CID 1030

Propylene glycol

Toxicity

1.1 Toxicological Information

1.1.1 NIOSH Toxicity Data

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Measurement	System	Route/Organism	Dose	Effect	Date
Skin and Eye Irritation		eye /rabbit	100 mg	mild	March 2019
Skin and Eye Irritation		eye /rabbit	500 mg/24H	mild	March 2019
Skin and Eye Irritation		skin /child	30%/96H-continuous	moderate	March 2019
Skin and Eye Irritation		skin /human	500 mg/7D	mild	March 2019
Skin and Eye Irritation		skin /human	104 mg/3D- intermittent	moderate	March 2019

1 2 3 ... 16 Next >

The National Institute for Occupational Safety and Health (NIOSH)

1.1.2 Evidence for Carcinogenicity

EPA: Not evaluated. IARC: Not evaluated. NTP: Not evaluated

CDC-ATSDR Toxic Substances Portal

Not listed

Occupational Safety and Health Administration (OSHA)

1.1.3 Health Effects

Health Effect Code(s)

HE16 - Irritation-Eyes, Nose, Throat, Skin---Mild

Occupational Safety and Health Administration (OSHA)

1.1.4 Inhalation Symptoms

Dry throat. Cough.

ILO International Chemical Safety Cards (ICSC)

1.1.5 Eye Symptoms

Dryness of eyes. Pain. Itching.

- ILO International Chemical Safety Cards (ICSC)

1.1.6 Ingestion Symptoms

See Effects of short-term exposure

- ILO International Chemical Safety Cards (ICSC)

1.1.7 Target Organs

Respiratory (From the Nose to the Lungs)

- CDC-ATSDR Toxic Substances Portal

1.1.8 Acute Toxicity Link

Chemical: PROPYLENE GLYCOL

- USGS Columbia Environmental Research Center

1.1.9 Acute Effects

- ChemIDplus

1.1.10 Interactions

The effects of propylene-glycol (PG) alone and the interactions between PG and calcium channel blockers were investigated on the inward calcium current at motor nerve terminals in mice. Phrenic nerve/diaphragm preparations from male ICR-mice were used. Examining the effect of 5% PG on the potassium current at the nerve terminal showed two positive spikes generated by treatment

with d-tubocurarine (d-Tc) at the terminal part of the nerve terminal. The second positive spike is ascribed to the outward potassium current. PG did not change this spike at all, suggesting that this compound had no effect on the potassium channels. Pretreatments with d-Tc, tetraethylammonium (TEA), and 3,4-diaminopyridine (DAP) evoked the prolonged negative component of the action potential at the terminal part of the nerve terminal. PG augmented this component which is ascribed to the inward calcium current. The effects of calcium channel blockers were examined to determine whether the calcium channel blockers antagonize PG. Cumulative addition of cadmium-chloride, manganese-chloride, or cobalt-chloride suppressed the prolonged negative component that had been augmented by treatment with PG.

Hattori T, Maehashi H; J Mol Cell Toxicol 9 (4): 373-5 (1996)

▶ Hazardous Substances Data Bank (HSDB)

1.1.11 Toxicity Summary

EXPOSURE. Propylene glycol (PG) production capacity in the US was 1312 million pounds (596 kilotons) in 1998. Domestic demand was 1050 million pounds (477 kilotons). PG is used as an ingredient in cosmetics at concentrations of <0.1% to >50%. Approximately 4000 cosmetic products contained PG in 1994. Uses of PG, with percent of demand, are: unsaturated polyester resins, 26 percent; antifreeze and de- icing fluids, 22 percent; food, drug and cosmetics uses, 18 percent; liquid detergents, 11 percent; functional fluids (inks, specialty anti-freeze, de-icing lubricants), 4 percent; pet foods, 3 percent; paints and coatings, 5 percent; tobacco, 3 percent; miscellaneous, including plasticizer use, 8 percent. HEALTH. Propylene glycol (PG) is not acutely toxic. The lowest oral LD50 values range between 18 and 23.9 mg/kg (5 different species) and the reported dermal LD50 is 20.8 mg/kg. PG is essentially nonirritating to the skin and mildly irritating to the eyes. Numerous studies support that PG is not a skin sensitizer. Repeated exposures of rats to propylene glycol in drinking water or feed did not result in adverse effects at levels up to 10% in water (estimated at about 10 g/kg bw/day) or 5% in feed (dosage reported as 2.5 g/kg bw/day) for periods up to 2 years. In cats, two studies of at least 90 days duration show that a species-specific effect of increased Heinz bodies was observed (NOAEL = 80 mg/kg bw/day; LOAEL = 443 mg/kg bw/day), with other hematological effects (decrease in number of erythrocytes and erythrocyte survival) reported at higher doses (6-12% in diet, or 3.7-10.1 g/cat/day). Propylene glycol did not cause fetal or developmental toxicity in rats, mice, rabbits, or hamsters (NOAELs range from 1.2 to 1.6 g/kg bw/day in four species). No reproductive effects were found when propylene glycol was administered at up to 5% in the drinking water (reported as 10.1 g/kg bw/day) of mice. Propylene glycol was not a genetic toxicant as demonstrated by a battery of in vivo (micronucleus, dominant lethal, chromosome aberration) and in vitro (bacterial and mammalian cells and cultures) studies. No increase in tumors was found in all tissues examined when propylene glycol was administered in the diet of rats (2.5 g/kg bw/day for 2 years), or applied to the skin of female rats (100% PG; total dose not reported; 14 months) or mice (mouse dose estimated at about 2 g/kg bw/week; lifetime). These data support a lack of carcinogenicity for PG. ENVIRONMENT. ... Measured freshwater aquatic toxicity data for fish, daphnia and algae report LC/EC50 values of >18,000 mg/L. Therefore, PG is not acutely toxic to aquatic organisms except at very high concentrations. Using an assessment factor of 100 and the Ceriodaphnia data (48- hour EC 50 = 18,340 mg/l), the predicted no effect concentration is 183 mg/L.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) pp.3-4 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

▶ Hazardous Substances Data Bank (HSDB)

1.1.12 Antidote and Emergency Treatment

Check the anion gap, arterial pH, renal function, and glucose level. Serum propylene glycol levels up to 1,000 mg/dL do not correlate well with clinical status. Patients have been conscious with serum levels of 760 mg/dL.

Ellenhorn, M.J. and D.G. Barceloux. Medical Toxicology - Diagnosis and Treatment of Human Poisoning. New York, NY: Elsevier Science Publishing Co., Inc. 1988., p. 810

▶ Hazardous Substances Data Bank (HSDB)

Maintain an open airway and assist ventilation if necessary. Administer supplemental oxygen. Treat coma, convulsions, cardiac arrhythmias, and metabolic acidosis if they occur. Observe the patient for several hours to monitor for for development of metabolic acidosis, especially if the patient is symptomatic or there is known co-ingestion of ethanol. Treat hypocalcemia with

intravenous calcium gluconate or calcium chloride

Olson, K.R. (ed.) Poisoning & Drug Overdose. 3rd edition. Lange Medical Books/McGraw-Hill, New York, NY. 1999., p. 169

Hazardous Substances Data Bank (HSDB)

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 262

Hazardous Substances Data Bank (HSDB)

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary ... . Anticipate seizures and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport ... . Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal ... . /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 262-3

Hazardous Substances Data Bank (HSDB)

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial. Consider drug therapy for pulmonary edema ... . Monitor cardiac rhythm and treat arrhythmias if necessary ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) lactated Ringer's (LR) if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload ... . Treat seizures with diazepam or lorazepam ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Ethylene glycol, glycols, and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 263

Hazardous Substances Data Bank (HSDB)

1.1.13 Human Toxicity Excerpts

/HUMAN EXPOSURE STUDIES/ Results from human patch testing show no sensitization potential after semi-occlusive or occlusive epicutaneous application to the skin of volunteers (in excess of 300 subjects in total). These studies demonstrate that it is not irritating to skin or eye, nor does it cause sensitization by skin contact.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.17 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ Patch-test in humans, 15 uL 100% propylene glycol/test chamber for 48 hr. Results: not irritating.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.56 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ In 6 human volunteers, pads containing /propylene glycol/ test substance were fixed to the forearm for 2 hr, observation time: 7 days. Results: not irritating.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.56 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ Cream containing 12% propylene glycol was tested on 204 persons. Results: not sensitizing.

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.60 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

For more Human Toxicity Excerpts (Complete) data for Propylene glycol (45 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

1.1.14 Non-Human Toxicity Excerpts

/LABORATORY ANIMALS: Acute Exposure/ Acute oral toxicity studies yielded similar, low acute toxicities with relatively high LD50 values ranging from 8000-46000 mg/kg/day propylene glycol for rodents and 18000-20000 mg/kg/day for both rabbits and guinea pigs. Clinical signs (loss of balance, marked depression, and analgesia) were reported in the rabbit and guinea pig only at extremely high doses that exceeded the established limit dose (5000 mg/kg) for an acute oral toxicity study. Similar effects were also evident in one study with mice only at doses that resulted in lethality (LD50 value of 24800 mg/kg/day).

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: http://www.regulations.gov/search/Regs/home.html#home

Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ Propylene glycol induced degeneration of goblet cells (+69%) in tracheal lining of rabbits after 20 and 120 minutes of aerosol exposure to 10% aerosol in an acute inhalation toxicity study; no other toxicological effects were observed.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: http://www.regulations.gov/search/Regs/home.html#home

Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ In primary eye irritation studies, propylene glycol was instilled in the eyes of rabbits (0.1-0.5 mL). There were no treatment-related effects on the corneas of the animals and propylene glycol was classified as a non-irritant.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: http://www.regulations.gov/search/Regs/home.html#home

Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ In a series of skin sensitization tests, no reactions were observed in guinea pigs exposed to solutions up to 70% propylene glycol.

US EPA; Revised Toxicology Chapter in Support of Issuance of the Reregistration Eligibility Decision (RED) Document. PC Code for Propylene Glycol: 068603; PC Code for Dipropylene Glycol: 068604. Reregistration Case Number: 3126. (February 5, 2007). Available from, as of February 24, 2010: http://www.regulations.gov/search/Regs/home.html#home

Hazardous Substances Data Bank (HSDB)

For more Non-Human Toxicity Excerpts (Complete) data for Propylene glycol (102 total), please visit the HSDB record page.

- Hazardous Substances Data Bank (HSDB)

1.1.15 Non-Human Toxicity Values

LD50 Rat oral 21000 - 33700 mg/kg

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

- Hazardous Substances Data Bank (HSDB)

LD50 Rat oral 22,000 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LD50 Rat ip 6660 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Rat iv 6423 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Rat sc 22,500 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Rat im 14,000 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Mouse oral 23900-31800 mg/kg

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

- Hazardous Substances Data Bank (HSDB)

LD50 Mouse oral 24,900 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LD50 Mouse sc 17,300 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Mouse ip 9718 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.53 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LD50 Mouse iv 6630 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3061

- Hazardous Substances Data Bank (HSDB)

LD50 Rabbit oral 18000 mg/kg bw

Amdur, M.O., J. Doull, C.D. Klaasen (eds). Casarett and Doull's Toxicology. 4th ed. New York, NY: Pergamon Press, 1991., p. 705

- Hazardous Substances Data Bank (HSDB)

LD50 Rabbit dermal 20,800 mg/kg bw

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) p.45 (2000 CD-ROM edition). Available from, as of January 12, 2009: http://esis.jrc.ec.europa.eu/

- Hazardous Substances Data Bank (HSDB)

LD50 Rabbit iv 3099 mg/kg bw

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) p.53 (2000 CD-ROM edition). Available from, as of January 12, 2009: http://esis.jrc.ec.europa.eu/

- Hazardous Substances Data Bank (HSDB)

LD50 Guinea pig oral 18400-19600 mg/kg

Cavender FL, Sowinski EJ; Patty's Toxicology CD-ROM (2005). NY, NY: John Wiley & Sons; Glycols. Online Posting Date: April 16, 2001

- Hazardous Substances Data Bank (HSDB)

LD50 Guinea pig oral 19,700 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LD50 Guinea pig sc 15,500 mg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.52 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LD50 Guinea pig ip 9256 mg/kg bw

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) p.49 (2000 CD-ROM edition). Available from, as of January 12, 2009: http://esis.jrc.ec.europa.eu/

- Hazardous Substances Data Bank (HSDB)

LD50 Dog oral 19000 mg/kg bw

Amdur, M.O., J. Doull, C.D. Klaasen (eds). Casarett and Doull's Toxicology. 4th ed. New York, NY: Pergamon Press, 1991., p. 705

- Hazardous Substances Data Bank (HSDB)

LD50 Dog iv 26,000 mg/kg

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.54 (2001). Available

from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

1.1.16 Ecotoxicity Values

EC50; Species: Selenastrum capricornutum (green algae); Concentration: 19,000 mg/L for 96 hr; Effect: 14-day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

EC50; Species: Selenastrum capricornutum (green algae); Concentration: 18,100 mg/L for 14 days; Effect: 14-day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

EC50; Species: Daphnia magna (Water flea, age 6-24 hr); Conditions: freshwater, static, 20 °C, pH > or =7.0; Concentration: >10000000 ug/L for 24, 48 hr; Effect: intoxication, immobilization /formulation/

Kuhn R et al; Water Res 23 (4): 495-9 (1989) as cited in the ECOTOX database. Available from, as of December 31, 2009

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Daphnia magna (water flea); Conditions: static; Concentration: 43,500 mg/L for 48 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.5 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Ceriodaphnia sp. (water flea); Conditions: static; Concentration: 18,340 mg/L for 48 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

EC50; Species: Skeletonema costatum (diatom); Concentration: 19,100 mg/L for 96 hr; Effect: 14 day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

EC50; Species: Skeletonema costatum (diatom); Concentration: >5300 mg/L for 14 days; Effect: 14 day growth rate /Conditions of bioassay not specified/

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Artemia salina (brine shrimp); Conditions: static; Concentration: >10,000 mg/L for 24 hr

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) p.37 (2000 CD-ROM edition). Available from the Database Query page, as of February 11, 2010: http://esis.jrc.ec.europa.eu/

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Mysidopsis bahia (Mysid shrimp); Conditions: static; Concentration: 18,800 mg/L for 96 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.6 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Carassius auratus (goldfish); Conditions: static; Concentration: >5,000 mg/L for 24 hr

European Commission, ESIS; IUCLID Dataset, Propane-1,2-diol (57-55-6) p.36 (2000 CD-ROM edition). Available from the Database Query page, as of February 11, 2010: http://esis.jrc.ec.europa.eu/

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Cyprinodon variegatus (Sheepshead minnow); Conditions: static; Concentration: 48,000 ppm for 96 hr

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.13 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Lebistes reticulatus (guppy); Concentration: > 10,000 mg/L for 48 hr /Conditions of bioassay not specified/

Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Volumes 1-2. 4th ed. John Wiley & Sons. New York, NY. 2001, p. 1855

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Lepomis macrochirus (Bluegill sunfish); Conditions: static; Concentration: > 10,000 ppm for 96 hr

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.13 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Menidia beryllina (Inland Silverside fish); Conditions: static; Concentration: > 10,000 ppm for 96 hr

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.14 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Oncorhynchus mykiss (Rainbow trout); Conditions: static; Concentration: 51,600 mg/L for 96 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.5 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Oncorhynchus mykiss (Rainbow trout); Concentration: 50,000 mg/L for 24 hr /Conditions of bioassay not specified/

Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Volumes 1-2. 4th ed. John Wiley & Sons. New York, NY. 2001, p. 1855

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Oncorhynchus mykiss (Rainbow trout); Conditions: static, 12 °C, pH 7.4, hardness 44 mg/L CaCO3; Concentration: 44 mL/L for 96 hr (95% confidence interval: 41-47 mL/L)

Columbia Environmental Research Center, USGS; Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals (1986)

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Oryzias latipes (Medaka); Conditions: freshwater, static, 10, 20, 30 °C; Concentration: >1000000 ug/L for 24, 48 hr

Tsuji S et al; J Hyg Chem (Eisei Kagaku) 32 (1): 46-53 (1986) as cited in the ECOTOX database. Available from, as of December 31, 2009

- Hazardous Substances Data Bank (HSDB)

LC50; Species: Pimephales promelas (Fathead minnow); Conditions: flow-through; Concentration: 59,900 - 77,400 ppm for 96 hr

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.14 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

LC50; Species: Pimephales promelas (Fathead minnow); Conditions: static; Concentration: 46,500 mg/L for 96 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.5 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

LC50; Species: Pimephales promelas (Fathead minnow); Conditions: static; Concentration: 51,400 mg/L for 96 hr

Organization for Economic Cooperation and Development; Screening Information Data Set for 1,2-Dihydroxypropane (57-55-6) p.5 (2001). Available from, as of December 31, 2009: http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html

Hazardous Substances Data Bank (HSDB)

LC50; Species: Pimephales promelas (Fathead minnow); Concentration: 54,900 mg/L for 96 hr /Conditions of bioassay not specified/

Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Volumes 1-2. 4th ed. John Wiley & Sons. New York, NY. 2001, p. 1855

Hazardous Substances Data Bank (HSDB)

LC50; Species: Pimephales promelas (Fathead minnow, age < or =7 days); Conditions: freshwater, renewal, 20 °C; Concentration: 34060 mg/L for 96 hr (95% confidence interval: 29485-39339 mg/L)

Cornell JS et al; Environ Toxicol Chem 19 (6): 1465-72 (2000) as cited in the ECOTOX database. Available from, as of December 31, 2009

Hazardous Substances Data Bank (HSDB)

1.1.17 Ecotoxicity Excerpts

/BIRDS and MAMMALS/ Due to the low likelihood of exposure and low toxicity of propylene glycol ..., the /Environmental Protection/ Agency expects no effects to listed species or critical habitats and therefore makes a "No Effect" determination for this chemical.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.15 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ The very low toxicity of propylene glycol to aquatic organisms, as indicated by the high LC50 values ..., further supports the unlikelihood of adverse effects to fish and aquatic invertebrates.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Propylene glycol and Dipropylene glycol p.14 EPA-739-R-06-002 (September 2006). Available from, as of December 31, 2009: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ ...This research investigated the contributions of environmentally significant concentrations of selected /aircraft deicing fluid/ (ADF) components to the toxicity of ADF-containing waste streams, and to the inhibition of biodegradation of propylene glycol (PG), the most important component of ADF. The component chemicals studied were PG, the corrosion inhibitor 4(5)-methylbenzotriazole (MeBT; common name: tolyltriazole), and proprietary mixes of corrosion inhibitors, buffers, and surfactants referred to as the additive package or AdPack. Relative to PG alone, the different additives increased the toxicity of ADF and decreased PG biodegradation rates. In enrichments of soil microorganisms acclimated to ADF, the MeBT component significantly decreased cell growth rates and yields, and inhibited PG biodegradation to a greater extent than the AdPack. Microtox tests indicated that MeBT is the ADF component most toxic to microorganisms. However, acute aquatic toxicity tests

indicated that the AdPack components were more toxic than MeBT to Ceriodaphnia dubia and Pimephales promelas, although both components were more toxic than PG alone. /Aircraft deicing fluid/

Cornell JS et al; Environ Chem Toxicol 19 (6): 1465-72 (2000)

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ Streams receiving runoff from General Mitchell International Airport (GMIA), Milwaukee, Wisconsin, USA, were studied to assess toxic impacts of aircraft and runway deicers. Elevated levels of constituents related to deicing (propylene glycol, ethylene glycol, and ammonia) were observed in stream samples. The LC50s of type I deicer for Ceriodaphnia dubia, Pimephelas promelas, Hyalela azteca, and Chironimus tentans and the EC50 for Microtox were less than 5,000 mg/L of propylene glycol. Concentrations up to 39,000 mg/L were observed at airport outfall sites in samples collected during deicing events. The IC25s of type I deicer for C. dubia and P. promelas were less than 1,500 mg/L of propylene glycol. Concentrations up to 960 mg/L were observed in low-flow samples at an airport outfall site. Measured toxicity of stream water was greatest during winter storms when deicers were applied. Chronic toxicity was observed at airport outfall samples from low-flow periods in the winter and the summer, with the greater toxic impacts from the winter sample. All forms of toxicity in stream-water samples decreased as downstream flows increased. /Aircraft and runway deicers/

Corsi SR et al; Environ Toxicol Chem 20 (7): 1483-90 (2001)

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ ... Many of the /aircraft/ deicers are formulated mixtures of ethylene glycol (EG) or propylene glycol (PG) and a variety of additives. Because these deicers may be intentionally or accidentally released into aquatic ecosystems, the possibility exists for direct and indirect adverse effects on aquatic organisms. Laboratory studies evaluated the comparative toxicity of formulated glycol deicers and pure materials on the water flea, Ceriodaphnia dubia, and fathead minnow, Pimephales promelas. Acute (48 hr and 96 hr) and short-term chronic tests were performed according to USEPA guidelines. The formulated mixtures were found to be substantially more toxic than either of the pure glycol materials. The 48 hr LC50s for C. dubia were 13,140 mg/L and 1,020 mg/L using formulated EG and PG, and 34,400 mg/L and 18,340 mg/L using pure EG and PG, respectively. The 96 hr LC50s for P. promelas were 8,050 mg/L and 710 mg/L using formulated EG and PG, and 72,860 mg/L and 55,770 mg/L using pure EG and PG, respectively. Chronic IC25s for C. dubia were 3,960 mg/L and 640 mg/L using formulated EG and PG, 12,310 mg/L and 13,470 mg/L using pure EG and PG. Chronic IC25s for P. promelas were 3,660 mg/L and 110 mg/L using formulated EG and PG, 22,520 mg/L and 6,940 mg/L using pure EG and PG. For airports that have stormwater discharge permits, numerical limits for EG and PG are generally listed, potential toxicity is assumed to be due to the glycol materials. However, other compounds in the mixtures may either contribute substantially to, or in some cases overshadow, the toxicity of the glycol materials.

Pillard DA; Environ Toxicol Chem 14 (2): 311-5 (1995)

Hazardous Substances Data Bank (HSDB)

1.1.18 National Toxicology Program Studies

Propylene glycol ... was tested for reproductive toxicity in Swiss CD-1 mice using the RACB protocol. It was part of a series of glycol ethers & congeners evaluated for structure-activity correlations using this design. Data collected on body weights, clinical signs, & food/water consumption during the dose-range-finding segment (Task 1) were used to set concns for the main study (Task 2) at 0.0, 1.0, 2.5, 5.0% PG in drinking water. These concns produced calculated consumption estimates of nearly =1.819, 4.796, & 10.118 g/kg bw/day. Although water consumption in the F0 generation was consistently higher for all groups (by 6 to 15%), these increases were not statistically different from controls. There was no effect on body weights during ... the continuous cohabitation portion of the study. All groups had > or =4.6 litters/pair, with > or =11.9 pups/litter. There was no treatment-related effect on pup weight adjusted for litter size (control value: 1.55 g). The viability & growth of the final litter was unaffected by PG consumption. Since there was no effect on fertility, a Task 3 crossover was not conducted. At the time this study was conducted, the protocol called for no necropsy of F0 animals in the absence of a fertility effect, so the F0 mice were killed & discarded without necropsy. For the second generation, just the control & 5% PG groups were evaluated. There was no treatment-related effect on mating, fertility, or on the number, weight, or viability of the F2 offspring. After delivery of the F2 pups, the F1 adults were killed & necropsied. There was no effect on body or organ weights in males or females, no change in sperm endpoints, & no change in estrous cycle parameters. Serum total calcium levels were measured in serum of the F1 mice, & was found unchanged by PG

exposure from a control value of 9.2 mg/dL. In summary, propylene glycol, under the conditions of this experiment, has no effect on fertility & reproduction in either generation of Swiss mice at up to 10 g/kg/day.

Department of Health & Human Services/National Institute of Environmental Health Sciences, National Toxicology Program; Propylene Glycol (CAS No. 57-55-6): Reproduction and Fertility Assessment in CD-1 Mice When Administered in Drinking Water, NTP Study No. RACB84068 (September 1985) Available from, as of August 14, 2002: http://ntp.niehs.nih.gov/index.cfm?objectid=0847F35A-0850-D1E7-B02ED4DDD150F990

▶ Hazardous Substances Data Bank (HSDB)

1.1.19 Populations at Special Risk

/Infant, premature/ The decreased size of premature infants and an increased serum half-life ... for propylene glycol in premature infants predispose them to a greater probability of toxic effects from over administration of propylene glycol. There is particular concern for very small infants and those receiving multiple IV medications containing propylene glycol. Absorption of propylene glycol from ointments applied to burns and injection of multivitamin products in infants has resulted in serum hyperosmolality, which was associated with cardiorespiratory arrest in one case.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 pp.II-45-46. Available from, as of January 11, 2010: http://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

▶ Hazardous Substances Data Bank (HSDB)

/Infant; Infant, newborn; Infant, premature; Child, preschool/ Hyperosmolarity and lactic acidosis, both of which occur most frequently in patients with consumption of large quantities of propylene glycol or on administration to neonates, children under 4 years of age, pregnant women, and patients with hepatic or renal failure.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▶ Hazardous Substances Data Bank (HSDB)

/Children/ In children, seizures and respiratory depression have occurred after taking liquid medications containing propylene glycol.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-44 . Available from, as of January 11, 2010: http://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

▶ Hazardous Substances Data Bank (HSDB)

Adverse effects /from propylene glycol/ may also occur in patients treated with disulfiram or metronidazole.

Rowe, R.C., Sheskey, P.J., Quinn, M.E.; (Eds.), Handbook of Pharmaceutical Excipients 6th edition Pharmaceutical Press, London, England 2009, p. 593

▶ Hazardous Substances Data Bank (HSDB)

The usually recommended dosage of amprenavir oral solution (22.5 mg/kg twice daily) provides a propylene glycol intake of 1650 mg/kg daily; however, an acceptable intake of propylene glycol used as an excipient in pharmaceuticals has not been established to date. Propylene glycol is metabolized in the liver by the alcohol and aldehyde dehydrogenase enzyme pathway, and the possibility exists that young infants, patients with renal or hepatic impairment, and certain patient groups (females, Asians, Native Alaskans, Native Americans) may be at increased risk of propylene glycol-associated adverse effects if they receive amprenavir oral solution because of diminished ability to metabolize propylene glycol /SRP: due to alcohol dehydrogenase polymorphism/.

McEvoy, G.K. (ed.). American Hospital Formulary Service - Drug Information 2003. Bethesda, MD: American Society of Health-System Pharmacists, Inc. 2003 (Plus Supplements)., p. 626

▶ Hazardous Substances Data Bank (HSDB)

In a patient with renal failure who was unable to excrete propylene glycol in the urine, such retention caused severe central nervous system depression. In addition, lactic acidosis was a prominent feature in this patient; with a large anion gap and a lactic acid level of 80 mEq/L.

Haddad, L.M., Clinical Management of Poisoning and Drug Overdose. 2nd ed. Philadelphia, PA: W.B. Saunders Co., 1990., p. 700

Hazardous Substances Data Bank (HSDB)

... Patients with impaired liver or kidney function would be at increased risk for developing propylene glycol toxicity. In patients with renal insufficiency, high propylene glycol levels have been associated with lactic acidosis (hyperlactemia). Propylene glycol has been found in the blood of alcoholics with cirrhosis of the liver without detectable measurable blood alcohol levels.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-44 . Available from, as of January 11, 2010: http://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

Hazardous Substances Data Bank (HSDB)

/Infant, Child/ In a study where adults and children were rectally exposed once to 123-173 mg/kg bw propylene glycol [blood levels 1.6-2.2 mM], the clearance rate was 0.2 L/hour/kg and half-life was 2.6-2.8 hours. In 6 adults receiving propylene glycol intravenously, blood levels of propylene glycol were measured at 48-425 ug/mL [0.63-5.6 mM] and an average half-life of 2.3 hours was estimated. A small number of studies suggest that elimination of propylene glycol in infants is slower than in adults. In an 8-month-old infant exposed to propylene glycol through medication applied to burns, the propylene glycol blood level was 1.059 g/dL [139 mM] and the elimination half-life was measured at 16.9 hours. Ten infants exposed to 10 mL [10.36 g] propylene glycol in a parenteral vitamin solution daily for 5 days had propylene glycol blood levels of 65.950 mg/dL [8.5-125mM] and elimination half-lives of 10.8-30.5 hours, with a mean of 19.3 hours.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-25 . Available from, as of January 11, 2010: http://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

Hazardous Substances Data Bank (HSDB)

/Infant/ ... A good correlation between osmolality gap and serum propylene glycol concentrations /was reported/ in ten infants. The half-life was reported as 19.3 hours (range 10.8-30.5 hours), which is about 10 times longer than in adults. Alcohol dehydrogenase activity is up to 10 times lower in infants than in adults providing an explanation for the prolonged half-life in the latter and at the same time further evidence that this enzyme is the rate-determining enzyme in the clearance of propylene glycol.

DHHS/NTP-CERHR; NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Propylene Glycol (March 2004) NIH Pub No. 04-4482 p.II-28 . Available from, as of January 11, 2010: http://cerhr.niehs.nih.gov/evals/egpg/propylene/PG_Monograph.pdf

Hazardous Substances Data Bank (HSDB)

1.2 Ecological Information

1.2.1 EPA Ecotoxicity

Pesticide Ecotoxicity Data from EPA

EPA Pesticide Ecotoxicity Database

1.2.2 US EPA Regional Screening Levels for Chemical Contaminants

Resident Soil (mg/kg)	1.30e+05
Industrial Soil (mg/kg)	1.60e+06
Tapwater (ug/L)	4.00e+04
Risk-based SSL (mg/kg)	8.10e+00
Chronic Oral Reference Dose (mg/kg-day)	2.00e+01
Fraction of Contaminant Absorbed in Gastrointestinal Tract	1
Fraction of Contaminant Absorbed Dermally from Soil	0.1

US EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites

1.2.3 US EPA Regional Removal Management Levels for Chemical Contaminants

Resident Soil (mg/kg)	3.80e+06
Industrial Soil (mg/kg)	4.90e+07
Tapwater (ug/L)	1.20e+06
Chronic Oral Reference Dose (mg/kg-day)	2.00e+01
Fraction of Contaminant Absorbed in Gastrointestinal Tract	1
Fraction of Contaminant Absorbed Dermally from Soil	0.1

US EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites

1.2.4 Environmental Fate/Exposure Summary

Propylene glycol's production and use as an antifreeze in breweries and dairy establishments, substitute for ethylene glycol and glycerol, in the manufacture of synthetic resins, emulsifier in foods, solvent for food colors and flavors, and pharmaceutic aid (humectant, solvent) may result in its release to the environment through various waste streams. Its use to create artificial smoke and mist for theatrical use, as an airplane de-icing fluid and in aerosol mists that are commonly used in hospitals and public buildings for disinfection purposes will result in its direct release to the environment. If released to air, a vapor pressure of 0.13 mm Hg at 25 °C indicates propylene glycol will exist solely as a vapor in the ambient atmosphere. Vapor-phase propylene glycol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 32 hours. Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight. If released to soil, propylene glycol is expected to have very high mobility based upon an estimated Koc of 1. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 1.3X10-8 atm-cu m/mole. Propylene glycol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Propylene glycol was mineralized 73-78% in laboratory studies conducted using an agricultural soil over a 51 day incubation period, suggesting biodegradation will be an important environmental fate process in soil. If released into water, propylene glycol is not expected to adsorb to suspended solids and

sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Numerous screening studies using wastewater or sewage inoculum as seed suggest that propylene glycol will be degraded readily in aqueous environments. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. Propylene glycol is not expected to undergo hydrolysis since this compound lacks functional groups that hydrolyze under environmental conditions. Occupational exposure to propylene glycol may occur through inhalation and dermal contact with this compound at workplaces where propylene glycol is produced or used. Monitoring and use data indicate that the general population may be exposed to propylene glycol via inhalation and dermal contact with consumer products containing propylene glycol. (SRC)

▶ Hazardous Substances Data Bank (HSDB)

1.2.5 Artificial Pollution Sources

Propylene glycol's production and use as an antifreeze in breweries and dairy establishments, substitute for ethylene glycol and glycerol, in the manufacture of synthetic resins, emulsifier in foods, solvent for food colors and flavors, and pharmaceutic aid (humectant, solvent)(1) may result in its release to the environment through various waste streams(SRC). Its use to create artificial smoke and mist for theatrical use, as an airplane de-icing fluid(1) and in aerosol mists that are commonly used in hospitals and public buildings for disinfection purposes(2) will result in its direct release to the environment(SRC).

(1) O'Neil MJ, ed; The Merck. 14th ed Whitehouse Station, NJ: Merck and Co., Inc., p. 1350 (2006) (2) Finis L et al; Patty's Toxicology 5th ed. Bingham E et al, eds., New York, NY: John Wiley & Sons 7: 26-31 (2001)

▶ Hazardous Substances Data Bank (HSDB)

1.2.6 Environmental Fate

TERRESTRIAL FATE: Based on a classification scheme(1), an estimated Koc value of 1(SRC), determined from a log Kow of -0.92(2) and a regression-derived equation(3), indicates that propylene glycol is expected to have very high mobility in soil(SRC). Volatilization of propylene glycol from moist soil surfaces is not expected to be an important fate process(SRC) given an estimated Henry's Law constant of 1.3X10-8 atm-cu m/mole(SRC), derived from its vapor pressure, 0.13 mm Hg(4), and assigned value for water solubility of 1X10+6 mg/L (miscible)(5). Propylene glycol is not expected to volatilize from dry soil surfaces(SRC) based upon its vapor pressure(4). Laboratory experiments using agricultural soils from South Carolina conducted at 22 °C and a fortification of 1,000 ppm propylene glycol, yielded 73-78% mineralization during a 51 day incubation period(6), suggesting that biodegradation will be an important fate process in soils(SRC).

(1) Swann RL et al; Res Rev 85: 17-28 (1983) (2) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995) (3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010. (4) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989) (5) Yalkowsky SH, Dannenfelser RM; The AQUASOL dATAbASE of Aqueous Solubility. Ver 5. Tucson, AZ: Univ AZ, College of Pharmacy (1992) (6) Shupack DP, Anderson TA; Water Air Soil Pollut 118: 53-58 (2000)

▶ Hazardous Substances Data Bank (HSDB)

AQUATIC FATE: Based on a classification scheme(1), an estimated Koc value of 1(SRC), determined from a log Kow of -0.92(2) and a regression-derived equation(3), indicates that propylene glycol is not expected to adsorb to suspended solids and sediment(SRC). Volatilization from water surfaces is not expected(3) based upon an estimated Henry's Law constant of 1.3X10-8 atm-cu m/mole(SRC), derived from its vapor pressure, 0.13 mm Hg(5), and assigned value for water solubility of 1X10+6 mg/L (miscible)(6). According to a classification scheme(7), an estimated BCF of 3(SRC), from its log Kow(2) and a regression-derived equation(8), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Numerous screening studies using wastewater or sewage inoculum as seed, suggests that propylene glycol will be degraded readily under aqueous environments(9-11).

(1) Swann RL et al; Res Rev 85: 17-28 (1983) (2) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995) (3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010. (4) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990) (5) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989) (6) Yalkowsky SH, He Y; Handbook of Aqueous Solubility Data: An Extensive Compilation of Aqueous Solubility Data for Organic Compounds Extracted from the AQUASOL dATAbASE. Boca Raton, FL: CRC Press LLC, (2003) (7) Franke C et al; Chemosphere 29: 1501-14 (1994) (8) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999) (9) Bridie AL et al; Water Res 13:

627-30 (1979) (10) Helfgott TB et al; An Index of Refractory Organics. USEPA-66/2-77-174 (1977) (11) Wagner R; Vom Wasser 47: 241-65 (1976)

Hazardous Substances Data Bank (HSDB)

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), propylene glycol, which has a vapor pressure of 0.13 mm Hg at 25 °C(2), is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase propylene glycol is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is estimated to be 32 hours(SRC), calculated from its rate constant of 1.2X10-11 cu cm/molecule-sec at 25 °C(3). Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight(4).

(1) Bidleman TF; Environ Sci Technol 22: 361-367 (1988) (2) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989) (3) Atkinson R; J Phys Chem Ref Data Monograph 1 (1989) (4) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 8-12 (1990)

Hazardous Substances Data Bank (HSDB)

1.2.7 Environmental Biodegradation

AEROBIC: Propylene glycol achieved 64% of its theoretical BOD using a sewage inoculum and a 5 day incubation period(1). A Warburg respirometer study employing a sewage seed showed that propylene glycol reached 78% of its theoretical BOD during a 40 day incubation period(2). Propylene glycol achieved 2.2, 56.7 and 80% of its theoretical BOD using a sewage inoculum and 5, 10, and 50 day incubation periods, respectively(3). Using raw wastewater and synthetic seawater as inoculum, propylene glycol achieved 55 and 83% of its theoretical BOD during 5 and 20 day incubation periods, respectively(4). Using wastewater from pretreated domestic sewage, propylene glycol reached 74.5% of its theoretical BOD in 5 days(5). Propylene glycol underwent 73-78% mineralization within 51 days when incubated with various agricultural soils from Clemson University, SC under laboratory conditions at 22 °C and 1,000 ppm propylene glycol in the soil; 40-79% mineralization was observed for propylene glycol incubated in the same soils for 64 days at 7 °C(6).

(1) Bridie AL et al; Water Res 13: 627-30 (1979) (2) Helfgott TB et al; An Index of Refractory Organics. USEPA-66/2-77-174 (1977) (3) Lamb CB, Jenkins GF; p. 326-9 in Proc 8th Industrial Waste Conf, Purdue Univ (1952) (4) Price KS et al; J Water Pollut Control Fed 46: 63-77 (1974) (5) Wagner R; Vom Wasser 47: 241-65 (1976) (6) Shupack DP, Anderson TA; Water Air Soil Pollut 118: 53-58 (2000)

Hazardous Substances Data Bank (HSDB)

AEROBIC: Propylene glycol is mineralized to CO2 in soil microcosms incubated at temperatures ranging from -2 to 25 °C. No lag time period was observed. Degradation occurred with propylene glycol alone and in combination with ethylene glycol and diethylene glycol at glycol concentrations ranging from 392 to 5278 mg/kg suggesting that high levels of glycols in deicing fluids are unlikely to inhibit biodegradation. Complete disappearance of 0.045% propylene glycol occurred after 12 days at 8 °C and 57% of the theoretical oxygen demand was recovered after 34 days. With 0.45% propylene glycol, 76% degradation and 44% mineralization was obtained after 111 days(1). The rate of biodegradation ranged from 11.4 to 41.4 mg/kg soil per day at 8 °C with an average of 22.7 mg/kg per day. Rates at 25 °C were approximately 3.4 times faster than those at 8 °C, ranging from 78.9 to 88 mg/kg per day with a mean of 83.5 mg/kg per day. At -2 °C, biodegradation rates for propylene glycol ranged from 1.1 to 3.5 mg/kg per day with a mean of 2.3 mg/kg per day. After 111 days of incubation at -2 °C, 14% degradation to the parent compound was observed and the BOD was 8% of the theoretical oxygen demand(1).

(1) Klecka GM et al; Ecotox Environ Saf 25: 280-95 (1993)

Hazardous Substances Data Bank (HSDB)

AEROBIC: Proylene glycol reached 90% of its theoretical BOD in 14 days in the Japanese MITI test(1). A mixture of propylene glycol, diethylene glycol and potassium acetate reached 32.9, 30.2%, and 24.1% of its theoretical BOD in 5 days, respectively at 8 °C, 4 °C and 1 °C(2). The measured surface biodegradation rates for deicing fluids, specifically propylene glycol, was 0.073 day-1(2). Aircraft deicing fluid, the major constituents being ethylene glycol and propylene glycol, reached concentrations ranging from 350-245,000 mg/L, with an average of 87,000 mg/L, of its theoretical BOD after 5 days(3).

(1) Sedykh A, Klopman G; SAR QSAR Environ Res 18(7-8): 693-709 (2007) (2) Revitt DM, Worrall P; Water Sci Technol 48: 103-111 (2003) (3) Zitomer DH, Tonuk GU; J Environ Eng 129: 123-129 (2003)

Hazardous Substances Data Bank (HSDB)

ANAEROBIC: Using an activated sludge or digester sludge incubated under anaerobic conditions, propylene glycol was completely degraded within 5-9 days, while a sterile control showed no degradation(1). Rapid propylene glycol degradation is observed in topsoil materials high in organic matter at 20 °C; in subsoil materials, degradation of propylene glycol is very slow and incomplete(2).

(1) Kaplan DL et al; Environ Sci Technol 16: 723-5 (1982) (2) Jaesche P et al; J Contam Hydrol 85: 271-286 (2006)

Hazardous Substances Data Bank (HSDB)

1.2.8 Environmental Abiotic Degradation

Under ordinary conditions propylene glycol is stable, but at high temps it tends to oxidize giving rise to products such as propionaldehyde, lactic acid, pyruvic acid and acetic acid.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1350

Hazardous Substances Data Bank (HSDB)

The rate constant for the vapor-phase reaction of propylene glycol with photochemically-produced hydroxyl radicals has been measured as 1.2X10-11 cu cm/molecule-sec at 25 °C(1). This corresponds to an atmospheric half-life of about 32 hours at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1). Propylene glycol is not expected to undergo hydrolysis in the environment due to the lack of hydrolyzable functional groups(2). Propylene glycol does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight(2). The rate constant for the reaction of propylene glycol with hydroxyl radicals in aqueous solution is approximately 0.94-1.68X10+9 L/mol-sec(3); if the hydroxyl radical concn of sunlit natural water is assumed to be 1X10-17 moles/L(4), the half-life would be approximately 1.3-2.3 years(SRC).

(1) Atkinson R; J Phys Chem Ref Data Monograph 1 (1989) (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990) (3) Anbar M, Neta P; Int J Appl Radiation Isotopes 18: 493-523 (1967) (4) Mill T et al; Science 207: 886-7 (1980)

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1.2.9 Environmental Bioconcentration

An estimated BCF of 3 was calculated for propylene glycol(SRC), using a log Kow of -0.92(1) and a regression-derived equation(2). According to a classification scheme(3), this BCF suggests the potential for bioconcentration in aquatic organisms is low(SRC).

(1) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer Chem Soc p. 7 (1995) (2) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999) (3) Franke C et al; Chemosphere 29: 1501-14 (1994)

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1.2.10 Soil Adsorption/Mobility

Soil Adsorption Coefficient

2.29 L/kg

EPA DSSTox

The Koc of propylene glycol is estimated as 1(SRC), using a log Kow of -0.92(1) and a regression-derived equation(2). According to a classification scheme(3), this estimated Koc value suggests that propylene glycol is expected to have very high mobility in soil(SRC).

(1) Hansch C et al; Exploring QSAR. Hydrophobic, Electronic, and Steric Constants. ACS Prof Ref Book. Heller SR, consult. ed., Washington, DC: Amer

Chem Soc p. 7 (1995) (2) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.0. Jan, 2009. Available from http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm as of Feb 12, 2010. (3) Swann RL et al; Res Rev 85: 17-28 (1983)

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1.2.11 Volatilization from Water/Soil

The Henry's Law constant for propylene glycol is estimated as 1.3X10-8 atm-cu m/mole(SRC) derived from its vapor pressure, 0.13 mm Hg(1), and assigned value for water solubility of 1X10+6 mg/L (miscible)(2). This Henry's Law constant indicates that propylene glycol is expected to be essentially nonvolatile from water surfaces(3). Propylene glycol is not expected to volatilize from dry soil surfaces(SRC) based upon its vapor pressure(1).

(1) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation Washington, DC: Taylor and Francis (1989) (2) Yalkowsky SH, He Y; Handbook of Aqueous Solubility Data: An Extensive Compilation of Aqueous Solubility Data for Organic Compounds Extracted from the AQUASOL dATAbASE. Boca Raton, FL: CRC Press LLC, (2003) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990)

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1.2.12 Environmental Water Concentrations

GROUNDWATER: Propylene glycol was detected at a concentration of 4 mg/L in samples from a perched water table at the Ottawa Airport, Ontario, Canada(1).

(1) ATSDR; Toxicological Profile for Propylene Glycol. Atlanta, GA: Agency for Toxic Substances and Disease Registry, US Public Health Service (2009). Available from, as of August 25, 2010: http://www.atsdr.cdc.gov/toxprofiles/index.asp

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SURFACE WATER: Trigg Lake and Big Bear Creek, in the vicinity of the Dallas/Fort Worth International Airport, TX, were monitored for aircraft deicer/anti-icer fluid runoff from October 2002 to April 2004. Glycol concentrations at outfalls ranged from less than 81 to 23,800 mg/L; concentrations in Big Bear Creek ranged from less than 18 to 230 mg/L, with 10 and 35% of what was applied to aircraft was subsequently discharged into the creek. Glycol effluent released to Trigg Lake was initially diluted and degraded prior to reaching the lake outlet(1). Propylene glycol was detected in storm water runoff at the Salt Lake City airport Utah at concentrations up to 19,000 mg/L. The compound may also be released to surface water as a metabolite of the military propellant propylene glycol dinitrate which is found in waste water streams from munitions facilities(2).

(1) Corsi SR et al; Environ Toxicol Chem 25: 2890-900 (2006) (2) ATSDR; Toxicological Profile for Propylene Glycol. Atlanta, GA: Agency for Toxic Substances and Disease Registry, US Public Health Service (2009). Available from, as of August 25, 2010: http://www.atsdr.cdc.gov/toxprofiles/index.asp

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1.2.13 Effluent Concentrations

Propylene glycol was identified, not quantified, in a wastewater effluent from a chemical plant in Memphis, TN in Aug 1974(1).

(1) Shackelford WM, Keith JL; Frequency of Organic Compounds Identified in Water. USEPA-600/4-76-062 p. 205 (1976)

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1.2.14 Atmospheric Concentrations

INDOOR AIR: Propylene glycol was detected in indoor air concentrations at the maximum concentration of 69.3 ug/cu m and the average concentration of 7.7 ug/cu m(1).

(1) Stolz P et al; in Indoor Air in Organic Indoor Air Pollutants. Occurrence, Measurement, Evaluation. Salthammer T, ed., New York, NY: Wiley-VCH, pp. 117-125 (1999)

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1.2.15 Other Environmental Concentrations

Propylene glycol was identified as a volatile component of latex-backed carpets(1). Propylene glycol was detected in newly manufactured and site houses at concentrations of 1.1-12.0 ppb and < 2.2-360 ppb in North America(2).

(1) USCPSC; Status Report for Chemical Emissions from New Carpets. US Consumer Product Safety Commission (1993) (2) Hodgson At et al; Indoor Air 10: 178-9 (2000)

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Propylene glycol was detected in snowbanks within the General Mitchell International Airport in Wisconsin, a medium-sized airport. The compound was identified as the main constituent, with the concentration ranging from 144 to 8,210 kg from February 2000-March 2003. Glycol content in snowbanks ranged from 0.17- 11.4%(1)

(1) Corsi SR et al; Environ Sci Technol 40: 3195-3202 (2006)

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Propylene glycol was present in the following consumer product categories: paint primers and varnishes, all purpose cleaners, room deodorants and disinfectants, personal deodorants, and metal cleaners and polishes(1). The weight percentage of propylene glycol in the products ranged from 16.15% to 42.47%(1). Propylene glycol was also detected in oven spray cleaner at unknown concentrations(2).

(1) USEPA; Compilation and speciation of National Emissions Factor for consumer/commercial solvent use. Information compiled to support urban air toxics assessment studies. USEPA-450/2-89-008 (1989) (2) Salthammer T; in Organic Indoor Air Pollutants. Occurrence, Measurement, Evaluation. Salthammer T, ed., New York, NY: Wiley-VCH, pp. 219-232 (1999)

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1.2.16 Probable Routes of Human Exposure

According to the 2006 TSCA Inventory Update Report, the number of persons reasonably likely to be exposed in the industrial manufacturing, processing, and use for propylene glycol is 1000 or greater; the data may be greatly underestimated(1).

(1) US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of March 2, 2010: http://cfpub.epa.gov/iursearch/index.cfm

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NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,238,429 workers (936,584 of these are female) are potentially exposed to propylene glycol in the US(1). Occupational exposure to propylene glycol may occur through inhalation and dermal contact with this compound at workplaces where propylene glycol is produced or used(SRC). Monitoring and use data indicate that the general population may be exposed to propylene glycol via inhalation and dermal contact with consumer products containing propylene glycol(SRC).

(1) NIOSH; NOES. National Occupational Exposure Survey conducted from 1981-1983. Estimated numbers of employees potentially exposed to specific agents by 2-digit standard industrial classification (SIC). Available from, as of Feb 12, 2010: http://www.cdc.gov/noes/

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