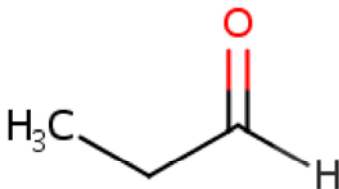


## PROPIONALDEHYDE

CASRN: 123-38-6

UNII: AMJ2B4M67V



### **FULL RECORD DISPLAY**

*Displays all fields in the record.*

*For other data, click on the Table of Contents*

Human Health Effects:

### **Human Toxicity Excerpts:**

/HUMAN EXPOSURE STUDIES/ In an experimental study with humans, irritation of the eyes and upper respiratory tract commenced at 14 to 16 mg/cu m.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] **\*\*PEER REVIEWED\*\***

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] **\*\*PEER REVIEWED\*\***

/HUMAN EXPOSURE STUDIES/ Twelve Asian volunteers were patch-tested with **propionaldehyde** applied to the forearm for 5 minutes. The skin reaction was observed for 60 minutes; all 12 volunteers developed erythema with 5 exhibiting strong erythema and 7 exhibiting weak erythema.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] **\*\*PEER REVIEWED\*\***

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] **\*\*PEER REVIEWED\*\***

/HUMAN EXPOSURE STUDIES/ Three Asian subjects who reported experiencing severe facial flushing in response to ethanol ingestion were subjects of patch testing to aliphatic alcohols and aldehydes. An aqueous suspension of 75% (v/v) of each alcohol and aldehyde was prepared and 25 uL was used to saturate ashless grade filter paper squares which were then placed on the forearm of each subject. Patches were covered with Parafilm and left in place for 5 minutes when the patches were removed and the area gently blotted. Sites showing erythema during the next 60 minutes were considered positive. All three subjects displayed positive responses to ethyl, propyl, butyl, and pentyl alcohols. Intense positive reactions, with variable amounts of edema, were observed for all the aldehydes tested (valeraldehyde as well as acetaldehyde, **propionaldehyde**, and butyraldehyde). [United Nations Environment Programme: Screening Information Data Sheets on n-Valeraldehyde (110-62-3) (October 2005) Available from, as of January 15, 2009:

<http://www.chem.unep.ch/irptc/sids/OECDsids/sidsub.html>] **\*\*PEER REVIEWED\*\***

[United Nations Environment Programme: Screening Information Data Sheets on n-Valeraldehyde (110-62-3) (October 2005) Available from, as of January 15, 2009: <http://www.chem.unep.ch/irptc/sids/OECD/SIDS/sidspub.html>] \*\*PEER REVIEWED\*\*

/SIGNS AND SYMPTOMS/ 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\*\*

[Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 1054] \*\*PEER REVIEWED\*\*

/SIGNS AND SYMPTOMS/ 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\*\*

[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\*\*

/SIGNS AND SYMPTOMS/ Irritates the skin causing a burning sensation and rash on contact. Inhalation can irritate the respiratory tract and may cause nosebleeds, sore throat, cough and phlegm. Higher exposures can cause pulmonary edema, a medical emergency that can be delayed for several hours. This can cause death. Long term exposure: Can irritate the lungs; bronchitis may develop. [Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

/GENOTOXICITY/ There was one report of a weak positive increase in the incidence of sister-chromatid exchange (SCE) in an in vitro human lymphocyte assay that failed to meet the criteria of either a three-point monotonic dose-response or a doubling of the SCE frequency above its appropriate negative control.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/ALTERNATIVE and IN VITRO TESTS/ ... Acetaldehyde, acrolein, diepoxybutane, paraformaldehyde, 2-furaldehyde, **propionaldehyde**, chloroacetaldehyde, sodium arsenite, and a deodorant tablet [Mega Blue; hazardous component listed as tris(hydroxymethyl)nitromethane] /were evaluated for/ ... DNA-protein cross-linking ... at no fewer than three doses and two cell lysate washing temperatures (45 and 65 degrees C) in Epstein-Barr virus (EBV) human Burkitt's lymphoma cells. The two washing temperatures were used to assess the heat stability of the DNA-protein cross-link, 2-Furaldehyde, acetaldehyde, and **propionaldehyde** produced statistically significant increases in DNA-protein cross-links at washing temperatures of 45 degrees C, but not 65 degrees C, and at or above concentrations of 5, 17.5, and 75 mM, respectively. Acrolein, diepoxybutane, paraformaldehyde, and Mega Blue produced statistically significant increases in DNA-protein cross-links washed at 45 and 65 degrees C at or above concentrations of 0.15 mM, 12.5 mM, 0.003%, and 0.1%, respectively. Sodium arsenite and chloroacetaldehyde did not produce significantly increased DNA-protein cross-links at either temperature nor at any dose tested. Excluding paraformaldehyde and 2-furaldehyde treatments, significant increases in DNA-protein cross-links were observed only at doses that resulted in complete cell death within 4 d following dosing. ...[Costa M et al; J Toxicol Environ Health 50 (5): 433-49 (1997)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)  
[Costa M et al; J Toxicol Environ Health 50 (5): 433-49 (1997)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/OTHER TOXICITY INFORMATION/ The saturated aldehydes by inhalation show decreasing toxicity with increasing chain length in the order acetaldehyde, **propionaldehyde**, isobutyraldehyde, n-butyraldehyde, n-valeraldehyde and isovaleraldehyde.[Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-186] \*\*PEER REVIEWED\*\*

[Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-186] \*\*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\*\*  
[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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*  
[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

Irritates the skin causing a burning sensation and rash on contact. Inhalation can irritate the respiratory tract and may cause nosebleeds, sore throat, cough, and phlegm.[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

## Medical Surveillance:

Lung function test. Consider chest x-ray following acute overexposure.[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

## Probable Routes of Human Exposure:

NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,086 workers (187 of these were female) were 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. Monitoring data and use information indicate that the general population may be exposed to **propionaldehyde** via inhalation of ambient air, ingestion of food and drinking water, and dermal contact with consumer products containing **propionaldehyde**(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 at <http://www.cdc.gov/noes/> as of Feb 2009.] \*\*PEER REVIEWED\*\*

[(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 at <http://www.cdc.gov/noes/> as of Feb 2009.]  
\*\*PEER REVIEWED\*\*

**Propionaldehyde** was found in 14 of 15 personal air samples at a mean concentration of 0.74 ppb from samples taken in Helsinki, Finland, tested May to September 1997(1).[(1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*PEER REVIEWED\*\*  
[(1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*PEER REVIEWED\*\*  
Emergency Medical Treatment:

## **Emergency Medical Treatment:**

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The following Overview, **\*\*\* ACETALDEHYDE \*\*\***, 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) This agent is a skin and mucous membrane irritant which causes a burning sensation of the nose, throat, and eyes. Prolonged exposure to high concentrations may injure the corneal epithelium causing persistent lacrimation, photophobia, and foreign body sensation.
- B) Fatalities, following inhalation, are due to anesthesia when prompt and pulmonary edema when delayed. Very large exposures may cause death due to respiratory paralysis.
- C) Prolonged skin contact may cause dermal erythema and burns. Repeated exposures may cause dermatitis due to primary irritation or sensitization.
- D) Sympathomimetic effects of acetaldehyde include tachycardia, hypertension, and increased respiration. Bradycardia and hypotension occur at higher levels of acetaldehyde exposure.

#### 0.2.3 VITAL SIGNS

##### 0.2.3.1 ACUTE EXPOSURE

- A) Increased ventilation, hypertension, and tachycardia are sympathomimetic effects which may develop at low levels of exposure.
- B) Higher levels produce bradycardia and hypotension.

#### 0.2.4 HEENT

##### 0.2.4.1 ACUTE EXPOSURE

- A) Human eye irritation begins to occur at 50 ppm in the air and becomes excessive at 200 ppm. Splash contacts produce painful but superficial corneal injury. Changes in auditory sensitivity were noted in one foreign study of vapor exposures.

#### 0.2.5 CARDIOVASCULAR

##### 0.2.5.1 ACUTE EXPOSURE

- A) In humans, systemic poisoning can result in sympathomimetic effects of tachycardia and hypertension.
- B) Ventricular dysrhythmias have occurred in halothane anesthetized animals given acetaldehyde.

#### 0.2.6 RESPIRATORY

##### 0.2.6.1 ACUTE EXPOSURE

- A) Acetaldehyde is a pulmonary irritant and may cause bronchitis and pulmonary edema when inhaled. Very high concentrations may result in respiratory paralysis.

#### 0.2.7 NEUROLOGIC

##### 0.2.7.1 ACUTE EXPOSURE

- A) High serum concentrations have caused narcosis in animals.

#### 0.2.8 GASTROINTESTINAL

##### 0.2.8.1 ACUTE EXPOSURE

- A) Liquid acetaldehyde is an emetic.

#### 0.2.9 HEPATIC

##### 0.2.9.1 ACUTE EXPOSURE

- A) Acetaldehyde can impair mitochondrial respiration in the liver, similar to effects seen with ethanol.

#### 0.2.14 DERMATOLOGIC

##### 0.2.14.1 ACUTE EXPOSURE

- A) Prolonged contact causes erythema and burns. Repeated exposures may cause dermatitis.

#### 0.2.20 REPRODUCTIVE HAZARDS

- A) No human reproductive effects were found at the time of this review. Acetaldehyde was detected in 4 out of 8 samples of human breast milk. Embryotoxicity and malformations have been seen in animals.

#### 0.2.21 CARCINOGENICITY

##### 0.2.21.1 IARC CATEGORY

- A) IARC Carcinogenicity Ratings for CAS75-07-0 (International Agency for Research on Cancer (IARC), 2016; International Agency for Research on Cancer, 2015; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2010; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2010a; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2008; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2007; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2006; IARC, 2004):

##### 1) IARC Classification

- a) Listed as: Acetaldehyde

b) Carcinogen Rating: 2B

- 1) The agent (mixture) is possibly carcinogenic to humans. The exposure circumstance entails exposures that are possibly carcinogenic to humans. This category is used for agents, mixtures and exposure circumstances for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. It may also be used when there is inadequate evidence of carcinogenicity in humans but there is sufficient evidence of carcinogenicity in experimental animals. In some instances, an agent, mixture or exposure circumstance for which there is inadequate evidence of carcinogenicity in humans but limited evidence of carcinogenicity in experimental animals together with supporting evidence from other relevant data may be placed in this group.

0.2.21.2 HUMAN OVERVIEW

- A) Acetaldehyde has been implicated as a cocarcinogen in the workplace. There was an increased incidence of total cancers in acetaldehyde production workers as compared with the general population, although this study failed to adjust for confounders.

0.2.21.3 ANIMAL OVERVIEW

- A) Acetaldehyde is a carcinogen in rats and hamsters.

0.2.22 GENOTOXICITY

- A) Acetaldehyde has been active in short-term assays for DNA damage and repair, mutagenicity, chromosome aberrations, sister chromatid exchanges, micronucleus test, and oncogenic transformation (HSDB , 2001; RTECS , 2001).

**Laboratory:**

- A) No toxic levels have been established. For significant exposures, base-line liver and kidney function tests may be indicated.
- B) Monitor vital signs and chest x-ray in all significant exposures.
- C) Monitor for signs of CNS depression following significant exposures.

**Treatment Overview:**

0.4.2 ORAL EXPOSURE

- A) 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 the head down left lateral decubitus position or by endotracheal intubation. Control any seizures first.
- 1) 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: 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) EMESIS: Ipecac-induced emesis is not recommended because of the potential for CNS depression.
- D) ACUTE LUNG INJURY: Maintain ventilation and oxygenation and evaluate with frequent arterial blood gases and/or pulse oximetry monitoring. Early use of PEEP and mechanical ventilation may be needed.
- E) Acetaldehyde in high concentrations may result in narcosis; patients should be monitored for possible coma and respiratory depression.

#### 0.4.3 INHALATION EXPOSURE

- A) 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 an inhaled beta2-adrenergic agonist. Consider systemic corticosteroids in patients with significant bronchospasm.
- B) ACUTE LUNG INJURY: Maintain ventilation and oxygenation and evaluate with frequent arterial blood gases and/or pulse oximetry monitoring. Early use of PEEP and mechanical ventilation may be needed.
- C) Acetaldehyde in high concentrations may result in narcosis so patients should be monitored for possible coma and respiratory depression.

#### 0.4.4 EYE EXPOSURE

- A) DECONTAMINATION: Remove contact lenses and irrigate exposed eyes with copious amounts of room temperature 0.9% saline or water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist after 15 minutes of irrigation, the patient should be seen in a healthcare facility.

#### 0.4.5 DERMAL EXPOSURE

- A) OVERVIEW
  - 1) DECONTAMINATION: Remove contaminated clothing and jewelry and place them in plastic bags. Wash exposed areas with soap and water for 10 to 15 minutes with gentle sponging to avoid skin breakdown. A physician may need to examine the area if irritation or pain persists (Burgess et al, 1999).

### **Range of Toxicity:**

- A) 50 ppm for 15 minutes will cause eye irritation in the majority of subjects.
- B) Fatalities have occurred in animals exposed to levels of 16,000 ppm for four hours.

[Rumack BH POISINDEX(R) Information System Micromedex, Inc., Englewood, CO, 2017; CCIS Volume 172, edition expires May, 2017. Hall AH & Rumack BH (Eds): TOMES(R) Information System Micromedex, Inc., Englewood, CO, 2017; CCIS Volume 172, edition expires May, 2017.] \*\*PEER REVIEWED\*\*

### **Antidote and Emergency Treatment:**

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. /Aldehydes 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. 266] \*\*PEER REVIEWED\*\*

[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 266] \*\*PEER REVIEWED\*\*

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. 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 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 ... . /Aldehydes 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. 266-7] \*\*PEER REVIEWED\*\*

[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 266-7] \*\*PEER REVIEWED\*\*

Advanced treatment: Consider Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. 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. Consider drug therapy for pulmonary edema ... . Consider administering a beta agonist such as albuterol for severe bronchospasm ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) or 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 ... . /Aldehydes 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. 267] \*\*PEER REVIEWED\*\*

[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 267] \*\*PEER REVIEWED\*\*

Animal Toxicity Studies:

## Non-Human Toxicity Excerpts:

/LABORATORY ANIMALS: Acute Exposure/ An acute dermal toxicity test was conducted with New Zealand white rabbits at a dose of 2 mg/kg applied as undiluted test material for 24-hours to the skin under an occlusive dressing. Extensive necrosis and severe edema were seen in all animals at 24 hours. Eschar developed subsequently (day 5) in most animals, fissuring was seen in some rabbits, and an exudate from the application site (considered to represent a secondary infection) appeared



from some of the test animals. Necrosis greater than 75% was present on all ten animals. All animals survived through day 8, after which they were sacrificed because of the severity of dermal lesions and evidence of secondary infection.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ Undiluted **propionaldehyde** held in contact with the depilated skin of guinea pigs for a period of 24 hours resulted in severe skin irritation. The material was absorbed directly through intact skin, as evidenced by death of one animal dosed with 5 mL/kg and weight loss in other animals.[American Conference of Governmental Industrial Hygienists.

Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ The acute dermal irritation and corrosivity potential of **propionaldehyde** was investigated by applying 0.5 mL of neat material to the intact skin of white Vienna rabbits for 3 or 4 hours under a semiocclusive dressing. Very slight erythema was observed in two of three rabbits after 4 hours of contact and cleared by 24 hours postexposure. No erythema or edema was reported in three rabbits after 3 hours contact or at 24, 48, or 72 hours postexposure.

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ Three rats exposed at approximately 60,000 ppm **propionaldehyde** for a period of 20 minutes died and exhibited signs of gasping, convulsions, and nasal discharge; three rats exposed at approximately 303,000 ppm for 8 minutes (ie, until death) also showed signs of /CNS depression/. [American Conference of Governmental Industrial Hygienists.

Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ Forty rats (5 groups of 8) were exposed at 32 to 83 mg/L for 30 minutes. The LC50 concentration was 62 mg/L (approximately 26,000 ppm). Fourteen of the 40 died during the experiments, 2 more within 1 hour postexposure, and the balance (60%) survived up to 3 weeks postexposure. The survivors recovered after about 1 hour and seemed unaffected on the day after the experiment. During exposure, inhalation of **propionaldehyde** produced a profound anesthetic effect in most rats, particularly at the higher concentrations.

Histological examinations of lungs, heart, liver, spleen, kidneys, and brain from at least four rats were made. Bronchitis and bronchopneumonias were observed in the lungs, hyperaemia in the liver and kidneys, and no changes in other organs.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ One drop of undiluted **propionaldehyde** placed in the conjunctival sac of a rabbit's eye was immediately irritating and caused corneal opacity which had not cleared at the end of the observation period.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ Instillation of 0.02 mL of undiluted **propionaldehyde** into the inferior conjunctival sac of rabbit eyes produced severe injury, and 0.005 mL instilled in an identical manner produced moderate damage. Instillation of 0.1 mL into the inferior conjunctival sac of rabbit eyes produced mild transient corneal injury and iritis with moderate to severe conjunctival irritation; all eye injuries were resolved by day 10. However, 0.01 mL produced minor, transient corneal injury; iritis; and moderate to severe conjunctival injury with complete resolution in 7 days.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ 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\*\*

[Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 1054] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Acute Exposure/ ... **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 severe bradycardia. Atropine decreased these effects. ... After vagotomy high doses ... increased blood pressure and caused a positive 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\*\* [PubMed Abstract](#)  
[Egle JL JR et al; Toxicol Appl Pharmacol 24 (4): 636-44 (1973)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/LABORATORY ANIMALS: Acute Exposure/... 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\*\*

[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\*\*

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

[Tokanova SE; Gig Sanit (4): 10-13 (1982)] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ **Propionaldehyde** liquid was

injected at a known rate into a metered stream of air by means of a controlled, fluid-free atomizer and delivered to two groups of rats (4 of each gender per group) at 90 or 1300 ppm. No weight gain was seen after 6 six-hour exposures in the group receiving 1300 ppm. Histological examination of tissues (lungs, liver, kidneys, spleen, adrenals) at necropsy revealed liver cell vacuolation. The second group received 20 six-hour exposures at 90 ppm. These test animals demonstrated no toxic signs, and organs were normal at necropsy. In addition to the histological examination, clinical observations were made, including nasal irritation, eye irritation, and respiratory difficulty. No adverse clinical observations were reported for either exposure group. No intermediate concentrations were tested.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Male and female CD rats (15 per exposure group) were exposed 6 hours/day, 7 days/week by inhalation at 0, 150, 750 or 1,500 ppm **propionaldehyde**. Males received 52 consecutive daily exposures, while females were exposed for 2-weeks prior to mating, during a 14-day (maximum) mating period and through day 20 of gestation. No differences were observed between means of all three male exposure groups and controls with respect to body weight, body weight gain, clinical observations and food consumption. In females, no exposure-related clinical signs were noted; however, body weight gain and food consumption were significantly reduced in the intermediate and high exposure groups during the first week of exposure and in the high exposure group during the first half of gestation. Food consumption was also slightly reduced in the females of the high and intermediate exposure groups either throughout or during part of gestation. Elevated erythrocyte count with accompanying increases in hemoglobin concentrations and hematocrit values and an increase in monocytes were noted in the males exposed at 1500 ppm. Kidney weights, as a percent of body weight, were also slightly increased in males exposed to 1500 ppm. No exposure-related increases in the incidence of gross lesions were apparent in either sex. The only exposure related finding upon microscopic examination of tissues was in the olfactory epithelium in the anterior two sections of the nasal cavities of both male and female rats.

Vacuolization was primarily evident in the low and intermediate exposure groups with atrophy seen in the intermediate and high exposure groups. The injury appeared to be somewhat diminished in females, possibly a result of a 6-day recovery period. No no-observed-effect level (NOEL) was established for nasal lesions. The NOEL for other manifestations of systemic toxicity was 150 ppm.

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ ... 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\*\*

[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\*\*

/LABORATORY ANIMALS: Developmental or Reproductive Toxicity/ ...No effects were noted on any reproductive parameter in animals exposed to vapor at concentrations up to 1500 ppm. Litter size and viability were similar among exposure groups (150, 750 and 1500 ppm) and the control. Thus, the no-observed-adverse effect level (NOAEL) for reproductive toxicity was greater than 1500 ppm. Information on the effects of **propionaldehyde** on the developing embryo and fetus was obtained in the same study. There was no evidence of external malformations in pups from dams exposed to vapor at concentrations up to 1500 ppm over the entire gestation. The data from the ... study suggest a NOAEL for developmental toxicity of greater than 1500 ppm.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Developmental or Reproductive Toxicity/ ... Male and female CD rats (15 per exposure group) were exposed to **propionaldehyde** by inhalation at air concentrations of 0, 150,750 or 1500 ppm using the OECD SIDS Combined Repeated-Dose Reproductive Toxicity protocol. Exposures were conducted 6 hours/day, 7 days/week. Males received 52 consecutive daily exposures, while females were exposed for 2 weeks prior to mating, during a 14-day (maximum) mating period, and through day 20 of gestation. Females were allowed to litter, and the body weight, viability, disposition of the offspring were monitored from birth until postnatal day 4. On day 4 of lactation, necropsies were performed on the adult females, and the offspring were examined externally and sacrificed without pathologic evaluation. No significant effects of exposure were noted on any reproductive parameter assessed. Litter size and viability were similar among exposure groups and the control. Pup body weights on postnatal days 0 and 4 were not affected by exposure, although the body weight gain of pups from the high exposure group mothers for that period was slightly depressed. The NOEL in parental animals for evidence of systemic toxicity was 150 ppm. ...

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Developmental or Reproductive Toxicity/ **Propionaldehyde** was administered to Sprague-Dawley rats by intraamniotic injection on day 13 of gestation at 10 ug, 100 ug, or 1000 ug/fetus. There was a dose-dependent increased incidence of resorbed fetuses that was significant at 1000 ug/fetus. There was one malformed fetus in the 1000 ug/fetus treatment group (ie, shortened tail); however, the incidence of malformed fetuses at this concentration was not increased compared to controls. The NOEL was 1000 ug/fetus.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/LABORATORY ANIMALS: Developmental or Reproductive Toxicity/ ... The teratogenicity and embryoletality of acrolein and five structurally related compounds: acrylic acid, allyl alcohol, glycidol, glyceraldehyde, and **propionaldehyde** /was assessed/ by intraamniotic injections in Sprague-Dawley rats on day 13 of gestation. All compounds tested were significantly embryoletal with at least one concentration of the drug. Acrolein was the most embryoletal of the drugs, causing a significant increase in resorptions with as little as 0.1 micrograms/fetus; the other drugs were

embryolethal at doses 100-10,000 times that of acrolein. Acrolein was also the most teratogenic of the drugs tested; a dose as low as 5 ug/fetus caused a significant increase in the incidence of fetal malformations. Of the other compounds tested, only glycidol at a dose of 1,000 ug/fetus induced a significant number of malformed fetuses compared to control.[Slott VL, Hales BF; Teratology 32 (1): 65-72 (1985)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Slott VL, Hales BF; Teratology 32 (1): 65-72 (1985)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)  
/GENOTOXICITY/ When tested in the nonbacterial in vitro Chinese hamster ovary V79 assay (HGPrT locus and Na<sup>+</sup>/K<sup>+</sup> locus), the lowest concentration producing cell toxicity without metabolic activation was approximately 30 mmol. **Propionaldehyde** induced a dose-dependent increase in the mutation frequency either at the HGPrT locus, with thioguanine as the selective agent, or at the Na<sup>+</sup>/K<sup>+</sup> locus, with ouabain as the selective agent.[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/GENOTOXICITY/ Forty mice (5 per sex per dose) received **propionaldehyde** by intraperitoneal injection at 0%, 25%, 50%, or 80% of the LD50 (0, 240, 480, or 768 mg/kg). No significant increases in the incidences of micronucleated PCEs were observed at 240 and 480 mg/kg in either sex or in the 768 mg/kg females. Increases in the incidence of micronucleated PCEs were observed at 24 and 48 hours, but not at 12 hours, in males receiving 768 mg/kg. There was no evidence that the increases in male mice were dose related, and they were not considered biologically significant. Effect on Mitotic Index or P/N Ratio: PCE/NCE was 58% of controls at 48 hours after injection in high dose females. [American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

/GENOTOXICITY/ 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 at 3 umol/plate was not mutagenic.[Florin I et al; Toxicol 15: 219-32 (1980)] \*\*PEER REVIEWED\*\*

[Florin I et al; Toxicol 15: 219-32 (1980)] \*\*PEER REVIEWED\*\*

/GENOTOXICITY/ **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\*\*

[Mortelmans K et al; Environ Mutagen 8: 1-119 (1986)] \*\*PEER REVIEWED\*\*

/GENOTOXICITY/ Alkaline elution was employed to study DNA damage in Chinese hamster ovary-K1 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\*\* [PubMed Abstract](#)

[Marinari UM et al; Cell Biochem Funct 2 (4): 243-8 (1984)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/GENOTOXICITY/ Several aldehydes and peroxides were tested for mutagenicity using Salmonella typhimurium tester strains TA97a, TA100, TA102 and TA104, in the presence and absence of Aroclor-induced liver S9 mix from F344 rats and B6C3F1 mice, in either preincubation or vapor phase protocols. Some chemicals were tested in additional Salmonella strains. Benzaldehyde, butyraldehyde, benzoyl peroxide, 4-chlorobenzaldehyde, isobutyraldehyde, **propionaldehyde** and veratraldehyde were non-mutagenic. Acetaldehyde and dicumyl peroxide gave inconsistent results and furfural gave equivocal responses in TA100 and TA104. Cumene hydroperoxide, formaldehyde and glutaraldehyde were mutagenic in TA100, TA102 and TA104. trans-Cinnamaldehyde exhibited a weak mutagenic response in TA100 with mouse liver S9 only. 2,4,5-Trimethoxybenzaldehyde was mutagenic only in strain TA1538 with rat liver S9. With the exception of butanone peroxide, which was mutagenic only in TA104, all chemicals mutagenic in strains TA102 and/or TA104 were also mutagenic in TA100. The data do not, therefore, support the preferential use of strains TA102 and TA104 for screening aldehydes and peroxides for mutagenicity. For a number of these chemicals the advantages of using TA102 or TA104 was in the increased responses compared with those obtained with TA100. Two of the four peroxides were mutagenic and one of these was mutagenic only with TA104.[Dillon D et al; Mutagenesis 13 (1): 19-26 (1998)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Dillon D et al; Mutagenesis 13 (1): 19-26 (1998)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/GENOTOXICITY/The induction of aneuploidy in cultured Chinese hamster cells by **propionaldehyde** (PA) ... has been studied. Chinese hamster embryonic diploid (CHED) cells were grown as a monolayer in cover glasses. Treatments were performed with doses of  $5 \times 10^{-4}$ ,  $1 \times 10^{-3}$  and  $2 \times 10^{-3}$ % of PA for 3 hr ... . Treatments with  $2 \times 10^{-3}$ % of acetaldehyde (AA) for the same PA and CH treatments were used as positive controls. Untreated cultures were used as negative controls. PA induced chromosomal aberrations with the three doses employed although in a lesser degree than the positive control. ... No correlation was found between the amount of chromosomal damage induced and the doses of PA ... employed. /PA/ ... increased the frequency of aneuploid cells in relation to untreated controls but not in relation to the positive control. However, ... PA /did not/ significantly increase the frequencies of polyploid cells. ...[Furnus CC et al; Mutagenesis 5 (4): 323-6 (1990)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Furnus CC et al; Mutagenesis 5 (4): 323-6 (1990)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/GENOTOXICITY/The mutagenicity of ... **propionaldehyde** was measured in V79 cells as resistance to 6-thioguanine. ... **Propionaldehyde** was not mutagenic at 1  $\mu$ M; it was toxic at 2  $\mu$ M...[Smith RA et al; Carcinogenesis 11 (3): 497-8 (1990)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Smith RA et al; Carcinogenesis 11 (3): 497-8 (1990)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/GENOTOXICITY/... **Propionaldehyde** induces DNA fragmentation in Chinese hamster ovary cells...[Bingham, E.; Cochrissen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V5:1000] \*\*PEER REVIEWED\*\*

[Bingham, E.; Cochrissen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V5:1000] \*\*PEER REVIEWED\*\*

/ALTERNATIVE and IN VITRO TESTS/ 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; Biochem Pharmacol 36 (5): 721-6

(1987)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Witz G et al; Biochem Pharmacol 36 (5): 721-6 (1987)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)  
/ALTERNATIVE and IN VITRO TESTS/ Thirteen chemicals present in tobacco smoke were assessed for their effect on viability and proliferation of mouse lymphocytes in vitro. Acetaldehyde, benzene, butyraldehyde, isoprene, styrene, and toluene produced no effect on either viability or proliferation after 3 hr of exposure. Formaldehyde, catechol, acrylonitrile, **propionaldehyde**, and hydroquinone significantly inhibited T-lymphocyte and B-lymphocyte proliferation with IC50 values ranging from  $1.19 \times 10^{-5}$  M to  $8.20 \times 10^{-4}$  M after 3 hr of exposure. Acrolein and crotonaldehyde not only inhibited T-cell and B-cell proliferation, but also acted on viability with IC50 values ranging from  $2.06 \times 10^{-5}$  M to  $4.26 \times 10^{-5}$  M. Mixtures of acrolein, formaldehyde, and **propionaldehyde** or crotonaldehyde were tested and interactive effects at 0.5 and 1 x IC50 were observed. Two mixtures significantly inhibited T-cell proliferation when compared to the control at 0.1 x IC50 concentration. The present study shows that some chemicals known to be present in tobacco smoke exert an effect on lymphocyte viability and proliferation in vitro.[Poirier M et al; J Toxicol Environ Health A 65 (19): 1437-51 (2002)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Poirier M et al; J Toxicol Environ Health A 65 (19): 1437-51 (2002)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

/OTHER TOXICITY INFORMATION/ ... The purpose of this study was to determine if formaldehyde (HCHO) pretreatment would cause sensory irritation cross tolerance to other inhaled aldehydes. Male F-344 rats, weighing 190 to 210 g, were pretreated with 15 ppm HCHO, 6 hr/day for 9 days, and challenged on the 10th day with a saturated (acetaldehyde, **propionaldehyde**, and butyraldehyde), unsaturated (acrolein and crotonaldehyde), or cyclic (cyclohexanecarboxaldehyde, 3-cyclohexene-1-carboxaldehyde, and benzaldehyde) aldehyde. ... In naive (nonpretreated) animals, the concentration eliciting a 50% decrease in respiratory rate (RD50) was 23 ppm or less for unsaturated aliphatic aldehydes. For cyclic and saturated aliphatic aldehydes, the RD50 ranged from 600 to 1000 ppm and 3000 to 6800 ppm, respectively. Formaldehyde pretreatment resulted in cross tolerance only with acetaldehyde (RD50 increased 3.5-fold) and acrolein (RD50 increased 5-fold).

[Babiuk C et al; Toxicol Appl Pharmacol 79 (1): 143-9 (1985)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[Babiuk C et al; Toxicol Appl Pharmacol 79 (1): 143-9 (1985)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

## Non-Human Toxicity Values:

LD50 Rat oral 800 to 1,600 mg/kg[Verschuieren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 1023] \*\*PEER REVIEWED\*\*

[Verschuieren, 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[Verschuieren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 1023] \*\*PEER REVIEWED\*\*

[Verschuieren, 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[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

LD50 Rabbit dermal 5040 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. 3069]

**\*\*PEER REVIEWED\*\***

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] **\*\*PEER REVIEWED\*\***

LC50 Mouse inhalation 9,000 ppm/2 hr[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069]

**\*\*PEER REVIEWED\*\***

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] **\*\*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\*\***

[ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 442] **\*\*PEER REVIEWED\*\***

## **Ecotoxicity Values:**

EC50; Species: Pseudokirchneriella subcapitata (Green algae, exponential growth phase, 15000 cells/mL, UTEX 1648); Conditions: static, 24 deg C, dissolved oxygen 1-2 mg/L; Concentration: 11380 ug/L for 48 hr; Effect: decreased photosynthesis[Chen CY et al; Environ Toxicol Chem 24 (5): 1067-73 (2005) Available from, as of December 22, 2008:

[http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

[Chen CY et al; Environ Toxicol Chem 24 (5): 1067-73 (2005) Available from, as of December 22, 2008: [http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

EC50; Species: Pseudokirchneriella subcapitata (Green algae, exponential growth phase, 15000 cells/mL, UTEX 1648); Conditions: static, 24 deg C, dissolved oxygen 1-2 mg/L; Concentration: 24950 ug/L for 48 hr; Effect: decreased population growth rate[Chen CY et al; Environ Toxicol Chem 24 (5): 1067-73 (2005) Available from, as of December 22, 2008:

[http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

[Chen CY et al; Environ Toxicol Chem 24 (5): 1067-73 (2005) Available from, as of December 22, 2008: [http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

LC50; Species: Lepomis macrochirus (Bluegill, length 33-75 mm); Conditions: freshwater, static, 23 deg C, pH 7.6-7.9, hardness 55 mg/L CaCO<sub>3</sub>; Concentration: 130000 ug/L for 96 hr[Dawson GW et al; J Hazard Mater 1 (4): 303-18 (1977) Available from, as of December 22, 2008:

[http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

[Dawson GW et al; J Hazard Mater 1 (4): 303-18 (1977) Available from, as of December 22, 2008: [http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

LC50; Species: Menidia beryllina (Inland silverside, length 40-100 mm); Conditions: saltwater, static, 20 deg C, pH 7.6-7.9, hardness 55 mg/L CaCO<sub>3</sub>; Concentration: 100000 ug/L for 96 hr[Dawson GW et al; J Hazard Mater 1 (4): 303-18 (1977) Available from, as of December 22, 2008:

[http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

[Dawson GW et al; J Hazard Mater 1 (4): 303-18 (1977) Available from, as of December 22, 2008: [http://cfpub.epa.gov/ecotox/quick\\_query.htm](http://cfpub.epa.gov/ecotox/quick_query.htm) **\*\*PEER REVIEWED\*\***

Metabolism/ Pharmacokinetics:

## **Metabolism/ Metabolites:**

Detoxification of aldehydes can proceed by oxidation to readily metabolized acids, by reduction to alcohols, and by reaction with sulfhydryl groups, particularly glutathione. Under conditions that deplete glutathione levels or result in an inhibition of aldehyde dehydrogenase (eg, Antabuse



treatment), the acute and chronic effects of aldehyde toxicity might be more fully expressed. [American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2007.] \*\*PEER REVIEWED\*\*

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\*\*

[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\*\* [PubMed Abstract](#)

[Gervasi PG et al; Biochem Pharmacol 41 (2): 177-84 (1991)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

## Mechanism of Action:

Inhibition of intercellular communication is an important feature in the tumor promotion phase of a multistage carcinogenesis model. In atherosclerosis inhibition of cell-cell communication by atherogenic compounds, e.g., low density lipoproteins (LDL), also seems to be important. For testing atherogenic compounds we used an atherosclerosis relevant cell type, namely human smooth muscle cells. In order to investigate which part of the LDL particle would be involved in inhibition of metabolic co-operation between human smooth muscle cells in culture ... several fatty acids and their breakdown products /were tested/, namely aldehydes. Unsaturated C-18 fatty acids markedly influenced gap-junctional intercellular communication (GJIC), whereas saturated (C18:0, C16:0) and unsaturated fatty acids with > 20 carbon atoms did not inhibit GJIC. In the case of oleic and elaidic acid, orientation seemed important; however, after exposure to palmitoleic and palmitelaidic acid no differences were found. The most potent inhibitor of GJIC was linoleic acid, which inhibited GJIC by 75%. No correlation was found between degrees of unsaturation and ability to inhibit GJIC. Of the tested aldehydes, hexanal, propanal, butanal and 4-hydroxynonenal did significantly inhibit GJIC, while pentanal had no effect. Since modification of LDL was shown to be important in order for LDL to inhibit GJIC, these results show that fatty acids and their oxidative breakdown products may be of importance for the inhibition of GJIC by LDL.[de Haan LH et al; Carcinogenesis 15 (2): 253-6 (1994)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

[de Haan LH et al; Carcinogenesis 15 (2): 253-6 (1994)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

## Interactions:

Guanethidine (G) is currently used in the treatment of essential hypertension. Acetaldehyde (A), acrolein (AR), formaldehyde (F) and **propionaldehyde** (P) are constituents of cigarette smoke and (A) is also an intermediate oxidative metabolite of ethanol. These aldehydes are known to produce sympathomimetic effects by the release of NE from adrenergic neurons and to exert cardioinhibitory effects. The type of predominant effect is dose-dependent. This study was undertaken to determine if these aldehydes result in sympathomimetic effects in the presence of G (15 mg/kg iv) in anesthetized rats. G enhanced the pressor responses to A and P in dose ranges of 5-20 and 5-10 mg/kg respectively. However, AR and F at dose ranges of 0.05-5 and 0.1-10 mg/kg, respectively, elicited only depressor responses after G. Thus, A and P exerted greater sympathomimetic effects through the release of intraneuronal NE in the presence of G. The adrenergic neuronal blocking action of G changes the blood pressure effects of AR and F. When these two compounds are administered in the absence of G, they cause predominant pressor effects, whereas in the presence of G a depressor response is noted. This depressor response is possibly by vagal stimulation and/or direct vasodilation.[Green MA, Egle JL Jr; Res Commun Chem Pathol Pharmacol 40 (2): 337-40 (1983)] \*\*PEER REVIEWED\*\*

[PubMed Abstract](#)

[Green MA, Egle JL Jr; Res Commun Chem Pathol Pharmacol 40 (2): 337-40 (1983)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

Pharmacology:

## Interactions:

Guanethidine (G) is currently used in the treatment of essential hypertension. Acetaldehyde (A), acrolein (AR), formaldehyde (F) and **propionaldehyde** (P) are constituents of cigarette smoke and (A) is also an intermediate oxidative metabolite of ethanol. These aldehydes are known to produce sympathomimetic effects by the release of NE from adrenergic neurons and to exert cardioinhibitory effects. The type of predominant effect is dose-dependent. This study was undertaken to determine if these aldehydes result in sympathomimetic effects in the presence of G (15 mg/kg iv) in anesthetized rats. G enhanced the pressor responses to A and P in dose ranges of 5-20 and 5-10 mg/kg respectively. However, AR and F at dose ranges of 0.05-5 and 0.1-10 mg/kg, respectively, elicited only depressor responses after G. Thus, A and P exerted greater sympathomimetic effects through the release of intraneuronal NE in the presence of G. The adrenergic neuronal blocking action of G changes the blood pressure effects of AR and F. When these two compounds are administered in the absence of G, they cause predominant pressor effects, whereas in the presence of G a depressor response is noted. This depressor response is possibly by vagal stimulation and/or direct vasodilation.[Green MA, Egle JL Jr; Res Commun Chem Pathol Pharmacol 40 (2): 337-40 (1983)] \*\*PEER REVIEWED\*\*

[PubMed Abstract](#)

[Green MA, Egle JL Jr; Res Commun Chem Pathol Pharmacol 40 (2): 337-40 (1983)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

Environmental Fate & Exposure:

## Environmental Fate/Exposure Summary:

**Propionaldehyde**'s production and use in the manufacture of propionic acid, polyvinyl and other plastics; in the synthesis of rubber chemicals; in disinfectant; and in preservatives may result in its

release to the environment through various waste streams. **Propionaldehyde** was identified as a natural volatile emission of arboreal plants. 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 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 18-20 hours. The direct photolysis rate constant for **propionaldehyde** in air is about  $4 \times 10^{-5}$ /sec, which corresponds to a half-life of about 4.8 hrs. 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  $7.34 \times 10^{-5}$  atm-cu m/mole. **Propionaldehyde** may volatilize from dry soil surfaces based upon its vapor pressure. **Propionaldehyde** reached 94% of its theoretical BOD in 4 weeks using an activated sludge inoculum in the Japanese MITI test, suggesting that biodegradation may be an important environmental fate process. **Propionaldehyde** degrades by anaerobic biological treatment with 26% utilization being reported in a system with a 20 day hydraulic retention time. If released into water, **propionaldehyde** is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. 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 11 hrs and 5.8 days, respectively. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions. Occupational exposure to **propionaldehyde** may occur through inhalation and dermal contact with this compound at workplaces where **propionaldehyde** is produced or used. Monitoring data and use information indicate that the general population may be exposed to **propionaldehyde** via inhalation of ambient air, ingestion of food and drinking water, and dermal contact with consumer products containing **propionaldehyde**. (SRC) \*\*PEER REVIEWED\*\*  
\*\*PEER REVIEWED\*\*

## Probable Routes of Human Exposure:

NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,086 workers (187 of these were female) were 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. Monitoring data and use information indicate that the general population may be exposed to **propionaldehyde** via inhalation of ambient air, ingestion of food and drinking water, and dermal contact with consumer products containing **propionaldehyde**(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 at <http://www.cdc.gov/noes/> as of Feb 2009.]  
\*\*PEER REVIEWED\*\*

[ (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 at <http://www.cdc.gov/noes/> as of Feb 2009.]  
\*\*PEER REVIEWED\*\*

**Propionaldehyde** was found in 14 of 15 personal air samples at a mean concentration of 0.74 ppb from samples taken in Helsinki, Finland, tested May to September 1997(1).[ (1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*PEER REVIEWED\*\*  
[ (1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*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\*\*  
[(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; in the synthesis of rubber chemicals; in disinfectant; and in preservatives(1) may result in its release to the environment through various waste streams(SRC).[(1) Lewis RJ Sr, ed; Hawley's Condensed Chemical Dictionary. 15th ed. NY, NY: John Wiley and Sons Inc, p. 1047 (1997)] \*\*PEER REVIEWED\*\*  
[(1) Lewis RJ Sr, ed; Hawley's Condensed Chemical Dictionary. 15th ed. NY, NY: John Wiley and Sons Inc, p. 1047 (1997)] \*\*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  $7.34 \times 10^{-5}$  atm-cu m/mole(4). **Propionaldehyde** is expected to volatilize from dry soil surfaces(SRC) based upon a vapor pressure of 317 mm Hg(5). **Propionaldehyde** reached 94% of its theoretical BOD in 4 weeks using an activated sludge inoculum in the Japanese MITI test, suggesting that biodegradation may be an important environmental fate process in soil (SRC). **Propionaldehyde** degrades by anaerobic biological treatment with 26% utilization being reported in a system with a 20 day hydraulic retention time(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 (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) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval. Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 10, 2009. (7) Chou WL et al; Biotech Bioeng Symp 8: 391-414 (1979)] \*\*PEER REVIEWED\*\*  
[(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) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval. Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 10, 2009. (7) Chou WL et al; Biotech Bioeng Symp 8: 391-414 (1979)] \*\*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  $7.34 \times 10^{-5}$  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 11 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** reached 94% of its theoretical BOD in 4 weeks using an activated sludge inoculum in the Japanese MITI test(7), suggesting that biodegradation may be an important environmental fate process in water (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. 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) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval.

Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 9, 2009.] \*\*PEER REVIEWED\*\*

[(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) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval. Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 9, 2009.] \*\*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. 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 estimated to be 18 or 20 hrs(SRC), calculated from rate constants of  $2.11 \times 10^{-11}$  cu cm/molecule-sec(3) and  $1.96 \times 10^{-11}$  cu cm/molecule-sec(4), respectively. The rate constant for the vapor-phase reaction of **propionaldehyde** with nitrate radical has been experimentally determined to be  $6.0 \times 10^{-13}$  cu cm/sec(3). This corresponds to an atmospheric half-life of about 1.3 hrs(SRC). The direct photolysis rate constant for **propionaldehyde** in air is about  $4 \times 10^{-5}$  sec<sup>-1</sup>(5), which corresponds to a half-life of about 4.8 hrs(SRC).[(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) Andresen O et al; IN: Proceedings From the EUROTRAC-2 Symposium 2000, Midgley PM et al (eds)Springer-Verlag: Berlin 5 pp (2001) (4) Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989) (5) Grosjean D, Swanson RD; Sci Total Environ 29: 65-85 (1983)] \*\*PEER REVIEWED\*\*

[(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) Andresen O et al; IN: Proceedings From the EUROTRAC-2 Symposium 2000, Midgley PM et al (eds)Springer-Verlag: Berlin 5 pp (2001) (4) Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989) (5) Grosjean D, Swanson RD; Sci Total Environ 29: 65-85 (1983)] \*\*PEER REVIEWED\*\*

## Environmental Biodegradation:

AEROBIC: **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). Laboratory tests confirm the degradability of **propionaldehyde** by acclimated sludge and sewage(1-5) with theoretical BODs of 38% in 5 days(2), 100% in 5 hrs(3), and 29% in 24 hrs(4). **Propionaldehyde** is generally degraded to propionic acid and then further degraded to carbon dioxide and water(5). Six day BOD:ThOD ratios for **propionaldehyde** ranged from 0.35 to 0.53 using an activated sludge inocula (5). Percentages of ThOD biodegraded after 6, 12, and 24 hrs were 14.4, 24.9, and 28.8, respectively (5).[ (1) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval. Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 10, 2009. (2) Dore M et al; Trib Cebedeau 28: 3-11 (1975) (3) Hatfield R; Ind Eng Chem 49: 192-6 (1957) (4) Gerhold RM, Malaney GW; J Water Pollut Contr Fed 38: 562-79 (1966) (5) Urano K, Kato Z; J Hazard Mater 13: 147-59 (1986)] \*\*PEER REVIEWED\*\*

[ (1) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Tokyo, Japan: Natl Inst Tech Eval. Available at <http://www.safe.nite.go.jp/english/db.html> as of Feb 10, 2009. (2) Dore M et al; Trib Cebedeau 28: 3-11 (1975) (3) Hatfield R; Ind Eng Chem 49: 192-6 (1957) (4) Gerhold RM, Malaney GW; J Water Pollut Contr Fed 38: 562-79 (1966) (5) Urano K, Kato Z; J Hazard Mater 13: 147-59 (1986)] \*\*PEER REVIEWED\*\*

ANAEROBIC: **Propionaldehyde** degrades by anaerobic biological treatment with 26% utilization being reported in a system with a 20 day hydraulic retention time(1).[ (1) Chou WL et al; Biotech Bioeng Symp 8: 391-414 (1979)] \*\*PEER REVIEWED\*\*

[ (1) Chou WL et al; Biotech Bioeng Symp 8: 391-414 (1979)] \*\*PEER REVIEWED\*\*

## Environmental Abiotic Degradation:

The rate constant for the vapor-phase reaction of **propionaldehyde** with photochemically produced hydroxyl radicals has been reported as  $2.11 \times 10^{-11}$  cu cm/molecule-sec(1) and  $1.96 \times 10^{-11}$  cu cm/molecule-sec(2). These correspond to atmospheric half-lives of about 18 and 20 hours at an atmospheric concentration of  $5 \times 10^5$  hydroxyl radicals per cu cm(3). The rate constant for the vapor-phase reaction of **propionaldehyde** with nitrate radical has been experimentally determined to be  $6.0 \times 10^{-13}$  cu cm/sec(1). This corresponds to an atmospheric half-life of about 1.3 hours at a concn of  $2.4 \times 10^8$  nitrate radicals per cu cm(3). The direct photolysis rate constant for **propionaldehyde** in air is about  $4 \times 10^{-5}$ /sec(4), which corresponds to a half-life of about 4.8 hrs(SRC). **Propionaldehyde** is not expected to undergo hydrolysis in the environment due to the lack of functional groups that hydrolyze under environmental conditions(5).[ (1) Andresen O et al; in Proceedings From the EUROTRAC-2 Symposium 2000, Midgley PM et al. eds., Springer-Verlag: Berlin 5 pp (2001) (2) Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989) (3) Atkinson R; Gas-Phase Tropospheric Chemistry of Organic Compounds, J Phys Chem Ref Data, Monograph 2, 216 pp (1994) (4) Grosjean D, Swanson RD; Sci Total Environ 29: 65-85 (1983) (5) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990)] \*\*PEER REVIEWED\*\*

[ (1) Andresen O et al; in Proceedings From the EUROTRAC-2 Symposium 2000, Midgley PM et al. eds., Springer-Verlag: Berlin 5 pp (2001) (2) Atkinson R; J Phys Chem Ref Data. Monograph 1 (1989) (3) Atkinson R; Gas-Phase Tropospheric Chemistry of Organic Compounds, J Phys Chem Ref Data, Monograph 2, 216 pp (1994) (4) Grosjean D, Swanson RD; Sci Total Environ 29: 65-85 (1983) (5) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990)] \*\*PEER REVIEWED\*\*

## Environmental Bioconcentration:

An estimated BCF of 3 was calculated in fish 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\*\*  
[(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.[ (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\*\*  
[(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  $7.34 \times 10^{-5}$  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 11 hrs(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** is expected to volatilize from dry soil surfaces(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\*\*  
[(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). **Propionaldehyde** 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\*\*

[(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 concns(1).[(1) Mopper K, Taylor BF; ACS Symp Ser 305(Org Mar Geochem): 324-39 (1986)] \*\*PEER REVIEWED\*\*

[(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). **Propionaldehyde** was 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\*\*

[(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 concns ranging from <100 to 260 ug/hr(1). **Propionaldehyde** was detected in non-catalyst and catalyst equipped gasoline engine exhaust at 0.10 and 0.06% by weight of total organic gas emissions, respectively(2). **Propionaldehyde** was detected in commercial jet aircraft exhaust at 1.0% by weight of total organic gas emissions(2). **Propionaldehyde** concns from automobile exhaust were 3.4-150 ppbv in models from 1971, 1975, and 1977(3). **Propionaldehyde** emissions from a two stroke engine (chainsaw) using aliphatic gasoline, regular gasoline, and ethanol were 0.039-0.027, 0.062-0.089, and 0.022-0.038 g/kWhr, respectively(4). Using the same two stroke engine, emissions of **propionaldehyde** from aliphatic gasoline mixed with ethanol at 15, 50, and 85% were 0.039-0.065, 0.036-0.052, and 0.027-0.042 g/kWhr, respectively, and regular gasoline mixed with ethanol at 15, 50, and 85% were 0.067-0.087, 0.053-0.076, and 0.031-0.044 g/kWhr, respectively(4).

**Propionaldehyde** was measured in the emissions of burnt wood at 255, 153, and 155 mg/kg of pine, oak, and eucalyptus, respectively(5). **Propionaldehyde** emissions from an automobile running on Swedish environmental classified diesel fuel were 3.2 mg/km and the same automobile running on European program emissions fuel were 3.4 mg/km(6).[(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) (3) Kawamura K et al; Atmos Environ 34: 4175-91 (2000) (4) Magnusson R et al; Environ Sci Technol 36: 1656-64 (2002) (5) Schauer JJ et al; Environ Sci Technol 35: 1716-28 (2001) (6) Westerholm R et al; Environ Sci Technol 35: 1748-54 (2001)] \*\*PEER REVIEWED\*\*

[(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) (3) Kawamura K et al; Atmos Environ 34: 4175-91 (2000) (4) Magnusson R et al; Environ Sci Technol 36: 1656-64 (2002) (5) Schauer JJ et



## Atmospheric Concentrations:

URBAN/SUBURBAN: 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 of 6-10, 0-14, 0-8 and 0-6 ppb, respectively(3). At Pomona College, Claremont, CA on Sept 11-19, 1985, atmospheric concns of **propionaldehyde** were 0.2-1.6 ppb(4). **Propionaldehyde** was detected at mean outdoor and indoor concns of 1.27 and 1.15 ppb, respectively, at 6 residential houses located in a suburban New Jersey area during the summer of 1992(5). **Propionaldehyde** was detected in Los Angeles (UCLA campus, Monterey Park, Newberry Park, La Habra) at 0.10-0.53 ppbv in samples taken Oct 1984(6). **Propionaldehyde** was detected at 0.08-7.90, 0.08-8.70, 0.02-6.90, and 0.17-9.10 ug/cu m at a fire station, Lathrop Ave, Presidents St, and the waterworks in Savannah, GA in samples taken Dec 1995 to Nov 1996(7). **Propionaldehyde** was detected in 13 of 13 samples taken across the US (3 in LA, 4 in TX, 5 in VT, 1 in NJ) from Sept 1996 to Aug 1997, 11 samples were <1 ppb and two samples were >1-<5 ppbv(8). **Propionaldehyde** was detected in 2371 of 2479 samples in urban/suburban and rural/remote locations throughout MN at concns of 0.012-1.39 ug/cu m(9).[(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) (5) Zhang J et al; Environ Sci Technol 28: 146-152 (1994) (6) Kawamura K et al; Atmos Environ 34: 4175-91 (2000) (7) Macintosh DL et al; Environ Monit Assess 63: 409-29 (2000) (8) Mohamed MF et al; Chemosphere 47: 863-82 (2002) (9) Pratt GC et al; Environ Health Perspect 108: 815-25 (2000)] \*\*PEER REVIEWED\*\*

[(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) (5) Zhang J et al; Environ Sci Technol 28: 146-152 (1994) (6) Kawamura K et al; Atmos Environ 34: 4175-91 (2000) (7) Macintosh DL et al; Environ Monit Assess 63: 409-29 (2000) (8) Mohamed MF et al; Chemosphere 47: 863-82 (2002) (9) Pratt GC et al; Environ Health Perspect 108: 815-25 (2000)] \*\*PEER REVIEWED\*\*

URBAN/SUBURBAN: **Propionaldehyde** was detected at 0.04-0.13 ppbv in samples taken at the top of an 11 story building on the campus of Hong Kong University Science and Technology(1).

**Propionaldehyde** was detected at 0.14 ppb in 3 of 13 Helsinki samples tested May to Sep 1997(2).

**Propionaldehyde** was detected in Santiago, Chile atmospheric samples at <0.05-0.61 ppbv in Nov 2003(3). **Propionaldehyde** was detected at 0.26, 0.48, and 0.51 ug/cu m in Frohnau, Nansenstrasse, and Frankfurter Allea, respectively, in Berlin, Germany from samples taken Jun-Aug 1996(4).[(1) Ho SSH, Yu JZ; Environ Sci Technol 38: 862-70 (2004) (2) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003) (3) Rubio MA et al; Chemosphere 62: 1011-20 (2005) (4) Thijsse TR et al; J Air Waste Manage Assoc 49: 1394-404 (1999)] \*\*PEER REVIEWED\*\*

[(1) Ho SSH, Yu JZ; Environ Sci Technol 38: 862-70 (2004) (2) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003) (3) Rubio MA et al; Chemosphere 62: 1011-20 (2005) (4) Thijsse TR et al; J Air Waste Manage Assoc 49: 1394-404 (1999)] \*\*PEER REVIEWED\*\*

RURAL/REMOTE: The atmospheric concentration of **propionaldehyde** for Jones State Forest, TX ranged from 1.8 to 39.9 ppb with an avg 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). **Propionaldehyde** was detected at 0.08-6.60 ug/cu m in Fort Morris, GA in samples taken Dec 1995 to Nov 1996(4).[(1) Seila RL; Non-urban Hydrocarbons concentration 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) (4) Macintosh DL et al; Environ Monit Assess 63: 409-29 (2000)] \*\*PEER REVIEWED\*\* [(1) Seila RL; Non-urban Hydrocarbons concentration 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) (4) Macintosh DL et al; Environ Monit Assess 63: 409-29 (2000)] \*\*PEER REVIEWED\*\*

INDOOR: **Propionaldehyde** was found in 15 of 15 indoor residences at an average concentration of 0.91 ppb and 9 of 9 work places at an average concentration of 0.54 ppb in Helsinki (Finland) samples tested May to September 1997(1).[(1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*PEER REVIEWED\*\* [(1) Jurvelin JA et al; J Air Waste Manage Assoc 53: 560-73 (2003)] \*\*PEER REVIEWED\*\*

SOURCE DOMINATED: 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). **Propionaldehyde** was detected in kitchen exhaust at concentrations of 2.07-10.9 ppbv(2).[(1) Shah JJ, Heyerdahl EK; National Ambient VOC Database Update USEPA 600/3-88/010 (1988) (2) Ho SSH, Yu JZ; Environ Sci Technol 38: 862-70 (2004)] \*\*PEER REVIEWED\*\* [(1) Shah JJ, Heyerdahl EK; National Ambient VOC Database Update USEPA 600/3-88/010 (1988) (2) Ho SSH, Yu JZ; Environ Sci Technol 38: 862-70 (2004)] \*\*PEER REVIEWED\*\*

## Food Survey Values:

**Propionaldehyde** was detected as a constituent of coffee aroma(1). **Propionaldehyde** volatilizes from soybean oil, peanut oil, and lard at rates of 0.01-0.47, 0.02-0.45, and 0.02-0.33 ppm/mg-min, respectively, when heated 150-400 deg C(2).[(1) Aeschbacher HU et al; Food Chem Toxic 27: 227-232 (1989) (2) Lin JM, Liou SJ; Bull Environ Contam Toxicol 64: 817-24 (2000)] \*\*PEER REVIEWED\*\* [(1) Aeschbacher HU et al; Food Chem Toxic 27: 227-232 (1989) (2) Lin JM, Liou SJ; Bull Environ Contam Toxicol 64: 817-24 (2000)] \*\*PEER REVIEWED\*\*

## Plant Concentrations:

**Propionaldehyde** was emitted from rape during the blooming period at a rate of 0.6-2.69 and 0.22-1.50 ppbv during May 8 and 9, 1998(1).[(1) Muller K et al; Chemosphere 49: 1247-56 (2002)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#) [(1) Muller K et al; Chemosphere 49: 1247-56 (2002)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)

Environmental Standards & Regulations:

## TSCA Requirements:

Section 8(a) of TSCA requires manufacturers of this chemical substance to report preliminary

assessment information concerned with production, exposure, and use to EPA as cited in the preamble in 51 FR 41329. Effective date 9/30/91; Reporting date: 11/2791.[40 CFR 712.30 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[40 CFR 712.30 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies.

Propanal is included on this list. Effective date 9/30/91; Sunset date: 6/30/98.[40 CFR 716.120

(USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[40 CFR 716.120 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*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. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).[40 CFR 302.4 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[40 CFR 302.4 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*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 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[40 CFR 60.489 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*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\*\*  
[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 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[21 CFR 172.515 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of January 26, 2009: <http://www.ecfr.gov>]  
\*\*PEER REVIEWED\*\*

Chemical/Physical Properties:

## Molecular Formula:

C3-H6-O \*\*PEER REVIEWED\*\*  
\*\*PEER REVIEWED\*\*

## Molecular Weight:

58.079[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*  
[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*

## Color/Form:

Liquid[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*  
[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*  
Water-white liquid[Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*PEER REVIEWED\*\*  
[Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*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\*\*

[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\*\*

[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.] \*\*PEER REVIEWED\*\*

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

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

## Boiling Point:

48 deg C[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*

[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*

## Melting Point:

-80 deg C[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-414] \*\*PEER REVIEWED\*\*

[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-414] \*\*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.] \*\*PEER REVIEWED\*\*

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

## Density/Specific Gravity:

0.8657 g/cu cm at 25 deg C[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*  
[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*

## Heat of Combustion:

1822.7 kJ/mol at 25 deg C (liquid)[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 5-70] \*\*PEER REVIEWED\*\*  
[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 5-70] \*\*PEER REVIEWED\*\*

## Heat of Vaporization:

29.62 kJ/mol at 25 deg C[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 6-116] \*\*PEER REVIEWED\*\*  
[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 6-116] \*\*PEER REVIEWED\*\*

## Octanol/Water Partition Coefficient:

log Kow = 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\*\*  
[Hansch, C., Leo, A., D. Hoekman. Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., 1995., p. 6] \*\*PEER REVIEWED\*\*

## Solubilities:

Soluble in water; miscible with ethanol, ethyl ether[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*PEER REVIEWED\*\*

[Lide, D.R. CRC Handbook of Chemistry and Physics 88TH Edition 2007-2008. CRC Press, Taylor & Francis, Boca Raton, FL 2007, p. 3-440] \*\*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\*\*

[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 at 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\*\*

[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: 1.36460 at 19 deg C/D; 1.3695 at 16.6 deg C/580 nm [O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1345] \*\*PEER REVIEWED\*\*

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

[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\*\*

[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\*\*

[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\*\*

[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\*\*

[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 at 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.]

\*\*PEER REVIEWED\*\*

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

## Vapor Density:

1.8 at 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\*\*

[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 at 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.] \*\*PEER REVIEWED\*\*

[Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.] \*\*PEER REVIEWED\*\*

## Viscosity:

0.3167 cP at 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\*\*

[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 at 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<sup>5</sup> J/kg; Floats and 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.] \*\*PEER REVIEWED\*\*

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

Specific gravity: 0.8432 at 0 deg C/4 deg C; 0.8192 at 9.7 deg C/4 deg C; 0.8071 at 20 deg C/4 deg C; 0.7898 at 33 deg C/4 deg C[O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1345] \*\*PEER REVIEWED\*\*

[O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1345] \*\*PEER REVIEWED\*\*

Vapor Pressure: 687 mm Hg at 45 deg C[Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V5: 964] \*\*PEER REVIEWED\*\*

[Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. V5: 964] \*\*PEER REVIEWED\*\*

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

[Buttery RG et al; J Agric Food Chem 17: 385-9 (1969)] \*\*PEER REVIEWED\*\*

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

[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 or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

/GUIDE 129: FLAMMABLE LIQUIDS (Polar/Water-Miscible/Noxious)/ Public Safety: CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover. 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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 Fire: Dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fire: 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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 Spill: 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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. In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. Keep victim warm and quiet. 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. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER REVIEWED\*\*

[U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012] \*\*PEER 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.] \*\*PEER REVIEWED\*\*

[U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978.] \*\*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\*\*

[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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

Irritates the skin causing a burning sensation and rash on contact. Inhalation can irritate the respiratory tract and may cause nosebleeds, sore throat, cough, and phlegm.[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

## **Fire Potential:**

Flammable Liquid.[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

Dangerous fire hazard when exposed to heat or flame.[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

## Flammable Limits:

Lower flammable limit: 2.6% by volume; Upper flammable limit: 17% by volume[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

## Flash Point:

-22 deg F (-30 deg C) (Closed cup)[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

15-19 deg F (open cup)[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

## Autoignition Temperature:

405 Deg F (207 Deg C)[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-100] \*\*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\*\*

[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\*\*

[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; Bureau of

Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 757] \*\*PEER REVIEWED\*\*

[Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 757] \*\*PEER REVIEWED\*\*

Fight fire from protected location or maximum possible distance. Use water spray to keep fire-exposed containers cool. Use water spray, dry chemical, "alcohol resistant" foam, or carbon dioxide.

Water may be ineffective.[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

## **Toxic Combustion Products:**

Combustion may produce irritants and toxic gases. Vapors are heavier than air and may travel to a source of ignition and flash back. Closed containers may rupture violently when heated.[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*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\*\*

[Fire Protection Guide to Hazardous Materials. 12 ed. Quincy, MA: National Fire Protection Association, 1997., p. 49-112] \*\*PEER REVIEWED\*\*

Can self-ignite if finely dispersed on porous or combustible material such as fabric.[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

## **Explosive Limits & Potential:**

Lower: 2.9%, Upper: 17%[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

## **Hazardous Reactivities & Incompatibilities:**

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

3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*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\*\*

[Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 533-4] \*\*PEER REVIEWED\*\*

Incompatible with strong acids, amines. Violent reaction with strong oxidizers. Strong caustics, reducing agents can cause explosive polymerization. Can self-ignite if finely dispersed on porous or combustible material such as fabric. Heat or ultraviolet can cause decomposition.[Sittig, M.

Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*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\*\*

[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.] \*\*PEER REVIEWED\*\*

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

Vigorous polymerization reaction with methyl methacrylate.[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*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\*\*

[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.] \*\*PEER REVIEWED\*\*

[U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978.] \*\*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\*\*

[ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 442] \*\*PEER REVIEWED\*\*

Wear protective gloves and clothing to prevent any reasonable probability of skin contact. ...All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work. Contact lenses should not be worn when working with this chemical. Wear splash-proof chemical goggles and face shield unless full facepiece respiratory protection is worn. Employees should wash immediately with soap when skin is wet or contaminated. Provide emergency showers and eyewash.[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*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\*\*

\*\*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; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 757] \*\*PEER REVIEWED\*\*

[Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 757] \*\*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\*\*

[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; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 757] \*\*PEER REVIEWED\*\*

[Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005,

p. 757] \*\*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\*\*

\*\*PEER REVIEWED\*\*

SRP: The scientific literature for the use of contact lenses in industry is conflicting. The benefit or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place.

\*\*PEER REVIEWED\*\*

\*\*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\*\*

\*\*PEER REVIEWED\*\*

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a POTW is acceptable only after review by the governing authority. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must meet Hazardous Material Criteria for disposal.

\*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

\*\*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, as of February 15, 2006: <http://www.ecfr.gov>] \*\*PEER REVIEWED\*\*

[49 CFR 171.2; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of February 15, 2006: <http://www.ecfr.gov>] \*\*PEER 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] \*\*PEER REVIEWED\*\*



[International Air Transport Association. Dangerous Goods Regulations. 47th Edition. Montreal, Quebec Canada. 2006., p. 243] \*\*PEER 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] \*\*PEER REVIEWED\*\*

[International Maritime Organization. International Maritime Dangerous Goods Code. London, UK. 2004., p. 55] \*\*PEER 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. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

...Store in cool, well ventilated area away from oxidizers. Where possible, automatically pump liquid from drums or other storage containers to process containers...Metals containers involving the transfer of 5 gallons or more of this chemical should be grounded or bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arresters. Use only non-sparking tools and equipment, especially when opening and closing containers of this chemical...[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1955] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1955] \*\*PEER REVIEWED\*\*

## **Cleanup Methods:**

Eliminate all ignition sources. stop or control the leak, if this can be without undue risk. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures. Control runoff and isolate discharged material for proper disposal.[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

[Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 49-126] \*\*PEER REVIEWED\*\*

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\*\*

[Prager, J.C. Environmental Contaminant Reference Databook Volume 1. New York, NY: Van Nostrand Reinhold, 1995., p. 1010] \*\*PEER REVIEWED\*\*

...Absorb liquids in vermiculite, dry sand, earth, peat, carbon, or a similar material and deposit in sealed containers...[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002.

4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1955] \*\*PEER REVIEWED\*\*  
[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1  
A-H Norwich, NY: Noyes Publications, 2002., p. 1955] \*\*PEER REVIEWED\*\*

## Disposal Methods:

SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations. \*\*PEER REVIEWED\*\*

\*\*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\*\*

[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\*\*

[USEPA; Management of Hazardous Waste Leachate, EPA Contract No.68-03-2766 p.E-135 (1982)] \*\*PEER REVIEWED\*\*

Occupational Exposure Standards:

## Threshold Limit Values:

8 hr Time Weighted Avg (TWA): 20 ppm[American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2008, p. 49] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2008, p. 49] \*\*PEER REVIEWED\*\*

Excursion Limit Recommendation: Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.[American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2008, p. 5] \*\*PEER REVIEWED\*\*

[American Conference of Governmental Industrial Hygienists TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, OH, 2008, p. 5] \*\*PEER REVIEWED\*\*

## NIOSH Recommendations:

Exposure to acetaldehyde has produced nasal tumors in rats and laryngeal tumors in hamsters, and exposure to malonaldehyde has produced thyroid gland and pancreatic islet cell tumors in rats.

NIOSH therefore recommends that acetaldehyde and malonaldehyde be considered potential occupational carcinogens in conformance with the OSHA carcinogen policy. Testing has not been completed to determine the carcinogenicity of ... **propionaldehyde**, ... /a/ related low-molecular-weight-aldehyde. However, the limited studies to date indicate that ... /this substance has/ chemical reactivity and mutagenicity similar to acetaldehyde and malonaldehyde. Therefore, NIOSH recommends that careful consideration should be given to reducing ... /exposure to this related aldehyde/. [NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)]  
\*\*PEER REVIEWED\*\*

[NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)] \*\*PEER REVIEWED\*\*

## Other Standards Regulations and Guidelines:

Workplace Environmental Exposure Level (WEEL): 8-hr Time-weighted Average (TWA) 20 ppm [American Industrial Hygiene Association. AIHA Emergency Response Planning Guidelines (ERPG) & Workplace Environmental Exposure Levels (WEEL). Fairfax, VA. 2008, p. 42] \*\*PEER REVIEWED\*\*

[American Industrial Hygiene Association. AIHA Emergency Response Planning Guidelines (ERPG) & Workplace Environmental Exposure Levels (WEEL). Fairfax, VA. 2008, p. 42] \*\*PEER REVIEWED\*\*

Manufacturing/Use Information:

## 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, as of May 24, 2001:  
<http://npirspublic.ceris.purdue.edu/ppis/>] \*\*PEER REVIEWED\*\*

[U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from, as of May 24, 2001:

<http://npirspublic.ceris.purdue.edu/ppis/>] \*\*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\*\*

[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.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*PEER REVIEWED\*\*

Reported uses (ppm): (FEMA, 2005)

### Reported uses (ppm): (FEMA, 2005)

Food Category	Ususal	Max.
Alcoholic beverages	3.00	6.11
Baked goods	10.58	16.37
Frozen dairy	8.10	14.05
Gelatins, puddings	8.85	17.89
Hard candy	1.52	1.52
Nonalcoholic beverages	3.55	5.98
Soft candy	8.35	13.70

[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 1617] \*\*PEER REVIEWED\*\*

[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 1617] \*\*PEER REVIEWED\*\*

Used as a synthetic flavoring...[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

### Manufacturers:

The Dow Chemical Co., 2030 Dow Center, Midland, MI 48642, (989) 636-1000; Production site: Texas City, TX 77592[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

Eastman Chemical Co., P.O. Box 511, Kingsport, TN 37662, (423) 229-2000; Chemical and Fibers Group; Production site: Longview, TX 75607[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

OXEА Corp., 1505 West LBJ Freeway, Suite 400, P.O. Box 810349, Dallas, TX 75381 (972) 443-8900; Production site: Bay City, TX 77404[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

[SRI Consulting. 2008 Directory of Chemical Producers United States. Menlo Park, CA 2008, p. 818] \*\*PEER REVIEWED\*\*

### Methods of Manufacturing:

Prepared by treating propyl alcohol with a bichromate oxidizing mixture; ... by passing propyl alcohol vapor over copper at high temp.[O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1345] \*\*PEER REVIEWED\*\*

[O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and

Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1345] \*\*PEER REVIEWED\*\*

Synthesis by ... dry distillation of barium propionate with calcium formate.[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 1617] \*\*PEER REVIEWED\*\*

[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 1617] \*\*PEER REVIEWED\*\*

(A) Oxidation of propyl alcohol with dichromate; (B) By passing alcohol over copper at elevated temperatures.[Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*PEER REVIEWED\*\*

[Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1047] \*\*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\*\*

[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\*\*

[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, as of May 24, 2001: <http://npirspublic.ceris.purdue.edu/ppis/>] \*\*PEER REVIEWED\*\*

[U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from, as of May 24, 2001: <http://npirspublic.ceris.purdue.edu/ppis/>] \*\*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.] \*\*PEER REVIEWED\*\*

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

## U. S. Production:

(1972) 5.3X10+10 GRAMS[SRI] \*\*PEER REVIEWED\*\*

[SRI] \*\*PEER REVIEWED\*\*

(1975) 5.94X10+10 GRAMS (EST)[SRI] \*\*PEER REVIEWED\*\*

[SRI] \*\*PEER REVIEWED\*\*

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

[USITC. SYN ORG CHEM-U.S. PROD/SALES 1984 p.255] \*\*PEER REVIEWED\*\*

Propanal is listed as a High Production Volume (HPV) chemical (65FR81686). Chemicals listed as HPV were produced in or imported into the U.S. in >1 million pounds in 1990 and/or 1994. The HPV list is based on the 1990 Inventory Update Rule. (IUR) (40 CFR part 710 subpart B; 51FR21438).

[EPA/Office of Pollution Prevention and Toxics; High Production Volume (HPV) Challenge Program. Available from the Database Query page at:

<http://www.epa.gov/hpv/pubs/general/opptsrch.htm> on Propanal (123-38-6) as of February 5, 2009]

\*\*PEER REVIEWED\*\*

[EPA/Office of Pollution Prevention and Toxics; High Production Volume (HPV) Challenge Program. Available from the Database Query page at:

<http://www.epa.gov/hpv/pubs/general/opptsrch.htm> on Propanal (123-38-6) as of February 5, 2009] \*\*PEER REVIEWED\*\*

Production volumes for non-confidential chemicals reported under the Inventory Update Rule.

Year	Production Range (pounds)
1986	>100 million - 500 million
1990	>100 million - 500 million
1994	>100 million - 500 million
1998	>100 million - 500 million
2002	>100 million - 500 million

[US EPA; Non-confidential Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Propanal (123-38-6). Available from, as of January 29, 2009: <http://www.epa.gov/oppt/iur/tools/data/2002-vol.html>] \*\*PEER REVIEWED\*\*

[US EPA; Non-confidential Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Propanal (123-38-6). Available from, as of January 29, 2009: <http://www.epa.gov/oppt/iur/tools/data/2002-vol.html>] \*\*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\*\*

[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\*\*

[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\*\* [PubMed Abstract](#)

[Kuwata K et al; J Chromatogr Sci 17 (5): 264-8 (1979)] \*\*PEER REVIEWED\*\* [PubMed Abstract](#)  
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\*\*

[Creech G et al; J Chromatogr Sci 20 (2): 67-72 (1982)] \*\*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\*\***

[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\*\***

[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\*\***

[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\*\***

[USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)] **\*\*PEER REVIEWED\*\***

Method: EPA-TSC/NERL 556; Procedure: gas chromatography with electron capture detector; Analyte: **propionaldehyde**; Matrix: finished drinking water and raw source water; Detection Limit: 0.41 ug/L.[National Environmental Methods Index; Analytical, Test and Sampling Methods.

Available from <http://www.nemi.gov> on **Propionaldehyde** (123-38-6) as of February 10, 2009]

**\*\*PEER REVIEWED\*\***

[National Environmental Methods Index; Analytical, Test and Sampling Methods. Available from <http://www.nemi.gov> on Propionaldehyde (123-38-6) as of February 10, 2009] **\*\*PEER REVIEWED\*\***

Method: EPA-OGWDW/TSC 556.1; Procedure: fast gas chromatography system equipped with an electron capture detector; Analyte: **propionaldehyde**; Matrix: finished drinking water and raw source water; Detection Limit: 0.11 ug/L.[National Environmental Methods Index; Analytical, Test and Sampling Methods. Available from <http://www.nemi.gov> on **Propionaldehyde** (123-38-6) as of February 10, 2009] **\*\*PEER REVIEWED\*\***

[National Environmental Methods Index; Analytical, Test and Sampling Methods. Available from <http://www.nemi.gov> on Propionaldehyde (123-38-6) as of February 10, 2009] **\*\*PEER REVIEWED\*\***

Method: NIOSH 2018; Procedure: high performance liquid chromatography with ultraviolet detection; Analyte: **propionaldehyde**; Matrix: air; Detection Limit: 0.3 ug/sample.[CDC; NIOSH Manual of Analytical Methods, 4th ed. **Propionaldehyde** (123-38-6). Available from, as of February 11, 2009: <http://www.cdc.gov/niosh/docs/2003-154/>] **\*\*PEER REVIEWED\*\***

[CDC; NIOSH Manual of Analytical Methods, 4th ed. Propionaldehyde (123-38-6). Available

from, as of February 11, 2009: <http://www.cdc.gov/niosh/docs/2003-154/>] \*\*PEER REVIEWED\*\*  
Method: NIOSH 2539; Procedure: gas chromatography, flame ionization detector and gas chromatography/mass spectrometry; Analyte: **propionaldehyde**; Matrix: air; Detection Limit: 2 ug/sample.[CDC; NIOSH Manual of Analytical Methods, 4th ed. **Propionaldehyde** (123-38-6). Available from, as of February 11, 2009: <http://www.cdc.gov/niosh/docs/2003-154/>] \*\*PEER REVIEWED\*\*

[CDC; NIOSH Manual of Analytical Methods, 4th ed. Propionaldehyde (123-38-6). Available from, as of February 11, 2009: <http://www.cdc.gov/niosh/docs/2003-154/>] \*\*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\*\*

[USEPA; EMMI. EPA's Environmental Monitoring Methods Index. Version 1.1. PC# 4082. Rockville, MD: Government Institutes (1997)] \*\*PEER REVIEWED\*\*

Synonyms and Identifiers:

## Synonyms:

ALDEHYDE PROPIONIQUE (FRENCH)[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*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, as of May 24, 2001: <http://npirspublic.ceris.purdue.edu/ppis/>] \*\*PEER REVIEWED\*\*

\*\*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\*\*

\*\*PEER REVIEWED\*\*

METHYLACETALDEHYDE[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

NCI-C61029[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPALDEHYDE[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPANAL[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPANALDEHYDE[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca



Raton, FL 2005, p. 1616] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPIONAL[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 161] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPIONIC ALDEHYDE[Burdock, G.A. (ed.). Fenaroli's Handbook of Flavor Ingredients. 5th ed. Boca Raton, FL 2005, p. 1616] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPYL ALDEHYDE[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

PROPYLIC ALDEHYDE[Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3069] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

n-Propanal[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

1-Propanal[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

\*\*PEER REVIEWED\*\*

1-Propanone[Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed. Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 1954] \*\*PEER REVIEWED\*\*

\*\*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, as of May 24, 2001: <http://npirspublic.ceris.purdue.edu/ppis/>] \*\*PEER REVIEWED\*\*

[U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Propionaldehyde (123-38-6). Available from, as of May 24, 2001: <http://npirspublic.ceris.purdue.edu/ppis/>] \*\*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.] \*\*PEER REVIEWED\*\*

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

20090817

**Last Review Date:**

Reviewed by SRP on 5/7/2009

**Update History:**

Field Update on 2014-12-05, 2 fields added/edited/deleted

Complete Update on 2009-08-17, 71 fields added/edited/deleted

Field Update on 2007-06-07, 1 fields added/edited/deleted

Field Update on 2006-04-18, 2 fields added/edited/deleted

Field Update on 2006-04-17, 2 fields added/edited/deleted

Complete Update on 02/14/2003, 1 field added/edited/deleted.

Complete Update on 11/08/2002, 1 field added/edited/deleted.

Complete Update on 10/16/2002, 1 field added/edited/deleted.

Complete Update on 08/06/2002, 1 field added/edited/deleted.

Complete Update on 04/19/2002, 69 fields added/edited/deleted.

Field Update on 01/14/2002, 1 field added/edited/deleted.

Field Update on 08/08/2001, 1 field added/edited/deleted.

Field Update on 05/15/2001, 1 field added/edited/deleted.

Complete Update on 06/12/2000, 1 field added/edited/deleted.

Complete Update on 02/08/2000, 1 field added/edited/deleted.

Complete Update on 02/02/2000, 1 field added/edited/deleted.

Complete Update on 01/13/2000, 2 fields added/edited/deleted.

Field Update on 11/18/1999, 1 field added/edited/deleted.

Field Update on 09/21/1999, 1 field added/edited/deleted.

Field Update on 08/26/1999, 1 field added/edited/deleted.

Complete Update on 06/02/1998, 1 field added/edited/deleted.

Complete Update on 02/27/1998, 1 field added/edited/deleted.

Complete Update on 10/20/1997, 1 field added/edited/deleted.

Complete Update on 04/07/1997, 2 fields added/edited/deleted.

Complete Update on 01/24/1997, 1 field added/edited/deleted.

Complete Update on 05/10/1996, 1 field added/edited/deleted.

Complete Update on 01/21/1996, 1 field added/edited/deleted.

Complete Update on 12/22/1994, 1 field added/edited/deleted.

Complete Update on 03/25/1994, 1 field added/edited/deleted.

Field update on 12/19/1992, 1 field added/edited/deleted.

Complete Update on 11/20/1992, 1 field added/edited/deleted.

Complete Update on 07/02/1992, 73 fields added/edited/deleted.

Complete Update on 10/10/1990, 1 field added/edited/deleted.

Complete Update on 04/16/1990, 1 field added/edited/deleted.

Field update on 03/06/1990, 1 field added/edited/deleted.

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

Complete Update on 05/26/1987

Created 19830401 by SYS