

**Type:** Excretion  
**Result:** The test substance had been detected in traces of human expired air and in the urine.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (154)

**Type:** Metabolism  
**Result:** The test substance is metabolized by microorganism via the malonyl succinate pathway. Only secondary literature; no further data.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (183)

**Type:** Metabolism  
**Result:** In mice, the test substance was converted to isopropanol and acetone following inhalation. In the presence of microsomes prepared from liver homogenate of mice, the test substance was converted in vitro to isopropanol, too. The oxidation of isopropanol to acetone occurred in the presence of alcohol dehydrogenase. The metabolites were detected in blood, liver, kidney and brain of the exposed mice. Only secondary literature; no further data.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (184) (185)

**Type:** other  
**Remark:** Narkotisierte Rhesusaffen (Macaca mulatta) wurde ueber kuenstliche Beatmung 10 bzw. 20 % Propan fuer 5 bzw. 15 min. zugesetzt. Je 3 Tiere wurden untersucht. Die Behandlung hatte keinen Effekt auf die untersuchten Parameter: Herzfrequenz, myokardiale Kontraktilitaet und Blutdruck. Bronchialverengung und Atemdepression wurden aufgrund der Behandlung beschrieben.  
**Source:** BASF AG Ludwigshafen (186) (187)

**Type:** other  
**Remark:** Propan wurde bezueglich der Neurotoxitzaet ein "risk index" von 2 gegeben. (Skala 1 - 5, 5 = staerkste Wirkung), wobei die Kriterien der Zuordnung nicht dargestellt wurden.  
**Source:** BASF AG Ludwigshafen (188)

**Type:** other  
**Remark:** In dieser Studie die " Cardiac Sensitization " von Hunden (Beagle) untersucht. Die Tiere erhielten 0.008 mg/kg Epinephrin (Adrenalin) i.v.. Danach wurden die Tiere gegenueber Propan (5; 10; 20 % V/V) inhalativ exponiert. Danach wurde wiederum i.v. Epinephrin appliziert. Die Zahl der "marked responses" (Arrhythmien) wurde bestimmt. Propan induziert dosisabhaengig Ereignisse. Die Autoren sehen darin die Faehigkeit das Saeugerherz gegenueber Epinephrin zu sensibilisieren.  
**Source:** BASF AG Ludwigshafen

(189)

**Type:** other  
**Remark:** In einem Sekundaerzitat wird beschrieben, dass befruchtete Huehnereier, die 20 Stunden gegenueber "natural gases" (= 95 % Methan, 4 % Ethan-Propan-Butan, 1 % Stickstoff) exponiert und insgesamt 4 Tage inkubiert wurden. Missbildungen wie Spina bifida und Hemimelie wurden beschrieben.

**Source:** Keine weiteren Angaben.  
 BASF AG Ludwigshafen

(190)

**Type:** other  
**Remark:** Propan wurde bezueglich der Neurotoxizitaet ein "risk index" von 2 gegeben. (Skala 1 - 5, 5 = staerkste Wirkung), wobei die Kriterien der Zuordnung nicht dargestellt wurden.

**Source:** BASF AG Ludwigshafen

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**Remark:** In dieser Studie die " Cardiac Sensitization " von Hunden (Beagle) untersucht. Die Tiere erhielten 0.008 mg/kg Epinephrin (Adrenalin) i.v.. Danach wurden die Tiere gegenueber Propan (5; 10; 20 % V/V) inhalativ exponiert. Danach wurde wiederum i.v. Epinephrin appliziert. Die Zahl der "marked responses" (Arrhythmien) wurde bestimmt. Propan induziert dosisabhaengig Ereignisse. Die Autoren sehen darin die Faehigkeit das Saeugerherz gegenueber Epinephrin zu sensibilisieren.

**Source:** BASF AG Ludwigshafen

(191) (189)

**Type:** other  
**Remark:** In einem Sekundaerzitat wird beschrieben, dass befruchtete Huehnereier, die 20 Stunden gegenueber "natural gases" (= 95 % Methan, 4 % Ethan-Propan-Butan, 1 % Stickstoff) exponiert und insgesamt 4 Tage inkubiert wurden. Missbildungen wie Spina bifida und Hemimelie wurden beschrieben.

**Source:** Keine weiteren Angaben.  
 BASF AG Ludwigshafen

(190)

**Type:** other  
**Remark:** Title:

"Abuse of inhalants: a review"

This publication reviews the health effects of "sniffed" or "huffed" inhalants; propane among others. No toxicological data on the test substance are given.

**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data

(192)

- Type:** other: anesthetic effect  
**Result:** The anesthetic potency of the test substance was assessed in 5 rats. Thus, the rats were exposed by inhalation to the test substance and the minimal anesthetic concentration (MAC) was determined. Anesthesia was defined by absence of movement in response to tail clamp or electric stimulation and the inspired concentrations just permitting and preventing movements were averaged to give an estimate of MAC. According to the authors, the MAC of propane was 0.94+-0.12 atm.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; according to the authors, purity was >97% (193)
- Type:** other: cardiac sensitization  
**Result:** Cardiac sensitization to epinephrine-induced arrhythmias had been reported in dogs at concentrations between 15 and 90% (ca. 275-1650 mg/l) in oxygen and in mice at 10% (ca. 183 mg/l). Only secondary literature; no further data.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (194) (195)
- Type:** other: cytotoxicity and mutagenicity  
**Result:** The test substance reduced the viable cell count in Escherichia coli and produced biochemical mutations, but is not mutagenic in the Ames system. Only secondary literature; no further data.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (196)
- Type:** other: general toxic effect  
**Result:** The test substance is an anesthetic. At very high levels, propane has CNS depressant and asphyxiating properties.  
**Source:** BASF AG Ludwigshafen  
**Test substance:** propane; no further data (159) (136)
- Type:** other: human  
**Remark:** Beim Menschen fuehrte die kurzzeitige Exposition gegenueber 10000 ppm zu keiner Wirkung; 100000 ppm bewirkten Schwindelgefuehl.  
Nur Sekundaerzitat liegt vor.  
**Source:** BASF AG Ludwigshafen (197)
- Type:** other: review  
**Source:** BASF AG Ludwigshafen (198) (134) (154) (159) (136)

**5.11 Experience with Human Exposure**

- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.
- Source:** Compañía Española de Petroleos CEPSA Madrid (199)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
- Source:** Compañía Española de Petroleos CEPSA Madrid (200)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
- Source:** Compañía Española de Petroleos CEPSA Madrid (201)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
- Source:** Compañía Española de Petroleos CEPSA Madrid (201)
- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.
- Source:** Texaco Ltd Pembroke-Dyfed (202)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
- Source:** Texaco Ltd Pembroke-Dyfed (203)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
- Source:** Texaco Ltd Pembroke-Dyfed (204)

- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.  
**Source:** Texaco Ltd Pembroke-Dyfed (204)
- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.  
**Source:** OK Raffinaderi AB Göteborg (202)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.  
**Source:** OK Raffinaderi AB Göteborg (203)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.  
**Source:** OK Raffinaderi AB Göteborg (204)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.  
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- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.  
**Source:** Skandinaviska Raffinaderi AB Lysekil (202)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.  
**Source:** Skandinaviska Raffinaderi AB Lysekil (203)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.  
**Source:** Skandinaviska Raffinaderi AB Lysekil (204)

- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.  
**Source:** Skandinaviska Raffinaderi AB Lysekil (204)
- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.  
**Source:** Phillips Petroleum Company Norway Tananger (205)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.  
**Source:** Phillips Petroleum Company Norway Tananger (206)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.  
**Source:** Phillips Petroleum Company Norway Tananger (207)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.  
**Source:** Phillips Petroleum Company Norway Tananger (207)
- Remark:** Die akute Exposition gegenueber 250, 500 oder 1000 ppm Propan fuer 1 Minute bis zu 8 Stunden fuehrte bei Probanden zu keinen Gesundheitsstoerungen.  
**Source:** BASF AG Ludwigshafen (208)
- Remark:** Fallbericht ueber Einwirkung von Propan bei Beschaeftigten in der Fluessiggasabfuellung. Es wurden trochner Hals, Husten, Erregung und Drehschwindel beobachtet. In einem Fall wurden epileptische Symptome und ein weiterer Fall wurde mit vegetativer Dystonie in die Klinik eingewiesen. Es traten Gastritis und Duodenitis und EKG-Veraenderungen auf.  
**Source:** BASF AG Ludwigshafen (209)
- Remark:** Fallbericht ueber Hautveraetzung durch fluessiges Propan.  
**Source:** BASF AG Ludwigshafen (210)
- Remark:** Fallbericht ueber Gasembolie mit einem Propan-Butan-Gasgemisch durch Stichverletzung.  
**Source:** BASF AG Ludwigshafen (211)

- Remark:** Bericht ueber Todesfall nach Asphyxie durch Propan. Propan konnte in Blut, Gehirn, Niere, Leber und Lunge nachgewiesen werden.
- Source:** BASF AG Ludwigshafen (212)
- Remark:** Bericht ueber Toderfall nach Propan-Intoxikation.
- Source:** BASF AG Ludwigshafen (213)
- Remark:** Fallbericht ueber Asphyxie durch Propangaseinwirkung.
- Source:** BASF AG Ludwigshafen (214)
- Remark:** Bericht ueber zwei Faelle von Hautveraetzungen nach Einwirkung von fluessigem Propan.
- Source:** BASF AG Ludwigshafen (215)
- Remark:** Bericht ueber Todesfall nach Intoxikation mit einem Propan-Butan-Gasgemisch.
- Source:** BASF AG Ludwigshafen (216)
- Remark:** Fallbericht ueber Hautveraetzung durch fluessiges Propan.
- Source:** BASF AG Ludwigshafen (217)
- Remark:** Fallbericht ueber Einwirkung von Propan, das aus einem Autotank entwich. Es traten Koliken, Erregung, Pupillenverengung, Speichelfluss und retrograde Amnesie auf. Fallbericht ueber Einwirkung von Propan, das aus einer Dichtung entwich, bei 5 Frauen. Es traten Kopfschmerzen, Taubheitsgefuehl, Schuettelfrost und Erbrechen auf.
- Source:** BASF AG Ludwigshafen (218)
- Remark:** Bei 125 Probanden, die kosmetische Produkte benutzen, die als Treibmittel Propan und Isobutan enthielt, traten keine Hautreizungen auf.
- Source:** BASF AG Ludwigshafen (219)
- Remark:** Fallbericht ueber einen 17 jaehrigen Jungen, der ueber einen Zeitraum von 6 Monaten regelmaessig Propan schnueffelte. Unter der Inhalation traten Euphorie, Ataxie und Schwindel auf. Dauernde Schaeden wurden nicht beobachtet.
- Source:** BASF AG Ludwigshafen (220)
- Remark:** Die akute Exposition gegenueber 250, 500 oder 1000 ppm Propan fuer 1 Minute bis zu 8 Stunden fuehrte bei Probanden zu keinen Gesundheitsstoerungen.
- Source:** BASF AG Ludwigshafen (208)

- Remark:** Fallbericht ueber Einwirkung von Propan bei Beschaeftigten in der Fluessiggasabfuellung. Es wurden trochner Hals, Husten, Erregung und Drehschwindel beobachtet. In einem Fall wurden epileptischê Symptome und ein weiterer Fall wurde mit vegetativer Dystonie in die Klinik eingewiesen. Es traten Gastritis und Duodenitis und EKG-Veraenderungen auf.
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- Source:** BASF AG Ludwigshafen (220)
- Remark:** A 26-year-old male committed suicide by inducing asphyxia using a combination of plastic bag suffocation and propane-gas inhalation. Autopsy findings were consistent with a hypoxic event, and blood, brain, and lung tissue tested positive for propane by gas chromatography. Propane, while possessing some narcotic properties, causes death primarily by displacing oxygen in the atmosphere with resultant asphyxia.
- Source:** BASF AG Ludwigshafen (221)
- Remark:** "Burn-like" propane thermal injury is produced by evaporative heat loss causing damage to vital structures. Acute appearance is that of heat burn with progressive vascular compromise. Histopathologic study demonstrates epidermal and dermal necrosis followed by vascular thrombosis.
- Source:** BASF AG Ludwigshafen (222)

- (126) Numerica Data Base, QSAR, Institute for Process Analysis, Montana State University, 1993.
- (127) Clark, D.G. and Tinston, D.J.; Acute inhalation toxicity of some halogenated and non-halogenated hydrocarbons, Human Toxicol., vol. 1, pp. 239-247, 1982.
- (128) Shugaev, B.B., Concentrations of hydrocarbons in tissues as a measure of toxicity, Arch. Environ. Health, vol. 18, pp. 878-882, 1969.
- (129) Clark, D.G. and Tinston, D.J., Acute inhalation toxicity of some halogenated and non-halogenated hydrocarbons, Human Toxicol., vol. 1, pp. 239-247, 1982.
- (130) Shugaev, B.B., Concentrations of hydrocarbons in tissues as a measure of toxicity, Arch. Environ. Health, vol. 18, pp. 878-882, 1969.
- (131) Clark, D.G. and Tinston, D.J., Acute inhalation toxicity of some halogenated and non-halogenated hydrocarbons, Human Toxicol., vol. 1, pp. 239-247, 1982.
- (132) Shugaev, B.B., Concentrations of hydrocarbons in tissues as a measure of toxicity, Arch. Environ. Health, vol. 18, pp. 878-882, 1969.
- (133) Clark D.G. und Tinston D.J.: Human. Toxicol., 1, 239-247, (1982)
- (134) Beratergremium fuer umweltrelevante Altstoffe (BUA) der Gesellschaft Deutscher Chemiker: BUA-Stoffbericht Nr. 144, S. Hirzel Wissenschaftliche Verlagsgesellschaft, Stuttgart (1994)
- (135) Clark, D.G. and Tinston, D.J.: Human. Toxicol. 1, 239-247, (1982)
- (136) Concawe, Petroleum Products and Health Management Groups: "Liquefied petroleum gas", product dossier no. 92/102, Brussels, june 1992
- (137) Friedman, J.A., Cammarato, M. and Aviado, D.M., Toxicology of aerosol propellants on the respiratory and circulatory systems. II: Respiratory and bronchopulmonary effects in the rat, Toxicology, vol. 1, pp. 345-355, 1973.
- (138) Friedman, J.A., Cammarato, M. and Aviado, D.M., Toxicology of aerosol propellants on the respiratory and circulatory systems. II: Respiratory and bronchopulmonary effects in the rat, Toxicology, vol. 1, pp. 345-355, 1973.

- (139) Friedman, J.A., Cammarato, M. and Aviado, D.M., Toxicology of aerosol propellants on the respiratory and circulatory systems. II: Respiratory and bronchopulmonary effects in the rat, Toxicology, vol. 1, pp. 345-355, 1973.
- (140) Anon.: J. Am. Coll. Toxicol 1, 127-142 (1982);  
cited in: Berzins, T.: "Propane", National Chemicals Inspectorate, Hazard and Risk Assessment Division, Solna, Sweden, January 1994
- (141) Aviado, D.M.: "Toxicity of Propellants", AMRL-TR-73-125, paper no. 23; pp. 291-345
- (142) Brown, W.E. and Henderson, V.E.: J. Pharmacol. Exp. Ther. 27, 1 (1925);  
cited in: Clayton, G.D. and Clayton, F.E. (eds.): Patty's Ind. Hyg. Toxicol., Vol IIB, 3rd ed., John Wiley & Sons, Inc., New York (1994), pp. 1221-1261
- (143) Nuckolls, A.H.: Underwriters Laboratory Report No. 2375, Nov. 13, 1933;  
cited in: Documentation of the Threshold Limit Value: Propane (1992)
- (144) Clark D.G. und Tinston D.J.: Human Toxicol., 1, 239-247, (1982)
- (145) Clark, D.G. and Tinston, D.J.: Human Toxicol. 1, 239-247, (1982)
- (146) Reinhardt, C.F. et al.: Arch. Environ. Health 22, 265-279 (1971);  
cited in: Beratergremium fuer umweltrelevante Altstoffe (BUA) der Gesellschaft Deutscher Chemiker: BUA-Stoffbericht Nr. 144, S. Hirzel Wissenschaftliche Verlagsgesellschaft, Stuttgart (1994)
- (147) Krantz, J.C. (Jnr), Carr, C.J. and Vitcha, J.F., AnaesthesiaXXXI - A study of cyclic and non-cyclic hydrocarbons on cardiac automaticity, J. Pharm. Exp. Therap., vol. 94, pp. 315-318, 1948.
- (148) Krantz, J.C. (Jnr), Carr, C.J. and Vitcha, J.F., Anaesthesia XXXI - A study of cyclic and non-cyclic hydrocarbons on cardiac automaticity, J. Pharm. Exp. Therap., vol. 94, pp. 315-318, 1948.
- (149) Krantz, J.C. (Jnr), Carr, C.J. and Vitcha, J.F., Anaesthesia XXXI - A study of cyclic and non-cyclic hydrocarbons on cardiac automaticity, J. Pharm. Exp. Therap., vol. 94, pp. 315-318, 1948.

- (150) Aviado, D.D.: Prog. Drug Res. 18, 365-397 (1974);  
cited in: Berzins, T.: "Propane", National Chemicals  
Inspectorate, Hazard and Risk Assessment Division,  
Solna, Sweden, January 1994
- (151) Aviado, D.M. et al.: Non-fluorinated propellants and  
solventfor aerosols, CRC Press, Cleveland, Ohio (1977);  
cited in: - Concawe, Petroleum Products and Health  
Management Groups: "Liquefied petroleum gas",  
product dossier no. 92/102, Brussels, june 1992  
- Clayton, G.D. and Clayton, F.E. (eds.): Patty's  
Ind. Hyg. Toxicol., Vol. IIB, 3rd ed., John  
Wiley & Sons, Inc.; New York (1994), pp.  
1221-1261
- (152) Krantz, C.J. Jr. et al: J. Pharmacol. Exp. Ther. 94, 315  
(1948);  
cited in: Clayton, G.D. and Clayton, F.E. (eds.): Patty's  
Ind. Hyg. Toxicol., Vol IIB, 3rd ed., John Wiley &  
Sons, Inc., New York (1994), pp. 1221-1261
- (153) Underwriters' Laboratories: Report on the Comparative Life,  
Fire and Explosion Hazards of Common Refrigerants, No. 2375,  
(1933) zitiert in Documentation of the Threshold Limit  
Values, Propane, ohne Datumsangabe
- (154) Berzins, T.: "Propane", National Chemicals Inspectorate,  
Hazard and Risk Assessment Division, Solna, Sweden, January  
1994
- (155) Nuckolls, A.H.: Underwriters Laboratory Report No. 2375,  
Nov. 13, 1933;  
cited in: - Clayton, G.D. and Clayton, F.E. (eds.): Patty's  
Ind. Hyg. Toxicol., Vol IIB, 3rd ed., John Wiley  
& Sons, Inc., New York (1994), pp. 1221-1261  
- Documentation of the Threshold Limit Value:  
Propane (1992)
- (156) Sandmeyer, E.E. in: Clayton, G.D. and Clayton, F.E. (eds.):  
Patty's Ind. Hyg. Toxicol. 3rd rev. ed. Vol. 2B, John  
wiley, New York (1981), pp. 3175-3220;  
cited in: Concawe, Petroleum Products and Health Management  
Groups: "Liquefied petroleum gas", product dossier  
no. 92/102, Brussels, june 1992
- (157) Aviado, D.M. and Smith, D.G.: Toxicology 3, 241-252, (1975)
- (158) Aviado, D.M.: Toxicology 3, 321-332, (1975)
- (159) Clayton, G.D. and Clayton, F.E. (eds.): Patty's Ind. Hyg.  
Toxicol., Vol IIB, 3rd ed., John Wiley & Sons, Inc., New  
York (1994), pp. 1221-1261

- (160) Patty's Ind. Hyg. and Toxicol., Vol. 2B, 3rd Edition, 3181-3182, (1981)
- (161) Grant, W.M., Toxicology of the Eye, 2nd edition, Charles C. Thomas, Springfield, Ill, 1974.
- (162) Grant, W.M., Toxicology of the Eye, 2nd edition, Charles C. Thomas, Springfield, Ill, 1974.
- (163) Grant, W.M., Toxicology of the Eye, 2nd edition, Charles C. Thomas, Springfield, Ill, 1974.
- (164) Patty's Ind. Hyg. and Toxicol., Vol. 2B, 3rd Edition, 3181-3182, (1982)
- (165) Patty's Ind. Hyg. and Toxicol., Vol. 2B, 3rd Edition, 3181-3182, (1982)
- (166) Aranyi, C. et al., Absence of hydrocarbon-induced nephropathy in rats exposed sub-chronically to volatile hydrocarbon mixtures pertinent to gasoline, Toxicol. Ind. Health, vol. 2, pp. 85-98, 1986.
- (167) Halder, C.A. et al., Gasoline vapour exposures. Part II. Evaluation of the nephrotoxicity of the major C4/C5 hydrocarbon components, J. Am. Ind. Hyg. Assoc., vol. 47, pp. 173-175, 1986.
- (168) Aranyi, C. et al., Absence of hydrocarbon-induced nephropathy in rats exposed sub-chronically to volatile hydrocarbon mixtures pertinent to gasoline, Toxicol. Ind. Health, vol. 2, pp. 85-98, 1986.
- (169) Halder, C.A. et al., Gasoline vapour exposures. Part II. Evaluation of the nephrotoxicity of the major C4/C5 hydrocarbon components, J. Am. Ind. Hyg. Assoc., vol. 47, pp. 173-175, 1986.
- (170) Aranyi, C. et al., Absence of hydrocarbon-induced nephropathy in rats exposed sub-chronically to volatile hydrocarbon mixtures pertinent to gasoline, Toxicol. Ind. Health, vol. 2, pp. 85-98, 1986.
- (171) Halder, C.A. et al., Gasoline vapour exposures. Part II. Evaluation of the nephrotoxicity of the major C4/C5 hydrocarbon components, J. Am. Ind. Hyg. Assoc., vol. 47, pp. 173-175, 1986.
- (172) Kirwin C.J. und Thomas W.C.: J. Soc. Cosmet. Chem., 31, 367-370; (1980)
- (173) Kirwin, C.J. and Thomas, W.C., In-vitro microbiological mutagenicity studies of hydrocarbon propellants, J. Soc. Cos. Chem., vol. 31, pp. 367-370, 1980.

- (174) Kirwin, C.J. and Thomas, W.C., In-vitro microbiological mutagenicity studies of hydrocarbon propellants, J. Soc. Cos. Chem., vol. 31, pp. 367-370, 1980.
- (175) Kirwin, C.J. and Thomas, W.C., In-vitro microbiological mutagenicity studies of hydrocarbon propellants, J. Soc. Cos. Chem., vol. 31, pp. 367-370, 1980.
- (176) Kirwin, C.J. and Thomas, W.C.: J. Soc. Cosmet. Chem. 31, 367-370 (1980)
- (177) TSCAT: OTS 206114, Doc. I.D.: 878211327, SRI Intl. for Minnesota Mining & MFG Co., 01-01-80
- (178) UK Health and Safety Executive, 1,3-Butadiene and Related Compounds, Toxicity Review No. 11, HMSO, London, 1985.
- (179) UK Health and Safety Executive, 1,3-Butadiene and Related Compounds, Toxicity Review No. 11, HMSO, London, 1985.
- (180) UK Health and Safety Executive, 1,3-Butadiene and Related Compounds, Toxicity Review No. 11, HMSO, London, 1985.
- (181) Low, K.L. et al.: "n-Propane"; in: Snyder, R. (ed.): Ethel Browning's Toxicity and Metabolism of Industrial Solvents, Vol. 1, 2nd ed., Elsevier, Science Publishers, B.V. Amsterdam (1987); pp. 261-266;  
cited in: Berzins, T.: "Propane", National Chemicals Inspectorate, Hazard and Risk Assessment Division, Solna, Sweden, January 1994
- (182) Haq, M.Z. and Hameli, A.Z.: J. Forensic Sci. 25, 25-28 (1980);  
cited in: Berzins, T.: "Propane", National Chemicals Inspectorate, Hazard and Risk Assessment Division, Solna, Sweden, January 1994
- (183) Vestal, J.R. and Perry, J.J.: J. Bacteriol. 99 (1), 216 (1969);  
cited in: Clayton, G.D. and Clayton, F.E. (eds.): Patty's Ind. Hyg. Toxicol., Vol IIB, 3rd ed., John Wiley & Sons, Inc., New York (1994), pp. 1221-1261
- (184) Tsukamoto, S. et al.: J. Toxicol. Sci. 10, 323-332 (1985);  
cited in: Beratergremium fuer umweltrelevante Altstoffe (BUA) der Gesellschaft Deutscher Chemiker: BUA-Stoffbericht Nr. 144, S. Hirzel Wissenschaftliche Verlagsgesellschaft, Stuttgart (1994)
- (185) Tsukamoto, S. et al.: Jpn. J. Legal Med. 39, 125-130 (1985);  
cited in: Beratergremium fuer umweltrelevante Altstoffe (BUA) der Gesellschaft Deutscher Chemiker: BUA-Stoffbericht Nr. 144, S. Hirzel Wissenschaftliche Verlagsgesellschaft, Stuttgart (1994)

- (186) Aviado D.M. und Smith D.G.: *Toxicology*, 3, 241-252, (1975)
- (187) Aviado D.M.: *Toxicology*, 3, 321-332, (1975)
- (188) Simonsen L. und Lund P.S.: *Am. J. Ind. Med.*, 21, 773-792, (1992)
- (189) TSCAT: OTS0514917, New Doc. I.D. 86-870001015, 07.11.1969
- (190) Hoffmann D.J.: *Reviews of Environmental Contamination and Toxicology*, Vol. 115, 39-89, (1990)
- (191) TSCAT: OTS 0520985, Doc. I.D.: 86-890000870, Haskell Laboratories for E.I. Dupont de Nemours & Co., 11-07-69
- (192) Dinwiddie, S.H.: *Addiction* 89, 925-939 (1994)
- (193) Eger, E.I. et al.: *Anesth. Analg.* 79, 245-251 (1994)
- (194) Aviado, D.M. *Toxicology* 3, 321-332 (1975);  
cited in: Concawe, Petroleum Products and Health Management Groups: "Liquefied petroleum gas", product dossier no. 92/102, Brussels, june 1992
- (195) Krantz, J.C. jr. et al.: *J. Pharm. Exp. Ter.* 94, 215-318 (1948);  
cited in: Concawe, Petroleum Products and Health Management Groups: "Liquefied petroleum gas", product dossier no. 92/102, Brussels, june 1992
- (196) Landry, M.M. and Fuerst, R.: *Dev. Ind. Microbiol.* 9, 370 (1968);  
cited in: Clayton, G.D. and Clayton, F.E. (eds.): *Patty's Ind. Hyg. Toxicol.*, Vol IIB, 3rd ed., John Wiley & Sons, Inc., New York (1994), pp. 1221-1261
- (197) *Patty, Ind. Hyg. and Toxicology*, Vol. 2, (1967) zitiert in Verschueren K.: *Handbook of Environmental Data on Organic Chemicals*, 2nd. ed.
- (198) Baxter, P.J. in: Raffle, P.A.B. et al. (eds.): *Hunter's Diseases of Occupations*, 8th ed., Edward Arnold Publishers, London (1994), pp. 213-267
- (199) Ikoma, T., *Nichidai Igaku Zasshi*, vol. 31, no. 2, p. 71, 1972.
- (200) Steward, R.D. et al, *Scand. J. Work Environ. Health*, vol. 3, no. 4, p. 243, 1977.
- (201) Aviado, D.M., Zakhari, S. and Wanatabe, T., *Non-fluorinated Propellants and Solvents for Aerosols*, CRC Press, Cleveland, Ohio, 1977.

- (202) Ikoma, T., *Nichidai Igaku Zasshi*, vol. 31, no. 2, p. 71, 1972.
- (203) Steward, R.D. et al, *Scand. J. Work Environ. Health*, vol. 3, no. 4, p. 243, 1977.
- (204) Aviado, D.M., Zakhari, S. and Wanatabe, T., *Non-fluorinated Propellants and Solvents for Aerosols*, CRC Press, Cleveland, Ohio, 1977.
- (205) Ikoma, T., *Nichidai Igaku Zasshi*, vol. 31, no. 2, p. 71, 1972.
- (206) Steward, R.D. et al, *Scand. J. Work Environ. Health*, vol. 3, no. 4, p. 243, 1977.
- (207) Aviado, D.M., Zakhari, S. and Wanatabe, T., *Non-fluorinated Propellants and Solvents for Aerosols*, CRC Press, Cleveland, Ohio, 1977.
- (208) Stewart, R., D., et al; *Environ. Health Pers.* 26, 275-285, (1978)
- (209) Ambrosio, L., Inserra, A., Sfogliano, C.; *Folia Medica* 51, 14-32, (1968)
- (210) Santoni, R.; *Unfallheilkunde* 82, 387-388, (1979)
- (211) Balogh, I., Bellus, Radvanyi, P.; *Morphol. Igazsagugyi Orv. Sz.* 20, 45-48, (1980)
- (212) Haq, M., Z., Haemli, A., Z.; *J. Forensic Sci.* 25, 25-28, (1980)
- (213) Rauschke, J., Harzer, K.; *Arch. Kriminol.* 171, 76-77, (1983)
- (214) Imami, R., H., Kemal, M.; *Am. J. Forensic Med. Pathol.* 7, 76-77, (1986)
- (215) James, N., K., Moss, A., L., H.; *Br. Med. J.* 299, 950-951, (1989)
- (216) Siegel, E., Wason, S.; *N. Engl. J. Med.* 323, 1638, (199)
- (217) Corn, C., C., Wachtel, T., L., Malone, J., M., Wood, M.; *J. Burn care Rehabil.* 12, 136-139, (1991)
- (218) ACGIH; *Documentation of TLV-values*, 3rd. ed., Cincinnati, (1971)
- (219) Synder, R. (ed); *Ethels Browning's Toxicity and Metabolism of Industrial Solvents*, 2nd ed., Elsevier, Amsterdam, p265, (1987)



6. References

- (220) Wheeler, M., G., Rozycki, A., A., Smith, R., P.; Clin. Toxicol. 30, 135-139, (1992)
- (221) Avis, S., P., Archibald, J., T.; J. Forensic Sci. 39, 253-256, (1994)
- (222) Matook, G., M., et al; J. Trauma 37, 318-321, (1994)



# PROPANE

資料P-9(CHRIS)

## CHRIS – Chemical Hazard Response Information System

### 0. OVERVIEW

#### Material name

PROPANE  
CHRIS Code PRP

#### Common synonyms

Dimethylmethane

#### Characteristics

Liquefied flammable gas Colorless Odorless—may have skunk odor added  
Liquid floats and boils on water. Flammable visible vapor  
cloud is produced.

#### Emergency Actions

Evacuate.  
Keep people away.  
Avoid contact with liquid and gas.  
Avoid inhalation.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to ``knock down" vapor.  
Notify local health and pollution control agencies.

#### Fire

FLAMMABLE.  
Containers may explode in fire.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Stop flow of gas if possible.  
Cool exposed containers and protect men effecting shut-off with water.  
Let fire burn.

#### Exposure

CALL FOR MEDICAL AID.  
VAPOR  
Not irritating to eyes, nose or throat.  
If inhaled, will cause dizziness, difficult breathing, or  
loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
LIQUID  
May cause frostbite.

Flush affected areas with plenty of water.  
DO NOT RUB AFFECTED AREAS.

### Water Pollution – General

Not harmful to aquatic life.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

## 2. CHEMICAL DESIGNATIONS

CG Compatibility Group: 31; Paraffin  
Formula:  $\text{CH}_3\text{CH}_2\text{CH}_3$   
IMO/UN Designation: 2.0/1978  
DOT ID Number: 1978  
CAS Registry Number: 74-98-6  
NAERG Guide Number: 115  
Standard Industrial Trade Classification: 51114

## 3. HEALTH HAZARDS

**Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations of gas.  
**Symptoms Following Exposure:** Vaporizing liquid may cause frostbite. Concentrations in air greater than 10% cause dizziness in a few minutes. 1% concentrations give the same effect in 10 min. High concentrations cause asphyxiation.  
**Treatment of Exposure:** Remove to open air. If victim is overcome by gas, apply artificial respiration. Guard against self-injury if confused.  
**TLV-TWA:** Not listed.  
**TLV-STEL:** Not listed.  
**TLV-Ceiling:** Not listed.  
**Toxicity by Ingestion:** Not pertinent  
**Toxicity by Inhalation:** Currently not available.  
**Chronic Toxicity:** None  
**Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
**Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly.  
**Odor Threshold:** 5,000–20,000 ppm  
**IDLH Value:** 2,100 ppm  
**OSHA PEL-TWA:** 1,000 ppm  
**OSHA PEL-STEL:** Not listed.  
**OSHA PEL Ceiling:** Not listed.  
**EPA AEGL:** Not listed.

## 4. FIRE HAZARDS

**Flash Point:**  $-156^{\circ}$  F C.C. (gas)  
**Flammable Limits in Air:** 2.1%–9.5%  
**Fire Extinguishing Agents:** Stop flow of gas. For small fires use dry chemicals. Cool adjacent areas with water spray.