Propionaldehyde:

The following information was generated from the
Hazardous Substances Data Bank (HSDB),
a database of the National Library of Medicine's TOXNET system
(http://toxnet.nlm.nih.gov) on October 30, 2006.

Query: The chemical name propionaldehyde was identified.
The following terms were added from ChemIDplus:
propylic aldehyde
propionic aldehyde
propaldehyde
methylacetaldehyde
aldehyde propionique
CAS Registry Number: 123-38-6

1
NAME: PROPIONALDEHYDE

HSN: 1193

RN: 123-38-6

HUMAN HEALTH EFFECTS:

HUMAN TOXICITY EXCERPTS:
THE VAPOR MAY CAUSE RESPIRATORY IRRITATION BUT IS NOT A STRONG ENOUGH
IRRITANT OF EYES OR RESPIRATORY TRACT TO BE CONSIDERED SIGNIFICANT FACTOR
IN SMOG. [Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL:
Charles C. Thomas Publisher, 1986., p. 1054]**PEER REVIEWED**

Aldehydes increase airflow at concentrations below those that decrease
respiratory frequency. /Aldehydes/ [Gilman, A.G., T.W. Rall, A.S. Nies and
P. Taylor (eds.). Goodman and Gilman's The Pharmacological Basis of
Therapeutics. 8th ed. New York, NY. Pergamon Press, 1990., p. 1618]**PEER
REVIEWED**

A study was performed to evaluate whether pulmonary alveolar macrophages
are susceptible to inhibition of superoxide anion radical production by
reactive aldehydes, and whether such an effect is produced by interaction
with membrane sulfhydryl groups. Pulmonary alveolar macrophages were

isolated from female Sprague-Dawley rats, and polymorphonuclear leukocytes were isolated from healthy human volunteers. There was a dose related decrease in surface sulfhydryls and soluble sulfhydryls in polymorphonuclear leukocytes and pulmonary alveolar macrophages after treatment with acrolein and crotonaldehyde, while the saturated aldehyde propionaldehyde had no effect. [Witz G et al; Bio Chem Pharmacol 36 (5): 721-6 (1987)]**PEER REVIEWED**

SKIN, EYE AND RESPIRATORY IRRITATIONS:
THE VAPOR MAY CAUSE RESPIRATORY IRRITATION BUT IS NOT A STRONG ENOUGH IRRITANT OF EYES OR RESPIRATORY TRACT TO BE CONSIDERED SIGNIFICANT FACTOR IN SMOG. [Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 1054]**PEER REVIEWED**

Irritating to skin, eyes, and respiratory system. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 49-112]**PEER REVIEWED**

PROBABLE ROUTES OF HUMAN EXPOSURE:
NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,086 workers (187 of these are female) are potentially exposed to propionaldehyde in the US(1). Occupational exposure to propionaldehyde may occur through inhalation and dermal contact with this compound at workplaces where propionaldehyde is produced or used(SRC). Monitoring data indicate that the general population may be exposed to propionaldehyde via inhalation of ambient air, ingestion of drinking water, and dermal contact with this compound and other products containing propionaldehyde(SRC).
[(1) NIOSH; National Occupational Exposure Survey (NOES) (1983)]**PEER REVIEWED**

Atmospheric workplace exposures have been documented among plastics manufacturing and office workers(1,2). [(1) USEPA; Indoor Air Quality and Work Environment Study. Washington, DC: US EPA Off Admin Res Manag (1990)
(2) Hodgkin JH et al; J Macromol Sci Chem 17: 35-43 (1982)]**PEER REVIEWED**

EMERGENCY MEDICAL TREATMENT:

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sale, redistribution or other use for commercial purposes is a violation of
Micromedex' rights and is strictly prohibited.<p>The following
Overview, ***
GENERAL OR UNKNOWN CHEMICAL ***, is relevant for this HSDB record chemical.
LIFE SUPPORT:
- o This overview assumes that basic life support measures have been instituted.

CLINICAL EFFECTS:
0.2.1 SUMMARY OF EXPOSURE
0.2.1.1 ACUTE EXPOSURE
A) A SPECIFIC REVIEW on the clinical effects and treatment of individuals exposed to this agent HAS NOT YET BEEN PREPARED. The following pertains to the GENERAL EVALUATION and TREATMENT of individuals exposed to potentially toxic chemicals.
B) GENERAL EVALUATION -
1) Exposed individuals should have a careful, thorough medical history and physical examination performed, looking for any abnormalities. Exposure to chemicals with a strong odor often results in such nonspecific symptoms as headache, dizziness, weakness, and nausea.
C) IRRITATION -
1) Many chemicals cause irritation of the eyes, skin, and respiratory tract. In severe cases respiratory tract

irritation can progress to ARDS/acute lung injury, which may be delayed in onset for up to 24 to 72 hours in some cases.

2) Irritation or burns of the esophagus or gastrointestinal tract are also possible if caustic or irritant chemicals are ingested.

D) HYPERSENSITIVITY -

1) A number of chemical agents produce an allergic hypersensitivity dermatitis or asthma with bronchospasm and wheezing with chronic exposure.

LABORATORY:

A) A number of chemicals produce abnormalities of the hematopoietic system, liver, and kidneys. Monitoring complete blood count, urinalysis, and liver and kidney function tests is suggested for patients with significant exposure.

B) If respiratory tract irritation or respiratory depression is evident, monitor arterial blood gases, chest x-ray, and pulmonary function tests.

TREATMENT OVERVIEW:

0.4.2 ORAL EXPOSURE

A) GASTRIC LAVAGE

1) Significant esophageal or gastrointestinal tract irritation or burns may occur following ingestion. The possible benefit of early removal of some ingested material by cautious gastric lavage must be weighed against potential complications of bleeding or perforation.

2) GASTRIC LAVAGE: Consider after ingestion of a potentially life-threatening amount of poison if it can be performed soon after ingestion (generally within 1 hour). Protect airway by placement in Trendelenburg and left lateral decubitus position or by endotracheal intubation. Control any seizures first.

a) CONTRAINDICATIONS: Loss of airway protective reflexes or decreased level of consciousness in unintubated patients; following ingestion of corrosives; hydrocarbons (high aspiration potential); patients at risk of hemorrhage or gastrointestinal perforation; and trivial or non-toxic ingestion.

B) ACTIVATED CHARCOAL

1) Activated charcoal binds most toxic agents and can decrease their systemic absorption if administered soon after ingestion. In general, metals and acids are poorly bound and patients ingesting these materials will not likely benefit from activated charcoal administration.

a) Activated charcoal should not be given to patients ingesting strong acidic or basic caustic chemicals. Activated charcoal is also of unproven value in patients ingesting irritant chemicals, where it may obscure endoscopic findings when the procedure is justified.

2) ACTIVATED CHARCOAL: Administer charcoal as a slurry (240 mL water/30 g charcoal). Usual dose: 25 to 100 g in adults/adolescents, 25 to 50 g in children (1 to 12 years), and 1 g/kg in infants less than 1 year old.

C) DILUTION -
1) Immediate dilution with milk or water may be of benefit in caustic or irritant chemical ingestions.
2) DILUTION: Immediately dilute with 4 to 8 ounces (120 to 240 mL) of water or milk (not to exceed 4 ounces/120 mL in a child).
D) IRRITATION -
1) Observe patients with ingestion carefully for the possible development of esophageal or gastrointestinal tract irritation or burns. If signs or symptoms of esophageal irritation or burns are present, consider endoscopy to determine the extent of injury.
E) OBSERVATION CRITERIA -
1) Carefully observe patients with ingestion exposure for the development of any systemic signs or symptoms and administer symptomatic treatment as necessary.
2) Patients symptomatic following exposure should be observed in a controlled setting until all signs and symptoms have fully resolved.

0.4.3 INHALATION EXPOSURE
A) DECONTAMINATION -
1) INHALATION: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer oxygen and assist ventilation as required. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids.
B) IRRITATION -
1) Respiratory tract irritation, if severe, can progress to pulmonary edema which may be delayed in onset up to 24 to 72 hours after exposure in some cases.
C) ACUTE LUNG INJURY -
1) ACUTE LUNG INJURY: Maintain ventilation and oxygenation and evaluate with frequent arterial blood gas or pulse oximetry monitoring. Early use of PEEP and mechanical ventilation may be needed.
D) BRONCHOSPASM -
1) If bronchospasm and wheezing occur, consider treatment with inhaled sympathomimetic agents.
E) OBSERVATION CRITERIA -
1) Carefully observe patients with inhalation exposure for the development of any systemic signs or symptoms and administer symptomatic treatment as necessary.
2) Patients symptomatic following exposure should be observed in a controlled setting until all signs and symptoms have fully resolved.

0.4.4 EYE EXPOSURE
A) DECONTAMINATION: Irrigate exposed eyes with copious amounts of room temperature water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist, the patient should be seen in a health care facility.

0.4.5 DERMAL EXPOSURE
A) OVERVIEW
1) DERMAL DECONTAMINATION -
a) DECONTAMINATION: Remove contaminated clothing and wash

exposed area thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists.

2) PESTICIDES -

a) DECONTAMINATION: Remove contaminated clothing and jewelry. Wash the skin, including hair and nails, vigorously; do repeated soap washings. Discard contaminated clothing.

3) IRRITATION -

a) Treat dermal irritation or burns with standard topical therapy. Patients developing dermal hypersensitivity reactions may require treatment with systemic or topical corticosteroids or antihistamines.

4) DERMAL ABSORPTION -

a) Some chemicals can produce systemic poisoning by absorption through intact skin. Carefully observe patients with dermal exposure for the development of any systemic signs or symptoms and administer symptomatic treatment as necessary.

RANGE OF TOXICITY:

A) No specific range of toxicity can be established for the broad field of chemicals in general.

ANTIDOTE AND EMERGENCY TREATMENT:

Basic treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Aggressive airway management may be necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Anticipate seizures and treat if necessary ... . Monitor for shock and treat if necessary ... . Monitor for pulmonary edema and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline 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 ... . /Aldehydes and related compounds/ [Bronstein, A.C., P.L. Currance; Emergency Care for Hazardous Materials Exposure. 2nd ed. St. Louis, MO. Mosby Lifeline. 1994., p. 234-35]**PEER REVIEWED**

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest. Intubation should be considered at the first sign of upper airway obstruction caused by edema. Positive pressure ventilation techniques with

a bag-valve-mask device may be beneficial. Start an IV with D5W /SRP: "To keep open", minimal flow rate/. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload. Treat seizures with diazepam ... . 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 ... . Consider drug therapy for pulmonary edema ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Aldehydes and related compounds/ [Bronstein, A.C., P.L. Currance; Emergency Care for Hazardous Materials Exposure. 2nd ed. St. Louis, MO. Mosby Lifeline. 1994., p. 235]**PEER REVIEWED**

ANIMAL TOXICITY STUDIES:

NON-HUMAN TOXICITY EXCERPTS:

THE LIQUID TESTED ON RABBIT EYES BY APPLICATION OF A DROP CAUSED MODERATE INJURY, GRADED 5 ON A SCALE OF 1-10 AFTER 24 HR, BUT THE FINAL RESULT IS NOT REPORTED. [Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 1054]**PEER REVIEWED**

... Acute toxicity of aldehydes in mice, guinea pigs, and rabbits /have been studied/. all animals exposed to high levels by inhalation developed fatal pulmonary edema. /Higher aliphatic aldehydes/ [Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology. 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 306]**PEER REVIEWED**

... Propionaldehyde (5-20 mg/kg, ip) increased blood pressure in a dose-related manner in rats ... . This effect was slightly decreased by adrenalectomy and morE strongly antagonized by pretreatment with reserpine or phentolamine. ... Doses > 20 mg/kg resulted in hypotension and sever bradycardia. Atropine decreased these effects. ... After vagotomy high doses ... increased blood pressure and caused a pos. chronotropic response. The pressor effects ... are primarily due to vasostriction

mediated by norepinephrine released from sympathetic nerve endings in vascular smooth muscle, while at high doses the bradycardia and hypotension result from stimulation of higher centers. [Egle JL JR et al; Toxicol Appl Pharmacol 24 (4): 636-44 (1973)]**PEER REVIEWED**

... Anesthesia /noted/ in rats at high levels of inhalation for propionaldehyde & butyraldehyde. The survivors recovered promptly. Autopsies showed principally evidence of bronchial & alveolar inflammation. ... Rats tolerated inhalation of 90 ppm of propionaldehyde, for 20 days, 6 hr/day, with no obvious pathology, although 1300 ppm for 6 days produced hepatic damage. [Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology. 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 306]**PEER REVIEWED**

Propionaldehyde affected the CNS of animals, affected cholinesterase of the peripheral blood, & reduced the number of erythrocytes & hemoglobin of blood. The lowest nonacting exposure level was 0.5 mg/cu m. [Tokanova SE; Gig Sanit (4): 10-13 (1982)]**PEER REVIEWED**

Propanal was tested for mutagenicity using the Ames test with strains TA98, TA100, TA1535, and TA1537 with & without S-9 mix from Aroclor-induced rats. The concn tested @ 3 umol/plate was not mutagenic. [Florin I et al; Toxicol 15: 219-32 (1980)]**PEER REVIEWED**

Propionaldehyde was found to be negative when tested for mutagenicity using the Salmonella/microsome preincubation assay, using the standard protocol approved by the National Toxicology Program. Propionaldehyde was tested in as many as 5 Salmonella typhimurium strains (TA1535, TA1537, TA97, TA98, and TA100) in the presence and absence of rat and hamster liver S-9, at doses of 0.100, 0.333, 1.000, 3.333, and 10.000 mg/plate. The highest ineffective dose tested in any Salmonella typhimurium strain was 10.000 mg/plate. [Mortelmans K et al; Environ Mutagen 8: 1-119 (1986)]**PEER REVIEWED**

Alkaline elution was employed to study DNA damage in Chinese hamster ovary-Kl cells treated with a series of biotic and xenobiotic aldehydes. DNA cross-linking was measured in terms of the reduction in the effect of methyl methanesulphonate on the kinetics of DNA elution and was observed in cells treated with formaldehyde, acetaldehyde, methylglyoxal and malonaldehyde. Propionaldehyde, valeraldehyde, hexanal, and 4-hydroxynonenal produced DNA single strand breaks, or lesions which were converted to breaks in alkali. Both types of DNA damage occurred in cells exposed to malonaldehyde. These findings support the hypothesis of a carcinogenic effect of the aldehydic products (malonaldehyde, methylglyoxal, propionaldehyde, hexanal, 4-hydroxynonenal) released in biomembranes during lipid peroxidation. Acetaldehyde did not cause DNA breaks. [Marinari UM et al; Cell Biochem Funct 2 (4): 243-8 (1984)]**PEER REVIEWED**

The induction of aneuploidy in cultured Chinese hamster cells by propionaldehyde and chloral hydrate has been studied. Chinese hamster embryonic diploid cells were grown as a monolayer in cover glasses. Treatments were performed with doses of 5 x 10(-4), 1 x 10(-3) and 2 x 10(-3)% of propionaldehyde for 3 hr and doses of 1 x 10(-3), 2 x 10(-3) and 3 x 10(-3)% of chloral hydrate for 1.5 hr. Treatments with 2 x 10(-3)% of acetaldehyde were used as positive controls. Propionaldehyde induced chromosomal aberrations with the three doses employed although in a lesser degree than the positive control. Chloral hydrate induced chromosomal damage only with the two higher doses. No correlation was found between the amount of chromosomal damage induced and the doses of propionaldehyde or chloral hydrate employed. Both compounds increased the frequency of aneuploid cells. However, neither propionaldehyde nor chloral hydrate significantly increased the frequencies of polyploid cells. Aldehydes and chlorine-replaced aldehydes are strong inducers of aneuploidy. [Furnus CC et al; Mutagenesis 5 (4): 323-6 (1990)]**PEER REVIEWED**

The mutagenicity of acrolein, allyl-alcohol, glycidol, and propionaldehyde was examined in V79 cells using the criteria of resistance to 6-thioguanine. Allyl-alcohol was observed to be as mutagenic as acrolein. Glycidol was noted less mutagenic than allyl- alcohol and acrolein. The monofunctional propionaldehyde, in contrast, was not mutagenic at 1.0 uM but proved to be toxic at 2.0 uM. Acrolein is mutagenic in mammalian cells. The mutagenic effect appears to be mediated by the bifunctional nature of acrolein and its structurally related compounds, while cytotoxicity appears to be mediated by the aldehyde function. [Smith RA et al; Carcinogenesis 11 (3): 497-8 (1990)]**PEER REVIEWED**

A study was performed to evaluate whether pulmonary alveolar macrophages are susceptible to inhibition of superoxide anion radical production by reactive aldehydes, and whether such an effect is produced by interaction with membrane sulfhydryl groups. Pulmonary alveolar macrophages were isolated from female Sprague-Dawley rats, and polymorphonuclear leukocytes were isolated from healthy human volunteers. There was a dose related decrease in surface sulfhydryls and soluble sulfhydryls in polymorphonuclear leukocytes and pulmonary alveolar macrophages after treatment with acrolein and crotonaldehyde, while the saturated aldehyde propionaldehyde had no effect. [Witz G et al; Bio Chem Pharmacol 36 (5): 721-6 (1987)]**PEER REVIEWED**

NON-HUMAN TOXICITY VALUES:

LD50 Rat oral 0.8 to 1.6 g/kg [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 1023]**PEER REVIEWED**

LC50 Rat inhalation 26,000 ppm/30 min [Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 1023]**PEER REVIEWED**

LD50 Rat sc 820 mg/kg [ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 442]**PEER REVIEWED**

LD50 Rabbit skin 5040 mg/kg [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

LC50 Mouse inhalation 21,800 mg/cu m/2 hr [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

LD50 Mouse sc 680 mg/kg [ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 442]**PEER REVIEWED**

METABOLISM/PHARMACOKINETICS:

METABOLISM/METABOLITES:

MITOCHONDRIA OXIDIZE A VARIETY OF ALDEHYDES TO ACIDS USING OXYGEN AS ELECTRON ACCEPTOR. RELATIVE RATES OF OXYGEN CONSUMPTION PROMOTED BY SHORT-CHAIN ALDEHYDES LIE IN ORDER: PROPIONALDEHYDE GREATER THAN ACETALDEHYDE GREATER THAN FORMALDEHYDE. ... THE NAD-DEPENDENT DEHYDROGENATION OF ALDEHYDES CAN ALSO BE OBSERVED IN MITOCHONDRIA.

RAT-LIVER CYTOSOL CONTAINS TWO ALDEHYDE DEHYDROGENASES (ACETALDEHYDE: NAD OXIDOREDUCTASES, EC 1.2.1.3) ... THE ENZYMES DIFFER IN THEIR SUBSTRATE SPECIFICITY TO ACETALDEHYDE, PROPIONALDEHYDE, BUTYRALDEHYDE, & 3-DIMETHYLAMINO-2,2-DIMETHYLPROPIONALDEHYDE. HORSE-LIVER ALDEHYDE DEHYDROGENASE ... IS CAPABLE OF OXIDIZING ... PROPIONALDEHYDE ... . [The Chemical Society. Foreign Compound Metabolism in Mammals Volume 3. London: The Chemical Society, 1975., p. 516]**PEER REVIEWED**

Study of xenobiotic-metabolizing enzymes was undertaken in microsomal and cytosolic fractions of two human livers, 10 individual and several pooled samples of human respiratory nasal mucosa obtained by surgical operation of patients affected by hypertrophy of the inferior turbinates. The activities of glutathione S-transferase, DT-diaphorase, epoxide hydrolase, UDP-glucuronyl-transferase, carbonyl reductase, benzaldehyde and

propionaldehyde dehydrogenases were investigated. These activities were similar in nasal and liver tissue, except for UDP-glucuronyl-transferase which was not detected in nasal mucosa. [Gervasi PG et al; Biochem Pharmacol 41 (2): 177-84 (1991)]**PEER REVIEWED**

INTERACTIONS:

Guanethidine is currently used in the treatment of essential hypertension. Acetaldehyde, acrolein, formaldehyde and propionaldehyde are known to produce sympathomimetic effects by the release of norepinephrine from adrenergic neurons and to exert cardioinhibitory effects. This study was undertaken to determine if these aldehydes results in sympathomimetic effects in the presence of guanethidine (15 mg/kg iv) in anesthetized rats. Guanethidine enhanced the pressor responses to acetaldehyde and propionaldehyde in dose ranges of 5-20 and 5-10 mg/kg respectively. However, acrolein and formaldehyde at dose ranges of 0.05-5 and 0.1-10 mg/kg, respectively, elicited only depressor responses after guanethidine. Thus, acetaldehyde and propionaldehyde exerted greater sympathomimetic effects through the release of intraneuronal norepinephrine in the presence of guanethidine. The adrenergic neuronal blocking action of guanethidine changes the blood pressure effects of acrolein and formaldehyde. When these two compounds are administered in the absence of guanethidine, they cause predominant pressor effects, whereas in the presence of guanethidine a depressor response is noted. [Green MA, Egle JL Jr; Res Commun Chem Pathol Pharmacol 40 (2): 337-40 (1983)]**PEER REVIEWED**

PHARMACOLOGY:

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ENVIRONMENTAL FATE & EXPOSURE:

ENVIRONMENTAL FATE/EXPOSURE SUMMARY:

Propionaldehyde's production and use in the manufacture of propionic acid, plastics, rubber chemicals, and as a disinfectant and preservative may result in its release to the environment through various waste streams. Propionaldehyde is released to the atmosphere via the combustion of wood, gasoline, diesel fuel, and polyethylene. Municipal waste incinerators can release it to ambient air. If released to air, a vapor pressure of 317 mm Hg at 25 deg C indicates propionaldehyde will exist solely as a vapor in the ambient atmosphere. Vapor-phase propionaldehyde 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 19.6 hrs. Propionaldehyde absorbs light in the environmental UV spectrum and has the potential for direct photolysis. If released to soil,

propionaldehyde is expected to have very high mobility based upon an estimated Koc of 50. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 7.3X10-5 atm-cu m/mole. Propionaldehyde may volatilize from dry soil surfaces based upon its vapor pressure. If released into water, propionaldehyde is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. In terrestrial and aquatic environments, propionaldehyde will biodegrade to propionic acid using an activated sludge inocula, which then undergoes mineralization. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 6.9 hrs and 5.8 days, respectively. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. Propionaldehyde is not expected to chemically hydrolyze in the environment due to the lack of hydrolyzable functional groups. Occupational exposure to propionaldehyde may occur through inhalation and dermal contact with this compound at workplaces where propionaldehyde is produced or used. Monitoring data indicate that the general population may be exposed to propionaldehyde via inhalation of ambient air, ingestion of drinking water, and dermal contact with this compound and other products containing propionaldehyde. (SRC) **PEER REVIEWED**

PROBABLE ROUTES OF HUMAN EXPOSURE:

NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,086 workers (187 of these are female) are potentially exposed to propionaldehyde in the US(1). Occupational exposure to propionaldehyde may occur through inhalation and dermal contact with this compound at workplaces where propionaldehyde is produced or used(SRC). Monitoring data indicate that the general population may be exposed to propionaldehyde via inhalation of ambient air, ingestion of drinking water, and dermal contact with this compound and other products containing propionaldehyde(SRC).

[(1) NIOSH; National Occupational Exposure Survey (NOES) (1983)]**PEER REVIEWED**

Atmospheric workplace exposures have been documented among plastics manufacturing and office workers(1,2). [(1) USEPA; Indoor Air Quality and Work Environment Study. Washington, DC: US EPA Off Admin Res Manag (1990) (2) Hodgkin JH et al; J Macromol Sci Chem 17: 35-43 (1982)]**PEER REVIEWED**

NATURAL POLLUTION SOURCES:

Propionaldehyde was identified as a volatile emission of arboreous plants(1). [(1) Isidorov VA et al; Atmos Environ 19: 1-8 (1985)]**PEER REVIEWED**

ARTIFICIAL POLLUTION SOURCES:

Propionaldehyde's production and use in the manufacture of propionic acid, polyvinyl and other plastics(1); in the synthesis of rubber chemicals(1); and as a disinfectant and preservative(1) may result in its release to the environment through various waste streams(SRC). Propionaldehyde is released to the atmosphere via the combustion of wood(2), gasoline(3,4), diesel fuel(5), and polyethylene(6). Municipal waste incinerators can release it to ambient air(7). The production of alkyl resins can also release propionaldehyde to surface and ground waters, and land(8). [(1) Lewis RJ Sr, ed; Hawley's Condensed Chemical Dictionary. 13th ed. NY, NY: John Wiley and Sons Inc, p. 931 (1997) (2) Lipari F et al; Environ Sci Technol 18: 326-30 (1984) (3) Westerholm RN et al; Environ Sci Technol 22: 925-30 (1988) (4) Zweidinger RB et al; Environ Sci Technol 22: 956-62 (1988) (5) Lopez B et al; Pollut Atmos 1987:113-23 (1987) (6) Hodgkin JH et al; J Macromol Sci Chem 17: 35-43 (1982) (7) Junk GA, Ford CS; Chemosphere 9: 187-230 (1980) (8) Mantica E et al; Comm Eur Communities Eur 10388 Org Micropollut Aquat Environ pp. 89-106 (1986)]**PEER REVIEWED**

ENVIRONMENTAL FATE:

TERRESTRIAL FATE: Based on a classification scheme(1), an estimated Koc value of 50(SRC), determined from a log Kow of 0.59(2) and a

regression-derived equation(3), indicates that propionaldehyde is expected to have very high mobility in soil(SRC). Volatilization of propionaldehyde from moist soil surfaces is expected to be an important fate process(SRC) given a Henry's Law constant of 7.3X10-5 atm-cu m/mole(4). The potential for volatilization of propionaldehyde from dry soil surfaces may exist(SRC) based upon a vapor pressure of 317 mm Hg(5). In terrestrial and aquatic environments, propionaldehyde will biodegrade using an activated sludge inocula to its corresponding carboxylic acid, which then undergoes mineralization(6). [(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. 6 (1995) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 4-9 (1990) (4) Buttery RG et al; J Agric Food Chem 17: 385-9 (1969) (5) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals: Data Compilation. Design Inst Phys Prop Data, Amer Inst Chem Eng NY, NY: Hemisphere Pub Corp (1989) (6) Urano K, Kato Z; J Hazard Mater 13: 147-59 (1986)]**PEER REVIEWED**

AQUATIC FATE: Based on a classification scheme(1), an estimated Koc value of 50(SRC), determined from a log Kow of 0.59(2) and a regression-derived equation(3), indicates that propionaldehyde is not expected to adsorb to suspended solids and sediment(SRC). Volatilization from water surfaces is expected(3) based upon a Henry's Law constant of 7.3X10-5 atm-cu m/mole(4). Using this Henry's Law constant and an estimation method(3), volatilization half-lives for a model river and model lake are 6.9 hrs and 5.8 days, respectively(SRC). According to a classification scheme(5), an estimated BCF of 3(SRC), from its log Kow(2) and a regression-derived equation(6), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Propionaldehyde, present at 100 mg/l, reached 94%

of its theoretical BOD in 4 weeks using an activated sludge inoculum at 30 mg/l and the Japanese MITI test(7). [(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. 6 (1995) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 4-9, 15-1 to 15-29 (1990) (4) Buttery RG et al; J Agric Food Chem 17: 385-9 (1969) (5) Franke C et al; Chemosphere 29: 1501-14 (1994) (6) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999) (7) CITI; Biodegradation and Bioaccumulation Data of Existing Chemicals. Isobutyraldehyde (78-84-2). Available from the Database Query page at http://www.cerij.or.jp/ceri_en/index_e4.shtml as of May 8, 2001.]**PEER REVIEWED**

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), propionaldehyde, which has a vapor pressure of 317 mm Hg at 25 deg C(2), is expected to exist solely as a vapor in the ambient atmosphere(SRC). Vapor-phase propionaldehyde is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is 19.6 hrs(SRC), calculated from its rate constant of 2.0X10-11 cu cm/molecule-sec at 25 deg C(3). [(1) Bidleman TF; Environ Sci Technol 22: 361-367 (1988) (2) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals: Data Compilation. Design Inst Phys Prop Data, Amer Inst Chem Eng NY, NY: Hemisphere Pub Corp (1989) (3) Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989)]**PEER REVIEWED**

ENVIRONMENTAL BIODEGRADATION:
River die-away tests and grab sample data pertaining to the biodegradation of propionaldehyde in natural waters and soil were not located in the available literature(SRC). A number of aerobic and anaerobic biological screening studies, which utilized settled waste water, sewage, or

activated sludge for inocula, have demonstrated that propionaldehyde is readily biodegradable(1-7). Propionaldehyde, present at 100 mg/l, reached 94% of its theoretical BOD in 4 weeks using an activated sludge inoculum at 30 mg/l and the Japanese MITI test(1). Aldehydes are generally degraded to propionic acid and then further degraded to carbon dioxide and water(6). Six day BOD:ThOD ratios for propionaldehyde ranged from 0.35 to 0.53 using an activated sludge inocula(6). Percentages of ThOD biodegraded after 6, 12, and 24 hrs were 14.4, 24.9, and 28.8, respectively(6). [(1) CITI; Biodegradation and Bioaccumulation Data of Existing Chemicals. Isobutyraldehyde (78-84-2). Available from the Database Query page at http://www.cerij.or.jp/ceri_en/index_e4.shtml as of May 8, 2001. (2) Dore M et al; Trib Cebedeau 28: 3-11 (1975) (3) Chou WL et al; Biotech Bioeng Symp 8: 391-414 (1979) (4) Hatfield R; Ind Eng Chem 49: 192-6 (1957) (5) Gerhold RM, Malaney GW; J Water Pollut Contr Fed 38: 562-79 (1966) (6) Urano K, Kato Z; J Hazard Mater 13: 147-59 (1986) (7) Speece RE; Environ Sci Technol 17: 416A-27A (1983)]**PEER REVIEWED**

ENVIRONMENTAL ABIOTIC DEGRADATION:

The rate constant for the vapor-phase reaction of propionaldehyde with photochemically-produced hydroxyl radicals is 2.0X10-11 cu cm/molecule-sec at 25 deg C(1). This corresponds to an atmospheric half-life of about 19.6 hrs at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1). Propionaldehyde is not expected to chemically hydrolyze in the environment due to the lack of hydrolyzable functional groups(2). The direct photolysis rate constant for propionaldehyde in air is about 4X10-5 sec-1(3), which corresponds to a half-life of about 4.8 hours(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 p. 7-4 (1990) (3) Grosjean D, Swanson RD; Sci Total Environ 29: 65-85 (1983)]**PEER REVIEWED**

ENVIRONMENTAL BIOCONCENTRATION:

An estimated BCF of 3 was calculated for propionaldehyde(SRC), using a log
Kow of 0.59(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. 6
(1995) (2) Meylan WM et al; Environ Toxicol Chem 18: 664-72 (1999) (3)
Franke C et al; Chemosphere 29: 1501-14 (1994)]**PEER REVIEWED**

SOIL ADSORPTION/MOBILITY:
The Koc of propionaldehyde is estimated as 50(SRC), using a log Kow of
0.59(1), and a regression-derived equation(2). According to a
classification scheme(3), this estimated Koc value suggests that
propionaldehyde 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. 6 (1995) (2) Lyman WJ et al; Handbook of Chemical
Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 4-9 (1990)
(3) Swann RL et al; Res Rev 85: 17-28 (1983)]**PEER REVIEWED**

VOLATILIZATION FROM WATER/SOIL:
The Henry's Law constant for propionaldehyde is 7.3X10-5 atm-cu m/mole(1).
This Henry's Law constant indicates that propionaldehyde is expected to
volatilize from water surfaces(2). Based on this Henry's Law constant, the
volatilization half-life from a model river (1 m deep, flowing 1 m/sec,
wind velocity of 3 m/sec)(2) is estimated as 6.9 hours(SRC). The
volatilization half-life from a model lake (1 m deep, flowing 0.05 m/sec,
wind velocity of 0.5 m/sec)(2) is estimated as 5.8 days(SRC).
Propionaldehyde's Henry's Law constant(1) indicates that volatilization
from moist soil surfaces may occur(SRC). The potential for volatilization
of propionaldehyde from dry soil surfaces may exist(SRC) based upon a
vapor pressure of 317 mm Hg(3). [(1) Buttery RG et al; J Agric Food Chem
17: 385-9 (1969) (2) Lyman WJ et al; Handbook of Chemical Property
Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990)

(3) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals: Data Compilation. Design Inst Phys Prop Data, Amer Inst Chem Eng NY, NY: Hemisphere Pub Corp (1989)]**PEER REVIEWED**

ENVIRONMENTAL WATER CONCENTRATIONS:

DRINKING WATER: Propionaldehyde was one of the most frequently occurring organic compounds found in drinking water supplies according to the US National Organic Reconnaissance Survey; however, levels were not reported(1). It was also qualitatively listed as a contaminant of drinking water supplies in the UK(2). [(1) Bedding ND et al; Sci Total Environ 25: 143-67 (1982) (2) Fielding M et al; Organic Micropollutants in Drinking Water TR-159 Medmenham, England Water Res Ctr (1981)]**PEER REVIEWED**

SURFACE WATER: Surface sea water samples from off the coast of Florida contained propionaldehyde at trace concentrations(1). [(1) Mopper K, Taylor BF; ACS Symp Ser 305(Org Mar Geochem): 324-39 (1986)]**PEER REVIEWED**

RAIN/SNOW/FOG: Trace quantities of propionaldehyde were detected in fog, ice fog, cloudwater and rainwater in the air of Los Angeles, CA(1). It was also qualitatively detected in precipitation at Hanover, Germany in 1989-90(2). [(1) Grosjean D, Wright B; Atmos Environ 17: 2093-6 (1983) (2) Levsen et al; Chemosphere 21: 1037-61 (1990)]**PEER REVIEWED**

EFFLUENT CONCENTRATIONS:

Propionaldehyde emission rates from dry-process photocopy machines were detected at concentrations ranging from less than 100 to 260 ug/hour(1). Propionaldehyde was detected in non-catalyst and catalyst equipped gasoline engine exhaust at 0.10 and 0.06 percent by weight of total organic gas emissions, respectively(2). Propionaldehyde was detected in commercial jet aircraft exhaust at 1.0 percent by weight of total organic gas emissions(2). [(1) Leovic KW et al; J Air Waste Manage Assoc 46: 821-829 (1996) (2) Harley RA et al; Environ Sci Technol 26: 2395-2408 (1992)]**PEER REVIEWED**

ATMOSPHERIC CONCENTRATIONS:
URBAN: Propionaldehyde was detected at mean outdoor and indoor concentrations of 1.27 and 1.15 ppb, respectively, at 6 residential houses located in a suburban New Jersey area during the summer of 1992(1). [(1) Zhang J et al; Environ Sci Technol 28: 146-152 (1994)]**PEER REVIEWED**

URBAN: According to the National Ambient Volatile Organic Compounds (VOCs) Database, the median urban atmospheric concn of propionaldehyde is 17.4 ppbV for 22 samples(1). Propionaldehyde was qualitatively detected air samples from Houston, TX(2). On Sept 19, Oct 1, Oct 7 and Oct 8, 1980, propionaldehyde was detected in the ambient air of Claremont, CA at concns ranging from 6-10, 0-14, 0-8 and 0-6 ppb(3). At Pomona College, Claremont, CA on Sept 11-19, 1985, atmospheric concns of propionaldehyde ranged from 0.2-1.6 ppb(4). [(1) Shah JJ, Heyerdahl EK; National Ambient VOC Database Update USEPA-600/3-88/010 (1988) (2) Lonneman WA et al; Hydrocarbons in Houston Air USEPA-600/3-79/018 p. 44 (1979) (3) Grosjean D; Environ Sci Technol 16: 254-62 (1982) (4) Grosjean D; Atmos Environ 22: 1637-48 (1988)]**PEER REVIEWED**

RURAL/REMOTE: The atmospheric concentration of propionaldehyde for Jones State Forest, TX ranged from 1.8 to 39.9 ppb with an average of 18.8 ppb for 5 samples(1). According to the National Ambient Volatile Organic Compounds (VOCs) Database, the median rural atmospheric concentration of propionaldehyde is 0.350 ppbV for 2 samples(2). According to the National Ambient Volatile Organic Compounds (VOCs) Database, the median remote atmospheric concentration of propionaldehyde is 0.933 ppbV for 3 samples(2). The average atmospheric concentration of propionaldehyde in the Florida everglades at sea level was 5.5 ppbC(3). [(1) Seila RL; Non-urban Hydrocarbons Concn in Ambient Air North of Houston TX. USEPA-500/3-79-010 p. 38 (1979) (2) Shah JJ, Heyerdahl EK; National Ambient VOC Database Update. USEPA-600/3-88/010 (1988) (3) Duce RA et al; Rev Geophys Space Phys 21: 921-52 (1983)]**PEER REVIEWED**

SOURCE: According to the National Ambient Volatile Organic Compounds (VOCs) Database, the median source-dominated atmospheric concentration of propionaldehyde was 4.950 ppbV for 4 samples(1). [(1) Shah JJ, Heyerdahl EK; National Ambient VOC Database Update USEPA 600/3-88/010 (1988)]**PEER REVIEWED**

FOOD SURVEY VALUES:
Propionaldehyde was detected as a constituent of coffee aroma(1). [(1) Aeschbacher HU et al; Food Chem Toxic 27: 227-232 (1989)]**PEER REVIEWED**

ENVIRONMENTAL STANDARDS & REGULATIONS:

TSCA REQUIREMENTS:
Section 8(a) of TSCA requires manufacturers of this chemical substance to report preliminary assessment information concerned with production, use, and exposure to EPA as cited in the preamble in 51 FR 41329. [40 CFR 712.30 (7/1/2000)]**PEER REVIEWED**

CERCLA REPORTABLE QUANTITIES:
Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 1000 lb or 454 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b). [40 CFR 302.4 (7/1/2000)]**PEER REVIEWED**

ATMOSPHERIC STANDARDS:
This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI

process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Propionaldehyde is produced, as an intermediate or a final product, by process units covered under this subpart. [40 CFR 60.489 (7/1/2000)]**PEER REVIEWED**

Listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Propionaldehyde is included on this list. [Clean Air Act as amended in 1990, Sect. 112 (b) (1) Public Law 101-549 Nov. 15, 1990]**PEER REVIEWED**

FDA REQUIREMENTS:
Propionaldehyde is a food additive permitted for direct addition to food for human consumption as a synthetic flavoring substance and adjuvant in accordance with the following conditions: a) they are used in the minimum quantity required to produce their intended effect, and otherwise in accordance with all the principles of good manufacturing practice, and 2) they consist of one or more of the following, used alone or in combination with flavoring substances and adjuvants generally recognized as safe in food, prior-sanctioned for such use, or regulated by an appropriate section in this part. [21 CFR 172.515 (4/1/2000)]**PEER REVIEWED**

CHEMICAL/PHYSICAL PROPERTIES:

MOLECULAR FORMULA:
C3-H6-O **PEER REVIEWED**

MOLECULAR WEIGHT:
58.08 [Tomlin, C.D.S. (ed.). The Pesticide Manual - World Compendium, 11

th ed., British Crop Protection Council, Surrey, England 1997, p. 1345]**PEER REVIEWED**

COLOR/FORM:

COLORLESS LIQUID [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986., p. 49-78]**PEER REVIEWED**

Water-white liquid [Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 931]**PEER REVIEWED**

ODOR:

SUFFOCATING, FRUITY [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986., p. 49-78]**PEER REVIEWED**

CHARACTERISTIC ODOR SIMILAR TO ACETALDEHYDE [Fenaroli's Handbook of Flavor Ingredients. Volume 2. Edited, translated, and revised by T.E. Furia and N. Bellanca. 2nd ed. Cleveland: The Chemical Rubber Co., 1975., p. 492]**PEER REVIEWED**

Pungent, unpleasant [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

Choking odor [Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Volume 2. Boca Raton, Florida: CRC Press, Inc., 1980., p. 299]**PEER REVIEWED**

TASTE:

Green, cocoa, coffee [Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Volume 2. Boca Raton, Florida: CRC Press, Inc., 1980., p. 299]**QC REVIEWED**

BOILING POINT:

49 deg C @ 760 mm Hg [Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 1345]**PEER REVIEWED**

MELTING POINT:

-81 deg C [Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 1345]**PEER REVIEWED**

CRITICAL TEMPERATURE & PRESSURE:
Critical temperature: 433 deg F= 223 deg C= 496 deg K; critical pressure: 690 psia= 47 atm= 4.8 MN/square m [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

DENSITY/SPECIFIC GRAVITY:
0.8657 @ 25 deg C [Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 3-267]**PEER REVIEWED**

HEAT OF COMBUSTION:
1822.7 kJ/mol @ 25 deg C (liquid) [Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 5-89]**PEER REVIEWED**

HEAT OF VAPORIZATION:
29.62 kJ/mol @ 25 deg C [Lide, DR (ed.). CRC Handbook of Chemistry and Physics. 81st Edition. CRC Press LLC, Boca Raton: FL 2000, p. 5-89]**PEER REVIEWED**

OCTANOL/WATER PARTITION COEFFICIENT:
0.59 [Hansch, C., Leo, A., D. Hoekman. Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., 1995., p. 6]**PEER REVIEWED**

SOLUBILITIES:
Miscible with alcohol, ether [Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 1345]**PEER REVIEWED**

SOL IN CHLOROFORM [Fenaroli's Handbook of Flavor Ingredients. Volume 2. Edited, translated, and revised by T.E. Furia and N. Bellanca. 2nd ed. Cleveland: The Chemical Rubber Co., 1975., p. 492]**PEER REVIEWED**

In water, 3.06X10+5 mg/l @ 25 deg C [Riddick, J.A., W.B. Bunger, Sakano T.K. Techniques of Chemistry 4th ed., Volume II. Organic Solvents. New York, NY: John Wiley and Sons., 1985., p. 329]**PEER REVIEWED**

SPECTRAL PROPERTIES:

Index of refraction: 1.3695 @ 16.6 deg C/580 nm; 1.36460 @ 19 deg C/D [Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 1345]**PEER REVIEWED**

MAX ABSORPTION (WATER): 282 NM (LOG E= 0.9) [Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-445]**PEER REVIEWED**

IR: 8348 (Sadtler Research Laboratories Prism Collection) [Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V5 4251]**PEER REVIEWED**

UV: 2-9 (Organic Electronic Spectral Data, Phillips et al, John Wiley & Sons, New York) [Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V5 4251]**PEER REVIEWED**

NMR: 14669 (Sadtler Research Laboratories Spectral Collection) [Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V5 4251]**PEER REVIEWED**

MASS: 18955 (NIST/EPA/MCDC Mass Spectral Database 1990 version) [Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V5 4251]**PEER REVIEWED**

SURFACE TENSION:

23.4 dynes/cm= 0.0234 N/m @ 20 deg C [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington,

D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

VAPOR DENSITY:
1.8 @ 100 deg F (air= 1) [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 9th ed. Boston, MA: National Fire Protection Association, 1986., p. 49-78]**PEER REVIEWED**

VAPOR PRESSURE:
317 mm Hg @ 25 deg C [Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989., p.]**PEER REVIEWED**

VISCOSITY:
0.3167 cP @ 26.7 deg C [Riddick, J.A., W.B. Bunger, Sakano T.K. Techniques of Chemistry 4th ed., Volume II. Organic Solvents. New York, NY: John Wiley and Sons., 1985., p. 329]**PEER REVIEWED**

OTHER CHEMICAL/PHYSICAL PROPERTIES:
Liquid-water interfacial tension: 29 dynes/cm= 0.029 N/m @ 22.7 deg C; Ratio of specific heats of vapor (gas): 1.120; Heat of solution: est -9 Btu/lb= -5 cal/g= -0.2x10+5 J/kg; Floats & mixes slowly with water [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

Henry's Law constant= 7.34X10-5 atm-cu m/mole at 25 deg C [Buttery RG et al; J Agric Food Chem 17: 385-9 (1969)]**PEER REVIEWED**

Vapor Pressure: 687 mm Hg @ 45 deg C [Bingham E et al, eds; Patty's Toxicology. 5th ed. NY, NY: John Wiley & Sons Inc. V5: 964 (2001)]**PEER REVIEWED**

Hydroxyl radical reaction rate constant = 2.0X10-11 cu cm/molecule-sec @ 25 deg C [Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989)]**PEER REVIEWED**

CHEMICAL SAFETY & HANDLING:

DOT EMERGENCY GUIDELINES:

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Fire or Explosion: HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Health: May cause toxic effects if inhaled or absorbed through skin. Inhalation or contact with material may irritate or burn skin and eyes. Fire will produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Public Safety: CALL Emergency Response Telephone Number ... . As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Protective Clothing: Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Evacuation: Large spill: Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Fire: Caution: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Small fires: Dry chemical, CO_2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large fires: Water spray, fog or alcohol-resistant foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fire involving tanks or car/trailer loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For

massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ Spill or Leak: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor; but may not prevent ignition in closed spaces. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

/GUIDE 129: FLAMMABLE LIQUIDS (POLAR/WATER-MISCIBLE/NOXIOUS)/ First Aid: Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. Wash skin with soap and water. Keep victim warm and quiet. In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Ensure that medical personnel are

aware of the material(s) involved and take precautions to protect themselves. [U.S. Department of Transportation. 2004 Emergency Response Guidebook. A Guide book for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident. Washington, D.C. 2004G-129]**QC REVIEWED**

ODOR THRESHOLD:
1 ppm. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978., p.]**PEER REVIEWED**

SKIN, EYE AND RESPIRATORY IRRITATIONS:
THE VAPOR MAY CAUSE RESPIRATORY IRRITATION BUT IS NOT A STRONG ENOUGH IRRITANT OF EYES OR RESPIRATORY TRACT TO BE CONSIDERED SIGNIFICANT FACTOR IN SMOG. [Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 1054]**PEER REVIEWED**

Irritating to skin, eyes, and respiratory system. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 49-112]**PEER REVIEWED**

FIRE POTENTIAL:
Dangerous fire hazard when exposed to heat or flame. [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

NFPA HAZARD CLASSIFICATION:
Health: 2. 2= Materials that, on intense or continued (but not chronic) exposure, could cause temporary incapacitation or possible residual injury, including those requiring the use of respiratory protective equipment that has an independent air supply. These materials are hazardous to health, but areas may be entered freely if personnel are provided with full-face mask self-contained breathing apparatus that provides complete eye protection. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

Flammability: 3. 3= This degree includes Class IB and IC flammable liquids

and materials that can be easily ignited under almost all normal temperature conditions. Water may be ineffective in controlling or extinguishing fires in such materials. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

Reactivity: 2. 2= This degree includes materials that are normally unstable and readily undergo violent chemical change, but are not capable of detonation. This includes materials that can undergo chemical change with rapid release of energy at normal temperatures and pressures and materials that can undergo violent chemical changes at elevated temperatures and pressures. This also includes materials that may react violently with water or that may form potentially explosive mixtures with water. In advanced or massive fires involving these materials, fire fighting should be done from a safe distance or from a protected location. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

FLAMMABLE LIMITS:
Lower flammable limit: 2.6% by volume; Upper flammable limit: 17% by volume [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

FLASH POINT:
-22 deg F (-30 deg C) (Closed cup) [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

15-19 deg F (open cup) [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

AUTOIGNITION TEMPERATURE:
405 DEG F (207 DEG C) [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 325-81]**PEER REVIEWED**

FIRE FIGHTING PROCEDURES:
A water spray may dilute to a point where combustion will not be supported. Water may be ineffective. Use alcohol foam, carbon dioxide, or dry chemical. [Prager, J.C. Environmental Contaminant Reference Databook Volume 1. New York, NY: Van Nostrand Reinhold, 1995., p. 1010]**PEER REVIEWED**

If fire becomes uncontrollable or container is exposed to direct flame consider evacuation of one-third (1/3) mile radius. [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, DC: Association of American Railroads, Bureau of Explosives, 1994., p. 916]**PEER REVIEWED**

If material on fire or involved in fire: Do not extinguish fire unless flow can be stopped or safely confined. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, DC: Association of American Railroads, Bureau of Explosives, 1994., p. 916]**PEER REVIEWED**

FIREFIGHTING HAZARDS:
Vapor is heavier than air ... & may travel a considerable distance to a source of ignition & flash back. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 49-112]**PEER REVIEWED**

EXPLOSIVE LIMITS & POTENTIAL:
Lower: 2.9%, Upper: 17% [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

HAZARDOUS REACTIVITIES & INCOMPATIBILITIES:
REACTS VIGOROUSLY WITH OXIDIZERS. [Lewis, R.J. Sax's Dangerous Properties

of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

Following an incident in which a drum containing bulked drainings (from other drums awaiting reconditioning) fumed and later exploded after sealing, it was found that methyl methacrylate and propionaldehyde can, under certain conditions of mixing, lead to a rapid exothermic reaction. [Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 533-4]**PEER REVIEWED**

HAZARDOUS DECOMPOSITION:

When heated to decomposition it emits acrid smoke and irritating fumes. [Gleason, M.N., R.E. Gosselin, H.C. Hodge, and R.P. Smith. Clinical Toxicology of Commercial Products. 3rd ed. Baltimore: Williams and Wilkins, 1969., p. 2797]**PEER REVIEWED**

HAZARDOUS POLYMERIZATION:

Polymerization may occur in presence of acids or caustics. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978., p.]**PEER REVIEWED**

Vigorous polymerization reaction with methyl methacrylate. [Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2797]**PEER REVIEWED**

PROTECTIVE EQUIPMENT & CLOTHING:

Wear self-contained breathing apparatus. [Prager, J.C. Environmental Contaminant Reference Databook Volume 1. New York, NY: Van Nostrand Reinhold, 1995., p. 1010]**PEER REVIEWED**

Air-supplied mask for high vapor concn; plastic gloves; goggles. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978., p.]**PEER REVIEWED**

Wear rubber gloves, self-contained respirator and protective clothing.
[ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 442]**PEER REVIEWED**

PREVENTIVE MEASURES:
SRP: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. **PEER REVIEWED**

If material not on fire and not involved in fire: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, DC: Association of American Railroads, Bureau of Explosives, 1994., p. 916]**PEER REVIEWED**

Evacuation: If material leaking (not on fire) consider evacuation from downwind area based on amount of material spilled, location and weather conditions. [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface Transportation. Washington, DC: Association of American Railroads, Bureau of Explosives, 1994., p. 916]**PEER REVIEWED**

Personnel protection: Avoid breathing vapors. Keep upwind. ... Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. [Association of American Railroads. Emergency Handling of Hazardous Materials in Surface

Transportation. Washington, DC: Association of American Railroads, Bureau of Explosives, 1994., p. 916]**PEER REVIEWED**

SRP: Contaminated protective clothing should be segregated in such a manner so that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. Quality assurance to ascertain the completeness of the cleaning procedures should be implemented before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at end of shift, but should remain at employee's place of work for cleaning. **PEER REVIEWED**

SHIPMENT METHODS AND REGULATIONS:

No person may /transport,/ offer or accept a hazardous material for transportation in commerce unless that person is registered in conformance ... and the hazardous material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./ [49 CFR 171.2; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from: http://www.gpoaccess.gov/ecfr/ as of February 15, 2006]**QC REVIEWED**

The International Air Transport Association (IATA) Dangerous Goods Regulations are published by the IATA Dangerous Goods Board pursuant to IATA Resolutions 618 and 619 and constitute a manual of industry carrier regulations to be followed by all IATA Member airlines when transporting hazardous materials. [International Air Transport Association. Dangerous Goods Regulations. 47th Edition. Montreal, Quebec Canada. 2006., p. 243]**QC REVIEWED**

The International Maritime Dangerous Goods Code lays down basic principles for transporting hazardous chemicals. Detailed recommendations for individual substances and a number of recommendations for good practice

are included in the classes dealing with such substances. A general index of technical names has also been compiled. This index should always be consulted when attempting to locate the appropriate procedures to be used when shipping any substance or article. [International Maritime Organization. International Maritime Dangerous Goods Code. London, UK. 2004., p. 55]**QC REVIEWED**

STORAGE CONDITIONS:
Store in cool, dry, well-ventilated location. Store away from heat and oxidizers. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage warehouse, room, or cabinet. Separate from oxidizing materials and other reactive hazards. [Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 49-112]**PEER REVIEWED**

CLEANUP METHODS:
Absorb the spills with rags or other available absorbing materials. Evaporate in hood and dispose by burning the rag or the absorbing materials. [Prager, J.C. Environmental Contaminant Reference Databook Volume 1. New York, NY: Van Nostrand Reinhold, 1995., p. 1010]**PEER REVIEWED**

DISPOSAL METHODS:
SRP: At the time of review, criteria for land treatment or burial (sanitary landfill) disposal practices are subject to significant revision. Prior to implementing land disposal of waste residue (including waste sludge), consult with environmental regulatory agencies for guidance on acceptable disposal practices. **PEER REVIEWED**

Propionaldehyde is a waste chemical stream constituent which may be subjected to ultimate disposal by controlled incineration. [Prager, J.C. Environmental Contaminant Reference Databook Volume 1. New York, NY: Van Nostrand Reinhold, 1995., p. 1010]**PEER REVIEWED**

The following wastewater treatment technologies have been investigated for propionaldehyde: Activated carbon. [USEPA; Management of Hazardous Waste Leachate, EPA Contract No.68-03-2766 p.E-135 (1982)]**PEER REVIEWED**

OCCUPATIONAL EXPOSURE STANDARDS:

THRESHOLD LIMIT VALUES:
Notice of Intended Change for 2001: These substances, with their corresponding values and notations, comprise those for which a limit has been proposed for the first time or for which a change in the Adopted listing has been proposed. In each case, the proposed values should be considered trial values for the year following ratification by the ACGIH Board of Directors. If, during the year, no evidence comes t light that questions the appropriateness of these proposals, the value will be reconsidered for adoption as TLVs. Time Weighted Avg (TWA): 20 ppm. [American Conference of Governmental Industrial Hygienists. Documentation of Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 2001. Cincinnati, OH. 2001., p. 64]**PEER REVIEWED**

MANUFACTURING/USE INFORMATION:

MAJOR USES:
For Propionaldehyde (USEPA/OPP Pesticide Code: 202400) there are 0 labels match. /SRP: Not registered for current use in the U.S., but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses./ [U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from the Database Query page at http://www.cdpr.ca.gov/docs/epa/epamenu.htm as of May 24, 2001.]**PEER REVIEWED**

Intermediate in the mfr of trimethylolethane for use in alkyd resin systems and, in certain cases, it is oxidized to propionic acid and reduced to propyl alcohol; in medicinal and agricultural chemical preparations. [International Labour Office. Encyclopedia of Occupational

Health and Safety. Vols. I&II. Geneva, Switzerland: International
Labour Office, 1983., p. 112]**PEER REVIEWED**

Manufacture of propionic acid, polyvinyl and other plastics; synthesis of
rubber chemicals; disinfectant; preservative [Lewis, R.J., Sr (Ed.).
Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley
& Sons, Inc. 1997., p. 931]**PEER REVIEWED**

MANUFACTURERS:
Celanese Ltd, 85 Morris Ave, Summit, NJ 07901, (972) 443-4000; Production
site: Bay City, TX 77414 [SRI International. 2000 Directory of Chemical
Producers -- United States. SRI Consulting, Menlo Park: CA 2000, p.
858]**PEER REVIEWED**

Eastman Chemical Co, P.O. Box 511, Kingsport, TN 37662, (423) 229-2196;
Production site: Longview, TX 75607 [SRI International. 2000 Directory of
Chemical Producers -- United States. SRI Consulting, Menlo Park: CA 2000,
p. 858]**PEER REVIEWED**

Union Carbide Corp, 39 Old Ridgebury Rd, Danbury, CT 06817-0001, (203)
794-2000; Production site: Texas City, TX 77590 [SRI International. 2000
Directory of Chemical Producers -- United States. SRI Consulting, Menlo
Park: CA 2000, p. 858]**PEER REVIEWED**

METHODS OF MANUFACTURING:
Prepd by treating propyl alcohol with a bichromate oxidizing mixture; by
passing propyl alcohol vapor over copper at high temp. [Budavari, S.
(ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and
Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p.
1345]**PEER REVIEWED**

SYNTHESIS BY ... DRY DISTILLATION OF BARIUM PROPIONATE WITH CALCIUM
FORMATE. [Fenaroli's Handbook of Flavor Ingredients. Volume 2. Edited,
translated, and revised by T.E. Furia and N. Bellanca. 2nd ed. Cleveland:
The Chemical Rubber Co., 1975., p. 492]**PEER REVIEWED**

(A) Oxidation of propyl alcohol with dichromate; (B) By passing alcohol

over copper at elevated temperatures. [Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 931]**PEER REVIEWED**

Ethylene and synthesis gas (hydroformylation) [Ashford, R.D. Ashford's Dictionary of Industrial Chemicals. London, England: Wavelength Publications Ltd., 1994., p. 767]**PEER REVIEWED**

GENERAL MANUFACTURING INFORMATION:

Synthetic flavoring substances & adjuvants: propionaldehyde [Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Volume 2. Boca Raton, Florida: CRC Press, Inc., 1980., p. 299]**PEER REVIEWED**

FORMULATIONS/PREPARATIONS:

USEPA/OPP Pesticide Code 202400; Trade Names: Propanal. [U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from the Database Query page at http://www.cdpr.ca.gov/docs/epa/epamenu.htm as of May 24, 2001.]**PEER REVIEWED**

Purity: 97-99+%. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

U. S. PRODUCTION:

(1972) 5.3X10+10 GRAMS **PEER REVIEWED**

(1975) 5.94X10+10 GRAMS (EST) **PEER REVIEWED**

(1984) 1.02X10+11 g [USITC. SYN ORG CHEM-U.S. PROD/SALES 1984 p.255]**PEER REVIEWED**

LABORATORY METHODS:

ANALYTIC LABORATORY METHODS:

Gas chromatographic methods were used to analyze smoke from commercial mosquito coils. Propionaldehyde is a pyrolytic product derived from materials of mosquito coils. [Takiura K et al; Bochu-Kagaku (Sci Pest Contr) 38 (1): 26-9 (1973)]**PEER REVIEWED**

Trace determination of carbonyl compounds, including propionaldehyde, in air by gas chromatography. [Smith RA, Drummond I; Analyst (London) 104 (1242): 875-87 (1979)]**PEER REVIEWED**

Determination of aliphatic and aromatic aldehydes, including propionaldehyde, in polluted air by high performance liquid chromatography. [Kuwata K et al; J Chromatogr Sci 17 (5): 264-8 (1979)]**PEER REVIEWED**

A normal-phase Bondapak high-performance liquid chromatographic system was compared to 2 different reversed-phase Bondapak C18 systems for separating and quantifying aldehydes and ketones. Precise measurements in the 0.05-10 ppm range were made for the C1-C6 aliphatic aldehydes found in diesel exhaust. [Creech G et al; J Chromatogr Sci 20 (2): 67-72 (1982)]**PEER REVIEWED**

NIOSH Method 2539. Screening of Aldehydes by Gas Chromatography. This method is applicable to air samples. Detection limit = 0.4 mg/cu m. [U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. NIOSH Manual of Analytical Methods. 4th ed. Methods A-Z & Supplements. Washington, DC: U.S. Government Printing Office, Aug 1994., p.]**PEER REVIEWED**

EPA Method 554. Determination of Carbonyl Compounds in Drinking Water by Dinitrophenylhydrazine Derivatization and High Performance Liquid Chromatography. This method is used for the determination of selected carbonyl compounds in finished drinking water or raw source water. Detection limit = 3.4 ug/l. [USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)]**PEER REVIEWED**

OSW Method 8315. Determination of Carbonyl Compounds by High Performance Liquid Chromatography (HPLC). This method is applicable to various matrices by derivatization with 2,4-dinitrophenylhydrazine (DNPH).

Detection limit = 8.4 ug/l. [USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)]**PEER REVIEWED**

OSW Method 8315A-LLE. Determination of Carbonyl Compounds by High Performance Liquid Chromatography (HPLC) Using Liquid-Liquid Extraction. This method is applicable to the determination of free carbonyl compounds in various matrices by derivatization with 2,4-dinitrophenylhydrazine (DNPH). Detection limit = 11 ug/l. [USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)]**PEER REVIEWED**

OSW Method 8315A-LSE. Determination of Carbonyl Compounds by High Performance Liquid Chromatography (HPLC) using Liquid-Solid Extraction. This method is applicable to the determination of free carbonyl compounds in various matrices by derivatization with 2,4-dinitrophenylhydrazine (DNPH). Detection limit = 8.4 ug/l. [USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)]**PEER REVIEWED**

SAMPLING PROCEDURES:

OSW Method 0100. Sampling for Formaldehyde and Other Carbonyl Compounds in Indoor Air. This method provides procedures for the sampling of various carbonyl compounds in indoor air by derivatization with 2,4-dinitrophenylhydrazine (DNPH) in a silica gel cartridge. [USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)]**PEER REVIEWED**

SPECIAL REFERENCES:

SYNONYMS AND IDENTIFIERS:

SYNONYMS:

ALDEHYDE PROPIONIQUE (FRENCH) **PEER REVIEWED**

Pesticide Code: 202400 [U.S. Environmental Protection Agency/Office of

Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from the Database Query page at http://www.cdpr.ca.gov/docs/epa/epamenu.htm as of May 24, 2001.]**PEER REVIEWED**

FEMA Number 2923 [Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Cleveland: The Chemical Rubber Co., 1972., p. 927]**PEER REVIEWED**

METHYLACETALDEHYDE **PEER REVIEWED**

NCI-C61029 **PEER REVIEWED**

PROPALDEHYDE **PEER REVIEWED**

PROPANAL **PEER REVIEWED**

PROPANALDEHYDE **PEER REVIEWED**

PROPIONAL **PEER REVIEWED**

PROPIONIC ALDEHYDE **PEER REVIEWED**

PROPYLALDEHYDE **PEER REVIEWED**

PROPYLIC ALDEHYDE **PEER REVIEWED**

FORMULATIONS/PREPARATIONS:

USEPA/OPP Pesticide Code 202400; Trade Names: Propanal. [U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from the Database Query page at http://www.cdpr.ca.gov/docs/epa/epamenu.htm as of May 24, 2001.]**PEER REVIEWED**

Purity: 97-99+%. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5., p.]**PEER REVIEWED**

SHIPPING NAME/ NUMBER DOT/UN/NA/IMO:

UN 1275; PROPIONALDEHYDE

IMO 3.2; PROPIONALDEHYDE

STANDARD TRANSPORTATION NUMBER:

49 082 70; Propionaldehyde (propyl aldehyde)

ADMINISTRATIVE INFORMATION:

HAZARDOUS SUBSTANCES DATABANK NUMBER: 1193

LAST REVISION DATE: 20030214

LAST REVIEW DATE: Reviewed by SRP on 9/15/2001

UPDATE HISTORY:

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Complete Update on 04/13/1989, 1 field added/edited/deleted.

Complete Update on 05/26/1987

RTECS: