01 LEGAL rn : 1400094
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : EEC type : REG

subject	specification	descriptor
FOOD	ADDIT	PRMT

THIS SUBSTANCE MAY BE USED AS A DILUTANT OR SOLVENT FOR COLOURING MATTERS AUTHORIZED FOR USE IN FOODSTUFFS INTENDED FOR HUMAN CONSUMPTION.
entry date: FEB 1986

title: COUNCIL DIRECTIVE ON THE APPROXIMATION OF THE RULES OF THE MEMBER STATES CONCERNING THE COLOURING MATTERS AUTHORISED FOR USE IN FOODSTUFFS INTENDED FOR HUMAN CONSUMPTION.
original : OJEC**, Official Journal of the European (Communities)/Union, 115 , , 2645/62 , 1962
amendment: OJEC**, Official Journal of the European (Communities)/Union, L43 , , 11 , 1981

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File: 17.01 LEGAL rn : 1402098
systematic name:2-Propanol
common name :2-propanol

reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : EEC type : REG

subject	specification	descriptor
FOOD		RQR
FOOD		MXL
FOOD		RSTR

THE SUBSTANCE MAY BE USED FOR THE MANUFACTURE OF REGENERATED CELLULOSE FILM WHICH IS INTENDED TO OR DOES COME INTO CONTACT WITH FOODSTUFFS. IT MAY BY USED AS SOLVENT; MAXIMUM TOTAL QUANTITY OF ALL SOLVENTS: 0.6MG/DM2 ON THE SIDE IN CONTACT WITH FOODSTUFFS.
entry date: OCT 1987 effective date: 01APR1987

title: COUNCIL DIRECTIVE OF 25 APRIL 1983 ON THE APPROXIMATION OF THE LAWS OF THE MEMBER STATES RELATING TO MATERIALS AND ARTICLES MADE OF REGENERATED CELLULOSE FILM INTENDED TO COME INTO CONTACT WITH FOODSTUFFS. (83/229/EEC).
original : OJEC**, Official Journal of the European (Communities)/Union, L123 , , 31 , 1983
amendment: OJEC**, Official Journal of the European (Communities)/Union, L228 , , 32 , 1986

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File: 17.01 LEGAL rn : 1402213
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000
area : EEC type : REG

subject	specification	descriptor
GOODS	FUEL	PRMT
GOODS	FUEL	RQR

MEMBER STATES MAY NOT PREVENT OR DISCOURAGE, ON GROUNDS OF OXYGENATE CONTENT, THE PRODUCTION, MARKETING AND FREE MOVEMENT OF BLENDED PETROL CONTAINING ISOPROPYL ALCOHOL UP TO 5% (VOL.). PUMPS WHICH DISPENSE MOTOR FUELS CONTAINING MORE THAN 10% (VOL.) OF ISOPROPYL ALCOHOL SHALL BE VERY CLEARLY MARKED ACCORDINGLY TO MAKE ACCOUNT IN PARTICULAR OF VARIATIONS IN THE CALORIFIC VALUE OF SUCH FUELS
entry date: FEB 1986 effective date: 01JAN1988

title: COUNCIL DIRECTIVE OF 5 DECEMBER 1985 ON CRUDE-OIL SAVINGS THROUGH THE USE OF SUBSTITUTE FUEL COMPONENTS IN PETROL. (85/536/EEC).
original : OJEC**, Official Journal of the European (Communities)/Union, L334 , , 20 , 1985

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File: 17.01 LEGAL rn : 1402713
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPYL ALCOHOL
cas no :67-63-0 rtecs no :NT8050000

area : EEC type : REG

subject	specification	descriptor
USE	OCC	RSTR
SAFTY	OCC	RQR
MONIT	OCC	RQR

STRONG ACID PROCESS IN THE MANUFACTURE OF ISOPROPYL ALCOHOL IS A PROCESS BY WHICH WORKERS ARE OR ARE LIKELY TO BE EXPOSED TO CARCINOGENS AS A RESULT OF THEIR WORK. IN THIS TYPE OF ACTIVITY, THE RISK TO THE HEALTH AND SAFETY OF WORKERS MUST BE ASSESSED. EMPLOYERS' OBLIGATIONS INCLUDE REDUCTION OF THE USE OF THE PROCESS AND WHERE POSSIBLE ITS REPLACEMENT BY A LESS DANGEROUS PROCESS. WHERE THE REPLACEMENT OF THE PROCESS IS NOT POSSIBLE, MEASURES TO ENSURE THE PROTECTION OF THE WORKERS AND TO REDUCE THE LEVEL OF THEIR EXPOSURE MUST BE TAKEN. EMPLOYERS SHALL WHEN REQUESTED, MAKE AVAILABLE TO THE COMPETENT AUTHORITY APPROPRIATE INFORMATION. THE WORKERS AND/OR THEIR REPRESENTATIVES MUST BE INFORMED ABOUT THE HEALTH RISKS, HYGIENIC REQUIREMENTS AND PRECAUTIONS TO BE TAKEN AND THEY CAN CHECK THAT THIS DIRECTIVE IS APPLIED. RELEVANT HEALTH SURVEILLANCE OF WORKERS IS REQUIRED. THE MEDICAL RECORDS SHALL BE KEPT FOR AT LEAST 40 YEARS.
entry date: JUN 1992 effective date: 31DEC1992

title: COUNCIL DIRECTIVE OF 28 JUNE 1990 ON THE PROTECTION OF WORKERS FROM THE RISKS RELATED TO EXPOSURE TO CARCINOGENS AT WORK (SIXTH INDIVIDUAL DIRECTIVE WITHIN THE MEANING OF ARTICLE 16(1) OF DIRECTIVE 89/391/EEC). (90/394/EEC).
original : OJEC**, Official Journal of the European (Communities)/Union, 196 , , 1 , 1990

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File: 17.01 LEGAL rn : 1646178
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000
area : IMO type : REC

subject	specification	descriptor
TRNSP LABEL PACK	MARIN	CLASS

HAZARD CLASS: 3 = INFLAMMABLE LIQUID. PACKING GROUP: II = MEDIUM DANGER (I=GREAT DANGER - III=MINOR DANGER). UN NO. 1219
entry date: JAN 1991

amendment: !IMCOC*, International Maritime Dangerous Goods Code, , , 10004 , 1990

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File: 17.01 LEGAL rn : 1744419
systematic name:2-Propanol
common name :2-propanol
reported name :ISOPROPANOL
cas no :67-63-0 rtecs no :NT8050000

area : UN type : REC

subject	specification	descriptor
TRNSP LABEL PACK		CLASS

HAZARD CLASS: 3 = INFLAMMABLE LIQUID. PACKING GROUP: II = MEDIUM DANGER (I=GREAT DANGER - III=MINOR DANGER). UN NO. 1219
entry date: AUG 1990

amendment: !UNTDG*, UN Transport of Dangerous Goods, Recommendation prepared by theCommittee of Experts on the Transport of Dangerous Goods, , , 15 , 1989