

PRINT DETAILED INDENTED CONTINUOUS

HAZARDOUS SUBSTANCES	169
DATABANK NUMBER	
LAST REVISION DATE	850524
RECORD LENGTH	69968
NAME OF SUBSTANCE	VINYL CHLORIDE
CAS REGISTRY NUMBER	75-01-4
SYNONYMS	CHLORETHENE
SYNONYMS	CHLORETHYLENE
SYNONYMS	CHLOROETHENE
SYNONYMS	CHLOROETHYLENE
SYNONYMS	CHLORURE DE VINYLE (FRENCH)
SYNONYMS	CLORURO DE VINILE (ITALIAN)
SYNONYMS	ETHYLENE MONOCHLORIDE
SYNONYMS	ETHYLENE, CHLORO-
SYNONYMS	MONOCHLOROETHENE
SYNONYMS	MONOCHLOROETHYLENE
SYNONYMS	TROVIDUR
SYNONYMS	VC
SYNONYMS	VCM
SYNONYMS	VINILE (CLORURO DI) (ITALIAN)
SYNONYMS	VINYL C MONOMER
SYNONYMS	VINYL CHLORIDE MONOMER
SYNONYMS	VINYLCHLORID (GERMAN)
SYNONYMS	VINYLE(CHLORURE DE) (FRENCH)
SYNONYMS	WINYLU CHLOREK (POLISH)
MOLECULAR FORMULA	C2-H3-Cl
RISWESSER LINE NOTATION	GIU1
RT NUMBER	NIOSH/KU9625000
OHM-TADS NUMBER	7216947
SHIPPING NAME/NUMBER -	UN1086
DOT/UN/NA/IMCO	
HTCC NUMBER	4905792
IPA HAZARDOUS WASTE	U043
NUMBER	
RELATED HSDB RECORDS	1995 [1,1-DICHLOROETHYLENE]
RELATED HSDB RECORDS	149 [1,2-DICHLOROETHYLENE]
RELATED HSDB RECORDS	5131 [1,1-DICHLOROPROPANE]
RELATED HSDB RECORDS	1102 [1,2-DICHLOROPROPANE]
RELATED HSDB RECORDS	5482 [1,3-DICHLOROPROPANE]
METHODS OF MANUFACTURING	CRACKING OF ETHYLENE DICHLORIDE OBTAINED VIA OXYCHLORINATION OR DIRECT CHLORINATION OF ETHYLENE; VAPOR-PHASE REACTION OF ACETYLENE & HYDROGEN CHLORIDE IN THE PRESENCE OF MERCURIC CHLORIDE [SRI]
METHODS OF MANUFACTURING	PREPN: FROM ETHYLENE DICHLORIDE AND ALCOHOLIC POTASSIUM: REGNAULT, ANN 14, 22 (1835); BY HALOGENATION OF ETHYLENE: MILLER, JENKS, US PATENT 2,896,000 (1959 TO NATIONAL DISTILLERS & CHEM CORP). COMPREHENSIVE MONOGRAPH ON TOXICITY OF VINYL CHLORIDE: ANN NY ACAD SCI 246, 1 (1975). [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 1283]
IMPORTITIES	Inhibitors such as phenol are added to prevent polymerization. [General Electric Co; Material Safety Data Sheet #382 (1979)]

R&S 139671

FORMULATIONS/PREPARATIONS

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OTHER MANUFACTURING INFORMATION

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...SOMETIMES STABILIZED BY ADDING HYDROQUINONE, BUTYL CATECHOL, OR PHENOL. [Lefaux, R. Practical Toxicology of Plastics. Cleveland: CRC Press Inc., 1968. GRADES OR PURITY: COMMERCIAL OR TECHNICAL 99+%. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978.] BORDEN INC, BORDEN CHEM DIV, PETROCHEMS DIV, GEISMAR, LA 70734 [SRI] DOW CHEM U.S.A., OYSTER CREEK, TX 77541; PLAQUEMINE, LA 70764 [SRI] E.I. DU PONT DE NEMOURS & CO, INC, CONOCO INC, SUBSID, CONOCO CHEMS CO DIV, [SRI] FORMOSA PLASTICS CORP USA, BATON ROUGE, LA 70821; POINT COMFORT, TX 77978 [SRI] GEORGIA-PACIFIC CORP, CHEM DIV, PLAQUEMINE, LA 70764 [SRI] THE B F GOODRICH CO, B F GOODRICH CHEM GROUP, CALVERT CITY, KY 42029; LA PORTE, TX 77571 [SRI] PPG INDUST, INC, CHEMS GROUP, INDUST CHEM DIV, LAKE CHARLES, LA 70601 [SRI] SHELL OIL CO, SHELL CHEM CO, DIV, DEER PARK, TX 77500; NORCO, LA 70079 [SRI] ALLIED CHEM CORP, INDUST CHEMS DIV, BATON ROUGE, LA [SRI] CONTINENTAL OIL CO, CONOCO CHEMS, WESTLAKE, LA [SRI] ETHYL CORP, BATON ROUGE, LA, PASADENA, TEX [SRI] MONOCHEM, INC, GEISMAR, LA [SRI] STAUFFER CHEM CO, PLASTICS DIV, POLYMERS WEST, CARSON, CALIF [SRI] TENNECO INC, TENNECO CHEMS, INC, ORGANICS AND POLYMERS DIV, HOUSTON, TEX [SRI] UNION CARBIDE CORP, CHEMS AND PLASTICS DIV, TEXAS CITY, TEX [SRI] BECAUSE IT HAS BEEN CONFIRMED THAT VINYL CHLORIDE MONOMER IS HUMAN & ANIMAL CARCINOGEN, SALE OF PROPELLANTS & ALL AEROSOLS CONTAINING IT WAS BANNED IN 1974 [USEPA, 1974; US CONSUMER PRODUCT SAFETY COMMISSION, 1974]. [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 738] IN PLASTIC INDUSTRY; IN ORG SYNTHESSES [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 1283] MONOMER FOR POLY(VINYL CHLORIDE) HOMOPOLYMER [SRI] COMONOMER-EG, WITH VINYL ACETATE OR VINYLIDENE CHLORIDE [SRI] CHEM INT FOR METHYL CHLOROFORM & 1,1,1-TRICHLOROETHANE [SRI] CHEM INT FOR OTHER ORG CHEMS-EG, CHLOROACETALDEHYDE [SRI] MONOMER & COMONOMER FOR FIBERS-EG, VINYLON &

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MAJOR USES	SARAN FIBERS [SRI]
MAJOR USES	OXIDN INHIBITOR IN ETHYLENE OXIDE PRODN [SRI]
CONSUMPTION PATTERNS	REFRIGERANT & EXTRACTION SOLVENT (FORMER USE) [SRI]
CONSUMPTION PATTERNS	MONOMER FOR POLY(VINYL CHLORIDE) RESINS, 85%; EXPORTS, 13.5%; MISCELLANEOUS (MOSTLY COPOLYMER USE), 1.5% (1982) [SRI]
	95% FOR POLYVINYL CHLORIDE HOMOPOLYMER AND COPOLYMER RESIN; 4% FOR SYNTHESIS OF METHYL CHLOROFORM; 1% FOR MISC APPLICATIONS (1972) [SRI]
J.S. PRODUCTION	(1977) 2.72X10+12 G [SRI]
J.S. PRODUCTION	(1982) 2.22X10+12 G [SRI]
J.S. IMPORTS	(1977) 6.05X10+5 G [SRI]
J.S. IMPORTS	(1982) 2.30X10+10 G [SRI]
J.S. EXPORTS	(1978) 4.08X10+11 G [SRI]
J.S. EXPORTS	(1983) 3.11X10+11 G [SRI]
COLOR/Form	COLORLESS GAS OR LIQUID [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975.
ODOR	Has sweet, pleasant odor [USEPA, Office of Drinking Water; Criteria Document (Draft): Vinyl Chloride p.III-1 (1983)]
BOILING POINT	-14 DEG C [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976.
MELTING POINT	-160 DEG C [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976.
MOLECULAR WEIGHT	62.50 [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 1283]
CORROSIVITY	VINYL CHLORIDE IS NOT CORROSIVE WHEN DRY BUT IN PRESENCE OF MOISTURE IT ATTACKS IRON AND STEEL. [Lefaux, R. Practical Toxicology of Plastics. Cleveland: CRC Press Inc., 1968.
CRITICAL TEMPERATURE & PRESSURE	424.61 deg K; 151.5 deg C; 304.6 deg F/5755 kPa; 57.55 bar; 834.7 psia; 56.8 atm [Braker W, Mossman Al; Matheson Gas Data Book 6th ED p.695 (1980)]
DENSITY/SPECIFIC GRAVITY	0.9121 @ 20 DEG C/4 DEG C [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 377]
HEAT OF VAPORIZATION	6.263x10+3 g cal/g mol [Weast. Hdbk Chem & Phys 64th ED (1984) p.C-691]
SOLUBILITIES	SOL IN ALCOHOL [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976.
SOLUBILITIES	SLIGHTLY SOL IN WATER (LESS THAN 0.11% BY WT @ 25 DEG C) [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 883]
SOLUBILITIES	VERY SOL IN ETHER, CARBON TETRACHLORIDE & BENZENE [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 378]
SPECTRAL PROPERTIES	INDEX OF REFRACTION: 1.3700 @ 20 DEG C/D;

SADTLER REF NUMBER: 1119 (IR, PRISM); 10973 (IR, GRATING) [Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979. C-298] 2.15 [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

APOR DENSITY 2660 MM HG @ 25 DEG C [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 377]

APOR PRESSURE GAS IS HEAVIER THAN AIR & LIQ SLIGHTLY LIGHTER THAN WATER [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 49-300]

THER CHEMICAL/PHYSICAL PROPERTIES Vinyl chloride is volatile. Volatilization half-life index in quiescent water is 290 min (unstirred) to 25.8 min (stirred). [USEPA; Report on the Activities and Findings of the Vinyl Chloride Task Force (1974) EPA 560/4-74-001]

THER CHEMICAL/PHYSICAL PROPERTIES Undergoes rapid photochemical oxidn. [Gay BW et al; Environ Sci Technol 10: 58-67 (1976); Lillian D et al; Environ Sci Technol 9: 1042-1048 (1975)]

THER CHEMICAL/PHYSICAL PROPERTIES FIRE HAZARD: DANGEROUS, WHEN EXPOSED TO HEAT OR FLAME. LARGE FIRES OF THIS MATERIAL ARE PRACTICALLY INEXTINGUISHABLE. SPONTANEOUS HEATING: NO. [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

THER CHEMICAL/PHYSICAL PROPERTIES .../FORMS/ INFLAMMABLE MIXT WITH AIR ABOVE -78 DEG C. [Lefaux, R. Practical Toxicology of Plastics. Cleveland: CRC Press Inc., 1968. p. 81]

THER CHEMICAL/PHYSICAL PROPERTIES HEALTH 2. 2= MATERIALS HAZARDOUS TO HEALTH, BUT AREAS MAY BE ENTERED FREELY WITH FULL-FACED MASK SELF-CONTAINED BREATHING APPARATUS WHICH PROVIDES EYE PROTECTION. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 325M-187]

THER CHEMICAL/PHYSICAL PROPERTIES FLAMMABILITY 4. 4= VERY FLAMMABLE GASES OR VERY VOLATILE FLAMMABLE LIQUIDS. SHUT OFF FLOW AND KEEP COOLING WATER STREAMS ON EXPOSED TANKS OR CONTAINERS. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 325M-187]

THER CHEMICAL/PHYSICAL PROPERTIES REACTIVITY 1. 1= MATERIALS WHICH (IN THEMSELVES) ARE NORMALLY STABLE BUT WHICH MAY BECOME UNSTABLE AT ELEVATED TEMPERATURES AND PRESSURES OR WHICH MAY REACT WITH WATER WITH SOME RELEASE OF ENERGY BUT NOT

FLAMMABLE LIMITS

VIOLENTLY. CAUTION MUST BE USED IN APPROACHING THE FIRE AND APPLYING WATER. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 325M-187]

FLAMMABLE LIMITS % BY VOL: LOWER 3.6; UPPER 33.0. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 325M-187] -78 DEG C OC [Clayton, G. D. and F. E. Clayton (eds.). Patty's Industrial Hygiene and Toxicology: Volume 2A, 2B, 2C: Toxicology. 3rd ed. New York: John Wiley Sons, 1981-1982. p. 3537]

FLASH POINT

AUTOIGNITION TEMPERATURE

882 DEG F [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

FIRE FIGHTING PROCEDURES

STOP FLOW OF GAS. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL & TO PROTECT MEN AFFECTING SHUT-OFF. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 49-300]

FIRE FIGHTING PROCEDURES

FIREFIGHTING METHODS: CARBON DIOXIDE, DRY CHEMICAL [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

OXYGEN COMBUSTION PRODUCTS

ON COMBUSTION, IT DEGRADES MAINLY TO HYDROGEN CHLORIDE, CARBON MONOXIDE, CARBON DIOXIDE & TRACES OF PHOSGENE... [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 378]

OTHER FIRE FIGHTING HAZARDS

GAS...MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION & FLASH BACK [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 49-300]

EXPLOSIVE LIMITS AND POTENTIAL

FORMS EXPLOSIVE MIXT WITH AIR. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 49-300]

EXPLOSIVE LIMITS AND POTENTIAL

EXPLOSION HAZARD: SEVERE, IN FORM OF VAPOR WHEN EXPOSED TO HEAT OR FLAME. [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

EXPLOSIVE LIMITS AND POTENTIAL

EXPLOSIVE LIMITS: LOWER 4%; UPPER 22%. [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

REACTIVITIES & INCOMPATIBILITIES

CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS. [Sax, N.I. Dangerous Properties

REACTIVITIES & INCOMPATIBILITIES	of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235] Incompatible with copper, aluminum and certain catalytic impurities. Peroxide can form by catalyzed oxidn with atmospheric oxygen. [General Electric Co; Material Safety Data Sheet #382 (1979)]
DECOMPOSITION	IT LOSES HCL ON TREATMENT WITH STRONG ALKALIS @ HIGH TEMP [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 378]
DECOMPOSITION	DISASTER HAZARD: VERY DANGEROUS; WHEN HEATED TO DECOMP, IT EMITS HIGHLY TOXIC FUMES OF PHOSGENE... [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]
POLYMERIZATION	POLYMERIZES IN LIGHT [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 1283]
POLYMERIZATION	Occurs if heated in sunlight or presence of air; reaction is exothermic. [Environment Canada; Tech Info for Problem Spills: Vinyl Chloride (Draft) p.1 (1983)]
POLYMERIZATION	POLY IN PRESENCE OF CATALYST [The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 1283]
LEAKAGE THRESHOLD	260 ppm [Environment Canada; Tech Info for Problem Spills: Vinyl Chloride (Draft) p.1 (1983)]
PROTECTIVE EQUIPMENT & CLOTHING	RUBBER GLOVES AND SHOES, GAS-TIGHT GOGGLES, ORGANIC VAPOR CANISTER OR SELF-CONTAINED BREATHING APPARATUS. [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Manual Two. Washington, DC: U.S. Government Printing Office, Oct., 1978.]
SHIPMENT METHODS AND REGULATIONS	STD & REGULATIONS: REGULATED BY CG, DOT, IATA. [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]
SHIPMENT METHODS AND REGULATIONS	STD & REGULATIONS: DOT- FLAMMABLE GAS, LABEL: FLAMMABLE GAS. [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
SHIPMENT METHODS AND REGULATIONS	USUAL SHIPPING CONTAINERS: PRESSURE CYLINDERS, TANK CARS, TANK BARGES. [National Fire Protection Association. Fire Protection Guide on Hazardous Materials. 7th ed. Boston, Mass.: National Fire Protection Association, 1978. 49-301]
SHIPMENT METHODS AND REGULATIONS	STORAGE...IS...READILY EFFECTED @ ORDINARY TEMP UNDER PRESSURE &...IN ABSENCE OF AIR.

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SHIPPING METHODS AND
REGULATIONS

STORAGE CONDITIONS

DISPOSAL METHODS

STABILITY/SHELF LIFE

DOT EMERGENCY GUIDELINES

DOT EMERGENCY GUIDELINES

DOT EMERGENCY GUIDELINES

IN THIS WAY IT CAN BE TRANSPORTED IN TANK
LORRIES. VINYL CHLORIDE IS NOT CORROSIVE
WHEN DRY BUT IN PRESENCE OF MOISTURE IT
ATTACKS IRON AND STEEL. [Lefaux, R.
Practical Toxicology of Plastics. Cleveland:
CRC Press Inc., 1968. p. 82]
STORAGE TEMPERATURE: UNDER PRESSURE,
AMBIENT; AT ATMOSPHERIC PRESSURE, LOW.
VENTING: UNDER PRESSURE, SAFETY RELIEF; AT
ATMOSPHERIC PRESSURE, PRESSURE-VACUUM. [U.S.
Coast Guard, Department of Transportation.
CHRIS - Hazardous Chemical Data. Manual Two.
Washington, DC: U.S. Government Printing
Office, Oct., 1978.]
PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR
DETACHED STORAGE IS PREFERABLE. INSIDE
STORAGE...COOL, WELL-VENTILATED,
NONCOMBUSTIBLE LOCATION, AWAY FROM ALL
POSSIBLE SOURCES OF IGNITION. SEPARATE FROM
OXIDIZING MATERIALS. [National Fire
Protection Association. Fire Protection
Guide on Hazardous Materials. 7th ed.
Boston, Mass.: National Fire Protection
Association, 1978. 49-301]
Burn in a high temp incinerator with a
scrubber to remove HCl. [General Electric
Co; Material Safety Data Sheet #382 (1979)]
HIGHLY VOLATILE [Lefaux, R. Practical
Toxicology of Plastics. Cleveland: CRC Press
Inc., 1968. p. 82]
Fire or Explosion: Extremely flammable. May
be ignited by heat, sparks, or flames.
Vapors may travel to a source of ignition
and flash back. Container may explode
violently in heat of fire. Vapor explosion
hazard indoors, outdoors or in sewers.
[Department of Transportation. Emergency
Response Guidebook 1984 DOT P 5800.3
Washington, DC: U.S. Government Printing
Office, 1984. G-17]
Health Hazards: If inhaled, may be harmful;
contact may cause burns to skin and eyes.
Vapors may cause dizziness or suffocation.
Contact with liquid may cause frostbite.
Fire may produce irritating or poisonous
gases. [Department of Transportation.
Emergency Response Guidebook 1984 DOT P
5800.3 Washington, DC: U.S. Government
Printing Office, 1984. G-17]
Emergency Action: Keep unnecessary people
away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Ventilate closed areas before entering them.
Wear self-contained (positive pressure if
available) breathing apparatus and full
protective clothing. Isolate for 1/2 mile in
all directions if tank car or truck is
involved in fire. FOR EMERGENCY ASSISTANCE
CALL CHEMTREC (800) 424-9300. [Department of
Transportation. Emergency Response Guidebook

DOT EMERGENCY GUIDELINES

1984 DOT P 5800.3 Washington, DC: U.S. Government Printing Office, 1984. G-17]
Fire: Let tank car, tank truck or storage tank burn unless leak can be stopped; with smaller tanks or cylinders, extinguish/isolate from other flammables. Small Fires: Dry chemical or CO2. Large Fires: Water spray, fog, or foam. Move container from fire area if you can do it without risk. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. Cool container with water using unmanned device until well after fire is out. [Department of Transportation. Emergency Response Guidebook 1984 DOT P 5800.3 Washington, DC: U.S.

DOT EMERGENCY GUIDELINES

Government Printing Office, 1984. G-17]
Spill or Leak: Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Use water spray to reduce vapors. Isolate area until gas has dispersed. [Department of Transportation. Emergency Response Guidebook 1984 DOT P 5800.3 Washington, DC: U.S.

DOT EMERGENCY GUIDELINES

Government Printing Office, 1984. G-17]
First Aid: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of frostbite, thaw frosted parts with water. Keep victim quiet and maintain normal body temperature. [Department of Transportation. Emergency Response Guidebook 1984 DOT P 5800.3 Washington, DC: U.S. Government Printing Office, 1984. G-17]

TOXIC HAZARD RATING

TOXICITY RATINGS. ACUTE LOCAL: IRRITANT 2. ACUTE SYSTEMIC: INHALATION 2. CHRONIC LOCAL: IRRITANT 2. 2= MODERATE: MAY INVOLVE BOTH IRREVERSIBLE & REVERSIBLE CHANGES NOT SEVERE ENOUGH TO CAUSE DEATH OR PERMANENT INJURY. CHRONIC SYSTEMIC: INHALATION 3. 3= HIGH: MAY CAUSE DEATH OR PERMANENT INJURY AFTER...SHORT EXPOSURE... [Sax, N.I. Dangerous Properties of Industrial Materials. 4th ed. New York: Van Nostrand Reinhold, 1975. p. 1235]

POISONING POTENTIAL

... vinyl chloride was reported... to induce angiosarcoma of the liver both in humans and in animals. ... Carcinogenicity to other organs and at lower concn /has now been demonstrated/. The target organs ... include liver, brain, ... lung, /and/ the lymphohematopoietic system. ... Cases of liver angiosarcoma have been reported among individuals living in near proximity to vinyl chloride-poly(vinyl chloride) plants.

POISONING POTENTIAL

... An assoc between PVC dust and pneumoconiosis also has been demonstrated... [Wagoner JK; Environ Health Perspect 52: 61-66 (1983)]

IN VIEW OF EXTREME RARITY OF ANGIOSARCOMA OF LIVER IN GENERAL POPULATION, OBSERVATION OF 16 CASES IN WORKERS EXPOSED TO VINYL CHLORIDE MONOMER DURING POLYMERIZATION PROCESS IS EVIDENCE OF CAUSAL RELATIONSHIP. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V7 305]

POISONING POTENTIAL

...RESULTS OF MASSIVE & APPARENTLY REPEATED EXPOSURES: ...EUPHORIA...FOLLOWED BY STATE OF INEBRIATION SIMILAR TO THAT OF ALCOHOL INTOXICATION. ...EPIGASTRIC PAIN...ANOREXIA...ALLERGIC DERMATITIS...& SCLERODERMA... [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists, Inc., 1980. p. 428]

ANTIDOTE AND EMERGENCY TREATMENT

SEE CARBON TETRACHLORIDE. GENERAL MGMNT: A) ESTABLISH RESP; CREATE ARTIFICIAL AIRWAY... CHECK TIDAL VOL (NORMAL 10-15 CC/KG). PREVENTION OF ABSORPTION: ORAL... A) EMESIS SHOULD BE INITIATED UNLESS PT IS COMATOSE, CONVULSING, OR HAS LOST GAG REFLEX. IF...CONTRAINDICATIONS ARE PRESENT, ENDOTRACHEAL INTUBATION SHOULD PRECEDE GASTRIC LAVAGE WITH LARGE BORE TUBE. B) ADMIN ACTIVATED CHARCOAL (ADULT: 60-100 G, CHILDREN: 30-60 G). C) ADMIN CATHARTIC. MAGNESIUM SULFATE (ADULT: 30 G, CHILD: 250 MG/KG) OR MAGNESIUM CITRATE NF (ADULT AND CHILD: 4 ML/KG UP TO 300 ML/DOSE). /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

ANTIDOTE AND EMERGENCY TREATMENT

SEE CARBON TETRACHLORIDE. DECONTAMINATION: A) REMOVE CONTAMINATED CLOTHING. WASH SKIN & HAIR 3 TIMES: ...INITIAL SOAP WASHING FOLLOWED BY ALCOHOL... FOLLOWED BY SOAP... LEATHER ABSORBS PESTICIDES. ...SHOULD NOT BE WORN IN PRESENCE OF PESTICIDES & ALL LEATHER SOAKED WITH SOLN SHOULD BE DISCARDED. /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

ANTIDOTE AND EMERGENCY TREATMENT

SEE CARBON TETRACHLORIDE. ORAL EXPOSURE: A) OBTAIN BASELINE LIVER & RENAL FUNCTION

ANTIDOTE AND EMERGENCY
TREATMENT

STUDIES. B) MONITOR ELECTROCARDIOGRAM. C) MAINTAIN FLUID & ELECTROLYTE STATUS. D) HEMODIALYSIS OR PERITONEAL DIALYSIS ARE PROBABLY NOT OF ANY VALUE UNLESS INSTITUTED VERY EARLY IN THE COURSE OF INTOXICATION TO REMOVE UNMETABOLIZED CARBON TETRACHLORIDE. HEMODIALYSIS OR HEMOPERFUSION MAY BE NECESSARY TO SUPPORT PATIENTS IN RENAL OR HEPATIC FAILURE, RESPECTIVELY. /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

SEE CARBON TETRACHLORIDE. ORAL... E) FORCED DIURESIS IS OF NO VALUE. F) EPINEPHRINE SHOULD BE AVOIDED.../MAY INDUCE/ VENTRICULAR ARRHYTHMIAS IN A SENSITIZED MYOCARDIUM. G) AVOID KNOWN ENZYME-INDUCING AGENTS, EG PHENOBARBITAL... H) VITAMIN K SHOULD BE ADMIN TO PT WITH SEVERE LIVER NECROSIS ALTHOUGH ANIMAL STUDIES HAVE SUGGESTED THAT IT MAY BE OF NO BENEFIT. I) INTENSIVE SUPPORTIVE CARE HAS RESULTED IN RECOVERY EVEN IN PT WITH SEVERE RENAL & HEPATIC INVOLVEMENT. J) N-ACETYLCYSTEINE (NAC) & PYRIDOXINE, IN ANIMALS, IS REPORTED TO BE EFFECTIVE IN PROTECTING (MINIMIZING) THE DEVELOPMENT OF HEPATIC NECROSIS FOLLOWING CARBON TETRACHLORIDE INTOXICATION. NAC IS PROBABLY MOST EFFECTIVE IF GIVEN WITHIN 16 HR FOLLOWING INGESTION OF CARBON TETRACHLORIDE. FURTHER STUDIES ARE NEEDED BEFORE THIS THERAPY CAN BE ROUTINELY RECOMMENDED. ESTIMATED DOSE OF NAC: LOADING DOSE OF 140 MG/KG ORALLY AS A 5% SOLN IN COLA FOLLOWED BY A MAINTENANCE DOSE OF 70 MG/KG ORALLY EVERY 4 HR FOR 17 DOSES. K) NEVER ADMIN OILS, ALCOHOLS, OR FATS... /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

ANTIDOTE AND EMERGENCY
TREATMENT

SEE CARBON TETRACHLORIDE. DERMAL...: A) PT...SHOULD WASH EXPOSED AREA TWICE WITH SOAP & WATER. B) PHYSICIAN SHOULD EXAMINE THE EXPOSED AREA IF IRRITATION OR PAIN PERSISTS AFTER THE AREA IS WASHED. C) TREATMENT SHOULD INCL RECOMMENDATIONS LISTED IN THE ORAL EXPOSURE SECTION WHEN APPROPRIATE. /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

ANTIDOTE AND EMERGENCY

SEE CARBON TETRACHLORIDE. INHALATION: A)

TREATMENT

REMOVE PT TO FRESH AIR. B) MONITOR...FOR RESP DISTRESS. IF COUGH OR DIFFICULTY IN BREATHING DEVELOPS, EVALUATE FOR RESP TRACT IRRITATION, BRONCHITIS & PNEUMONIA. EYE EXPOSURE: A) ...SHOULD BE IRRIGATED COPIOUSLY WITH WATER FOR @ LEAST 15 MIN. B) OPHTHALMIC EXAM...IF IRRITATION OR PAIN PERSISTS... /CARBON TETRACHLORIDE/ [Rumack, B.H. (ed.) Poisindex. Microfiche Edition. Denver, Colorado: Micromedex, Inc., in association with the National Center for Poison Information, with updates, 1975-present. MGT 2/EXP 8308]

MEDICAL SURVEILLANCE

Exam by wide-field capillary microscopy of the hands of PVC workers demonstrated capillary abnormalities in a high percentage of exposed men. This non-invasive technique may be useful as a mass screening procedure in the early detection of vinyl chloride induced disease. [Maricq HR et al; JAMA 236: 1368 (1976) as cited in USEPA; Ambient Water Quality Criteria Doc: Vinyl Chloride p.C-19 (1980) EPA 720-016/5963]

MEDICAL SURVEILLANCE

Pathologic porphyrinuria, especially secondary coproporphyrinuria with transition to subclinical chronic hepatic porphyria, is a consistent pathobiochemical parameter for the recognition of vinyl chloride hepatic lesions. ... Erythrocyte uroporphyrinogen decarboxylase activity studied in 6 cases with initial chronic hepatic porphyria was normal, suggesting that vinyl chloride affects this enzyme only in the liver. [Doss M et al; Klin Wochenschr 62(4): 175-158 (1984)]

UMAN TOXICITY EXCERPTS

...VINYL CHLORIDE DOES NOT EXERT CLEARLY PERCEPTIBLE ACTION BELOW 1,000 PPM. AT THAT DOSE HUMANS EXHIBIT SLIGHT ANESTHESIA, DROWSINESS, SLIGHT VISUAL DISTURBANCES, FALTERING GAIT, NUMBNESS, & TINGLING OF EXTREMITIES. ...PRIMARY IRRITANT FOR SKIN... [Lefaux, R. Practical Toxicology of Plastics. Cleveland: CRC Press Inc., 1968.

UMAN TOXICITY EXCERPTS

THERE WAS SIGNIFICANT INCR IN CHROMOSOMAL ABNORMALITIES IN CULTURED PERIPHERAL LYMPHOCYTES FROM 57 MALE WORKERS WHEN COMPARED WITH CONTROLS. GREATEST STATISTICAL INCR OCCURRED IN AUTOCLAVE OPERATORS. [PURCHASE I HF ET AL; CHROMOSOMAL ANALYSES IN VINYL CHLORIDE-EXPOSED WORKERS; MUTAT RES 57(3) 325 (1978)]

UMAN TOXICITY EXCERPTS

THE HEALTH STATUS OF 13 WORKERS EMPLOYED FOR 1.75-18 YR IN A POLYVINYL CHLORIDE FACTORY WAS STUDIED. 8 OF THEM HAD SCLERODERMA-LIKE SKIN CHANGES CHARACTERIZED HISTOLOGICALLY BY THICKENING & RAREFRACTION OF THE ELASTIC FIBERS. IN 7 PT, THICKENING OF TERMINAL FINGER PHALANGES RESEMBLING CLUBBING WAS NOTED; 11 PT HAD CIRCULATORY DISTURBANCES OF THE EXTREMITIES (4 HAD RAYNAUD'S SYNDROME) &

HUMAN TOXICITY EXCERPTS	6 PT HAD BAND-LIKE OSTEOLYSES OF TERMINAL FINGER PHALANGES. THROMBOCYTOPENIA WAS OBSERVED IN ALL PT, SPLENOMEGALY IN 12 PT, & MALFUNCTION OF THE LIVER IN 11 PT. LONG TERM EXOSURE TO VAPORS MAY CAUSE OCCUPATIONAL ACROOSTEOLYSIS. [LANGE C-E ET AL; THE SO-CALLED VINYL CHLORIDE DISEASES, AN OCCUPATIONAL SYSTEMIC SCLEROSIS; INT ARCH ARBEITSMED 32(1-2) 1 (1974)] An unusual distribution in the cell type of brain cancer was noted in vinyl chloride exposed workers. Of 10 brain cancer deaths identified, 9 had a histologic diagnosis of glioblastoma multiforme. The other case did not have histological confirmation. [Waxweiler RJ et al; Ann NY Acad Sci 271: 40-48 (1976)]
HUMAN TOXICITY EXCERPTS	A population of 10,173 men employed in 37 plants, /were/ identified as having worked for at least one yr in jobs involving probable exposure to vinyl chloride monomer (VCM). Of the 9677 men whose vital status was determined, 707 were known to have died. For 699, death certificates were obtained. ... the only type of malignancy found in significant excess was ... malignant neoplasms of the brain and other parts of the nervous system. ... There were slight but inconclusive upward trends for malignancies of the respiratory tract, digestive tract, and central nervous system associated with reported levels of maximum exposure to vinyl chloride. ... [Cooper WC; Envir Health Perspect 41: 101-106 (1981)]
HUMAN TOXICITY EXCERPTS	Hepatic angiosarcoma in man was first assoc with exposure to vinyl chloride in Louisville, Kentucky where it was identified in 10 persons from a single vinyl chloride polymerization plant ... Clinical manifestations ... /were/... nonspecific hepatic injury with mildly abnormal biochem liver test results. Carcinoembryonic antigen and alpha fetoprotein /were/ undetectable. ... A definite diagnosis /was/ made only by open liver biopsy. ... Avg survival from diagnosis is about 12 mo. Overt liver failure usually occurs only as a preterminal event and was the major cause of death... [Dannaher CL et al; Am J Med 70(2): 279-287 (1981)]
HUMAN TOXICITY EXCERPTS	The livers from five vinyl chloride workers /showed/ angioformative and hepatocellular growth disturbance in varying proportions: angiosarcoma in four cases, liver cell hyperplasia in all cases, hyperplastic nodules in three cases, and hepatocellular carcinoma in two cases... [Evans DM et al; Histopath 7(3): 377-388 (1983)]
HUMAN TOXICITY EXCERPTS	The results of angiography of the hand in workers in the vinyl chloride industry were

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described. Among 93 patients, there were 19 on whom angiograms of the hand were performed because of Raynaud-like changes, pain, or other pathological findings. All patients examined by angiography showed abnormalities of the vessels in the hands and fingers of varying severity. Vascular occlusions (17 patients), stenoses (9 patients), and thread-like narrowing of the digital arteries (6 patients) with the development of a collateral circulation were prominent findings ... There was elongation and tortuosity of the digital arteries (14 pt) which were regarded as crisoid aneurysms. ... [Koischwitz D et al; Roefo 132(1): 62-68 (1980)]

HUMAN TOXICITY EXCERPTS

In ... 200 workers ... exposed to vinyl chloride from 1 to 25 yr (mean 14 yr), 58 (29%) were free of complaints and nervous disturbances. An astheno-autonomic syndrome was found in 54 (27%) and in 88 (44%) in combination with pos neurological findings, i.e. pyramidal syndrome in 52, cerebellar disturbances in 38, trigeminal neuropathy in 24, and extrapyramidal symptoms in 3, ... pyramidal + cerebellar in 12, trigeminal + pyramidal in 7, trigeminal + cerebellar in 5. Headaches (48%), nervousness (26%), decr in physical strength (16%), loss of memory (14%), sleeping disturbances and somnolence were the most frequent complaints. Scleroderma-like skin changes were found in 10 subjects, but only 6 of them had any neurological disturbances ... Frequency of the arterial hypertension were the same in both groups, whereas acroparesthesias, Raynaud's syndrome, and increased gamma GTP serum activity were significantly more frequent in workers with neurological disturbances. 62% of the neurologically pos group and only 24% of the neg group reported euphoric or narcotic states after exposure. This probably indicates episodic exposures to high concn of vinyl chloride. This difference points to a possibility that neurological disturbances may be related to short exposures to peak concn. The neurological injury may be both a direct neurotoxic effect of vinyl chloride and secondary to vascular disorders.

[Langauer-Lewowicka H; Int Arch Occup Envir Health 52(2): 151-157 (1983)]

HUMAN TOXICITY EXCERPTS

... the nervous system and bioelectric functioning of the brain (EEG) /were evaluated/ in 114 workers aged 20-62, employed in significant exposure to vinyl chloride for 1-28 yr on avg -- 7.5 +/- 4.0 years. Clinical symptoms of the nervous system occurred in the form of peripheral-vegetative syndrome with

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accompanying vasomotor disturbances of Raynaud syndrome type. EEG yielded 39 (34.2%) correct and 75 (65.8%) incorrect records. Among incorrect records most frequent (32.5%) were low-voltage and flat records; those with fast spindled activity and frequent changes typical for reduced wakefulness. The nature of clinical symptoms and EEG disturbances may point to the contribution of the hypothalamus in the pathomechanism of changes in those chronically exposed to vinyl chloride. [Si'nczuk-Walczak H, Gluszc M; Med Pr 33(5-6): 349-354 (1982)]

HUMAN TOXICITY EXCERPTS

... The mortality of 451 workers exposed to VCM for more than 5 yr was compared with that of 870 workers from the same company ... not exposed to vinyl chloride. The relative risk for digestive cancer was significantly higher than 1 (6.25, confidence interval 2.69 - 14.52) in the exposed group. The standardized mortality ratio (SMR) for digestive cancer was also higher (SMR 259.26 $p < 0.01$) than that of the general population. No other cancer was in excess. Since the exposed workers are known to have had a cigarette smoking experience similar to that of those who were not exposed, it is concluded that the association between lung cancer and VCM exposure... is ... rather small. [Th'eriaux G, Allard P; Jour Occup Med 23(10): 671-676 (1981)]

HUMAN TOXICITY EXCERPTS

The incidence of birth defects for infants born to residents of Shawinigan, Canada in 1966-1979 were significantly higher than in three comparison communities. Since there has been a vinyl chloride polymerization plant in this town since 1943 from which ten cases of /liver/ angiosarcoma have been identified this study explored the possible association between exposure to vinyl chloride monomer in ambient air and the occurrence of birth defects in the community. The excess of birth defects fluctuated seasonally in a way that corresponded to changes in VCM concn in the environ. ... There /was/ no excess of still births in Shawinigan. The excess in birth defects involved most organ systems, and variation in birth-defect rates among school districts could not be accounted for by estimates of VCM in the atmosphere. The occupational and residential histories of parents who gave birth to malformed infants were compared with those of normal infants. The two groups did not differ in occupational exposure or closeness to the vinyl chloride polymerization plant. ... [Th'eriaux G et al; Teratology 27(3):

HUMAN TOXICITY EXCERPTS

359-370 (1983)]
 ...CONCN OF 2 1/2% OF VINYL CHLORIDE IN AIR
 FOR PERIOD OF 3 MIN WILL CAUSE DIZZINESS &
 DISORIENTATION IN EXPOSED MEN. [Patty, F.
 (ed.). Industrial Hygiene and Toxicology:
 Volume II: Toxicology. 2nd ed. New York:
 Interscience Publishers, 1963. p. 1304]

HUMAN TOXICITY EXCERPTS

...RESULTS OF MASSIVE & APPARENTLY REPEATED
 EXPOSURES: ...EUPHORIA...FOLLOWED BY STATE
 OF INEBRIATION SIMILAR TO THAT OF ALCOHOL
 INTOXICATION. ...EPIGASTRIC
 PAIN...ANOREXIA...ALLERGIC DERMATITIS...&
 SCLERODERMA... [American Conference of
 Governmental Industrial Hygienists, Inc.
 Documentation of the Threshold Limit Values,
 4th ed., 1980. Cincinnati, Ohio: American
 Conference of Governmental Industrial
 Hygienists, Inc., 1980. p. 428]

NON-HUMAN TOXICITY
EXCERPTS

...26 MALE AR/IRE WISTAR RATS...EXPOSED
 TO...3% VOL/VOL...COMMERCIAL-GRADE VINYL
 CHLORIDE MONOMER...(99% PURE) 4 HR/DAY ON 5
 DAY/WK FOR 12 MO. ... SKIN TUMORS DEVELOPED
 IN SUBMAXILLARY PAROTID REGION...(14
 EPIDERMOID CARCINOMAS, 2 MUCOEPIDERMOID
 CARCINOMAS, 1 PAPILLOMA)...LUNG TUMORS
 DEVELOPED IN 7 RATS AND OSTEOCHONDROMAS IN
 5. NO TUMORS...IN 25 UNTREATED
 CONTROLS.../SKIN TUMORS WERE ZIMBAL GLAND
 TUMORS AND LUNG TUMORS WERE METASTASIS FROM
 THESE/. [IARC. Monographs on the Evaluation
 of the Carcinogenic Risk of Chemicals to
 Man. Geneva: World Health Organization,
 International Agency for Research on Cancer,
 1972-1985. (Multivolume work). V19 386]

NON-HUMAN TOXICITY
EXCERPTS

GROUPS OF MALE AND FEMALE 11-WEEK-OLD SWISS
 MICE WERE EXPOSED TO CONCENTRATIONS OF 50 TO
 10,000 PPM VINYL CHLORIDE IN AIR FOR 4
 HOURS/DAY ON 5 DAYS/WEEK FOR 30 WEEKS. AT 81
 WEEKS, 70% (OF THE 10,000 PPM GROUP) HAD
 ADENOMAS AND/OR ADENOCARCINOMAS OF THE LUNG,
 47% HAD MAMMARY ADENOCARCINOMAS AND 16% HAD
 ANGIOSARCOMAS OF THE LIVER. IN 80 MALE AND
 70 FEMALE UNTREATED CONTROLS, 8 PULMONARY
 TUMORS AND 3 LYMPHOMAS WERE OBSERVED. [IARC.
 Monographs on the Evaluation of the
 Carcinogenic Risk of Chemicals to Man.
 Geneva: World Health Organization,
 International Agency for Research on Cancer,
 1972-1985. (Multivolume work). V19 384]

ON-HUMAN TOXICITY
EXCERPTS

VINYL CHLORIDE WAS ADMIN FOR 7 HR/DAY ON
 DAYS 6-18 OF GESTATION IN MICE, RATS, &
 RABBITS. IT WAS CONCLUDED THAT ALTHOUGH
 MATERNAL TOXICITY...OBSERVED, VINYL CHLORIDE
 ALONE DID NOT CAUSE SIGNIFICANT EMBRYONAL OR
 FETAL TOXICITY & WAS NOT TERATOGENIC IN ANY
 OF SPECIES @ CONCN TESTED... [National
 Research Council. Drinking Water & Health
 Volume 1. Washington, DC: National Academy
 Press, 1977. p. 785]

ON-HUMAN TOXICITY

...EXPOSURE OF SALMONELLA TYPHIMURIUM

EXCERPTS STRAINS TA1530, TA1535, & G-46...INCR NUMBER OF HIS+ REVERTANTS/PLATE 16, 12 OR 5 TIMES OVER SPONTANEOUS MUTATION RATE. MUTAGENIC RESPONSE FOR TA1530 STRAIN...INCR WHEN S-9 LIVER FRACTIONS FROM HUMANS, RATS, OR MICE...ADDED. [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 784]

NON-HUMAN TOXICITY EXCERPTS ACUTE EFFECTS. ...INHALATION.../OF/ VINYL CHLORIDE...SHOWN TO PRODUCE LUNG CONGESTION & SOME HEMORRHAGING, BLOOD-CLOTTING DIFFICULTIES, & CONGESTION OF LIVER & KIDNEYS IN LAB ANIMALS. [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 784]

NON-HUMAN TOXICITY EXCERPTS ACUTE EFFECTS. AFTER 2 HR @ 5% VINYL CHLORIDE, RATS SHOWED MODERATE INTOXICATION; 2 HR @ 15% PROVOKED RESP FAILURE... [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 784]

NON-HUMAN TOXICITY EXCERPTS ...DEGENERATION OF BONE & CONNECTIVE TISSUE IN MALE WISTAR RATS EXPOSED TO CONC N OF 30,000 PPM...4 HR/DAY ON 5 DAYS/WK FOR UP TO 12 MO. DEGENERATIVE CHANGES WERE OBSERVED IN LIVER (INTERSTITIAL HEPATITIS...), BRAIN...& KIDNEY (TUBULAR NEPHROSIS &...INTERSTITIAL NEPHRITIS). [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V7 302]

NON-HUMAN TOXICITY EXCERPTS CONTINUOUS EXPOSURE OF CFY RATS TO VINYL CHLORIDE (4000 MG/CU M IN AIR) DURING FIRST 3RD OF PREGNANCY CAUSED INCR IN FETAL DEATHS & EMBRYOTOXIC EFFECTS. [UNGVARY G ET AL; EFFECTS OF VINYL CHLORIDE EXPOSURE ALONE AND IN COMBINATION WITH TRY PAN BLUE - APPLIED SYSTEMATICALLY DURING ALL THIRDS OF PREGANCY ON THE FETUSES OF CFY RATS; TOXICOLOGY 11(1) 45 (1978)]

NON-HUMAN TOXICITY EXCERPTS DOMINANT LETHAL STUDIES OF MALE CD-1 MICE WHO HAD BEEN EXPOSED TO 3000, 10,000, & 30,000 PPM FOR 5 DAYS SHOWED NO MUTAGENIC EFFECT. [ANDERSON D ET AL; DOMINANT LETHAL STUDIES WITH THE HALOGENATED OLEFINS VINYL CHLORIDE AND VINYLIDENE DICHLORIDE IN MALE CD-1 MICE; ENVIRON HEALTH PERSPECT (21) 71 (1977)]

NON-HUMAN TOXICITY EXCERPTS SPRAGUE-DAWLEY RATS WERE EXPOSED TO 10,000 PPM VINYL CHLORIDE IN AIR FOR 4 HOURS/DAY ON 5 DAYS/WEEK FOR 5 WEEKS, STARTING AT THE AGE OF 13 WEEKS (120 RATS PER GROUP) OR 1 DAY (43 AND 46 RATS). ANIMALS WERE OBSERVED FOR 135 WEEKS. ONE HEPATOMA WAS REPORTED IN THE OLDER RATS...IN NEWBORN RATS, 10 ANGIOSARCOMAS AND 15 HEPATOMAS WERE FOUND.

NON-HUMAN TOXICITY
EXCERPTS

NO LIVER TUMORS WERE REPORTED IN 249 CONTROLS. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 388]

40 RABBITS WERE EXPOSED FOR 4 HOURS/DAY ON 5 DAYS/WEEK FOR 12 MONTHS TO AIR CONTAINING...(10,000 PPM) VINYL CHLORIDE. BETWEEN 9 AND 15 MONTHS EXPOSURE, 12 SKIN ACANTHOMAS AND 6 LUNG ADENOCARCINOMAS WERE SEEN. NO SIMILAR TUMORS OCCURRED IN 20 CONTROLS AFTER 15 MONTHS OBSERVATION. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 389]

NON-HUMAN TOXICITY
EXCERPTS

THE EMBRYOTOXIC & TERATOGENIC ACTION OF VINYLCHLORIDE ON 40 PREGNANT WHITE WISTAR RATS WAS EXAMINED. THE EXPT WERE CARRIED OUT UNDER THE CONDITIONS OF DAILY INHALATORY POISONING DURING GESTATION AT MEAN DAILY CONCEN OF 6.15 MG/CU M. THERE WAS A MANIFESTATED EMBRYOTOXIC & TERATOGENIC EFFECT OF ELEVATED TOTAL EMBRYONAL MORTALITY, LOWERED FETAL WT & INTRODUCTION OF EXTERNAL & INTERNAL ANOMALIES IN THE DEVELOPMENT OF THE FETUS. THE THRESHOLD VALUE OF CONCEN FOR EMBRYOTOXICITY & TERATOGENICITY WAS CALCULATED TO BE 10 MG/CU M. [MIRKOVA E ET AL; EMBRYOTOXIC AND TERATOGENIC ACTION OF VINYLCHLORIDE; KHIG ZDRAVEOPAZ 21(5) 440 (1978)]

NON-HUMAN TOXICITY
EXCERPTS

... rats and mice were exposed in an inhalation chamber to single 1-hr /concentration/ of vinyl chloride ranging from 50-50,000 ppm. A second group was given 10 1-hr exposures to 500 ppm or 100 1-hr exposures to 50 ppm... /The study demonstrated/ dose related effects for single 1-hr exposure of VCM at high levels, i.e. 5,000 and 50,000 ppm. The concn increased the incidence of pulmonary adenomas and carcinomas in mice. Repeated exposure of A/J mice ... at 500 ppm x 10 1-hr exposures also increased the incidence of pulmonary adenomas and carcinomas... Rats exposed to identical concn of VCM failed to elicit a tumorigenic response. [Hehir RM et al; Environ Health Perspect 41: 63-72 (1981)]

NON-HUMAN TOXICITY
EXCERPTS

Wistar rats were exposed to atmospheres containing 0 (control) or 5000 ppm vinyl chloride monomer, 7 hr/day, 5 day/wk, for 52 wk. ... 10 rats/sex per group were killed... Growth, mortality, hematology, clinical chemistry, and organ weights were studied. Slight growth retardation throughout the

NON-HUMAN TOXICITY
EXCERPTS

experimental period and high mortality in the 2nd half of the study were observed in VCM-exposed animals. ... Blood clotting time was ... shorter in VCM-exposed rats than controls. There were minor /incr in/ K content in the blood serum in VCM-exposed animals during the 1st half of the test period. Increased blood urea N levels and relative kidney weights were evidence that the kidneys were adversely affected by VCM. After 52 wk increased weights of heart and spleen, and slight signs of an anemia were noted in VCM-exposed rats. ... [Feron VJ et al; Toxicol 13(1): 25-28 (1979)]

Rats exposed to vinyl chloride (in air at 2500 ppm, 4-7 hr/day, 5 days/wk) from day 12 of embryonic life for 57 wk had a 63.1% incidence of liver angiosarcoma with a latency period of 49.9 wk and a 41.4% incidence of lung metastasis. The experimental tumors were similar to those of humans with respect to gross pathology, histopathology, and metastatic behavior. ... [Maltoni C et al; Dev Oncol 15: 339-341 (1983)]

NON-HUMAN TOXICITY
EXCERPTS

... the mutagenicity of vinyl chloride ... was tested in V79 Chinese hamster cells in the presence of a 15,000 supernatant from phenobarbitone-pretreated rats and mice. Mutations... of 8-azaquanine and ouabain resistance were induced in a dose-related fashion by exposure to vapor of vinyl chloride in the presence of liver supernatant from phenobarbitone-pretreated rats. ... [Drevon C, Kuroki T; Mutat Res 67(2): 173-182 (1979)]

NON-HUMAN TOXICITY
EXCERPTS

...ZYMBALE'S GLAND CARCINOMAS, NEPHROBLASTOMAS, & ANGIOSARCOMAS OF LIVER & OF OTHER LOCATIONS /INDUCED/ IN RATS FOLLOWING 52 WK OF EXPOSURE FOR 20 HR EACH WK. CONC. ... 10,000 PPM ... 6000 PPM ... 2500 PPM ... 500 PPM ... 50 PPM, WITH ANGIOSARCOMAS IN 7, 13, 14, 7, 4 & 1 RATS, RESPECTIVELY (AIR CONTROLS WERE NEGATIVE). [Searle, C. E. (ed.). Chemical Carcinogens. ACS Monograph 173. Washington, DC: American Chemical Society, 1976. p. 333]

NON-HUMAN TOXICITY
EXCERPTS

...REPEATED EXPOSURES...FOR 7 HR/DAY, 5 DAYS/WK. @ 500 PPM, RATS...INCR LIVER WT & HISTOPATHOLOGY. @ 200 & 100 PPM, RATS...INCR LIVER WT, BUT NO CHANGES...OBSERVED IN DOGS OR GUINEA PIGS. ALL SPECIES TOLERATED 50 PPM FOR 6 MONTHS. [Clayton, G. D. and F. E. Clayton (eds.). Patty's Industrial Hygiene and Toxicology: Volume 2A, 2B, 2C: Toxicology. 3rd ed. New York: John Wiley Sons, 1981-1982. p. 3538]

NON-HUMAN TOXICITY
EXCERPTS

DNA SYNTHESIS WAS DEPRESSED IN RAT LIVER IN VIVO BY VINYL CHLORIDE AND TWO OF ITS PRESUMED METABOLITES, CHLOROETHYLENE OXIDE

AND CHLOROACETALDEHYDE. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 391]

HUMAN TOXICITY VALUES

TCLO MAN INHALATION 30 MG/CU M (MALE EXPOSED FOR 5 YEARS); TOXIC EFFECTS: REPRODUCTIVE; PATERAL [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

HUMAN TOXICITY VALUES

CYTOGENETIC ANALYSIS HUMAN HELA CELLS MUTATION DOSE 10 MMOL/L [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

HUMAN TOXICITY VALUES

TCLO MAN INHALATION 500 PPM/4 YR INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS. [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

ION-HUMAN TOXICITY VALUES

LD50 RATS ORAL 500 MG/KG [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

ION-HUMAN TOXICITY VALUES

MUTATION SALMONELLA TYPHIMURIUM MUTATION DOSE 2000 PPM/48 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

ION-HUMAN TOXICITY VALUES

MUTATION/METABOLIC ACTIVATION SALMONELLA TYPHIMURIUM MUTATION DOSE 20 PPM/4 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

ION-HUMAN TOXICITY VALUES

MUTATION ESCHERICHIA COLI MUTATION DOSE

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NON-HUMAN TOXICITY VALUES	10600 UMOL/L [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209] DNA REPAIR ESCHERICHIA COLI MUTATION DOSE 100 UG/PLATE [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MUTATION/METABOLIC ACTIVATION SCHIZOSACCHAROMYCES POMBE MUTATION DOSE 16 MMOL/L/30 MINUTES [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MUTATION/METABOLIC ACTIVATION SACCHAROMYCES CEREVISIAE MUTATION DOSE 25000 PPM [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MITOTIC RECOMBINATION SACCHAROMYCES CEREVISIAE MUTATION DOSE 48 MMOL/L/3 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MITOTIC RECOMBINATION SCHIZOSACCHAROMYCES POMBE MUTATION DOSES 48 MMOL/L [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	ONCOGENIC TRANSFORMATION RATS INHALATION MUTATION DOSE 2000 PPM/14 WK- INTERMITTENT [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

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NON-HUMAN TOXICITY VALUES	DNA DAMAGE RATS ORAL MUTATION DOSE 18 G/KG/2 YR- CONTINUOUS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	CYTOGENETIC ANALYSIS RATS INHALATION MUTATION DOSE 150 UG/CU M/14 WK- CONTINUOUS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MICRONUCLEUS TEST MOUSE INHALATION MUTATION DOSE 5 PPH/4 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	HOST MEDIATED ASSAY RATS/SACCHAROMYCES CEREVISIAE MUTATION DOSE 1 PPH/24 HR- CONTINUOUS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	HOST MEDIATED MOUSE/SCHIZOSACCHAROMYCES POMBE MUTATION DOSE 700 MG/KG [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	MUTATION/METABOLIC ACTIVATION HAMSTER LUNG SOMATIC CELLS MUTATION DOSE 20 PPH/5 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]
NON-HUMAN TOXICITY VALUES	CYTOGENETIC ANALYSIS HAMSTERS INHALATION MUTATION DOSE 12500 PPM/6 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file.

NON-HUMAN TOXICITY VALUES

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SISTER CHROMATID EXCHANGE HAMSTERS
INHALATION MUTATION DOSE 12500 PPM/6 HR
[U.S. Department of Health and Human
Services, Public Health Service, Center for
Disease Control, National Institute for
Occupational Safety Health. Registry of
Toxic Effects of Chemical Substances
(RTECS). National Library of Medicine's
current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES

TCLO RATS INHALATION 500 PPM/7 HR (6TH-15TH
DAY OF PREGNANCY); TOXIC EFFECTS:
REPRODUCTIVE; EMBRYOTOXICITY [U.S.
Department of Health and Human Services,
Public Health Service, Center for Disease
Control, National Institute for Occupational
Safety Health. Registry of Toxic Effects of
Chemical Substances (RTECS). National
Library of Medicine's current MEDLINE file.
83/8209]

NON-HUMAN TOXICITY VALUES

TCLO RATS INHALATION 1500 PPM/24 HR (1ST-9TH
DAY OF PREGNANCY); TOXIC EFFECTS:
REPRODUCTIVE; FERTILITY [U.S. Department of
Health and Human Services, Public Health
Service, Center for Disease Control,
National Institute for Occupational Safety
Health. Registry of Toxic Effects of
Chemical Substances (RTECS). National
Library of Medicine's current MEDLINE file.
83/8209]

NON-HUMAN TOXICITY VALUES

TCLO MICE INHALATION 30,000 PPM/6 HR (5 DAYS
BEFORE MATING, MALES); TOXIC EFFECTS:
REPRODUCTIVE; FERTILITY [U.S. Department of
Health and Human Services, Public Health
Service, Center for Disease Control,
National Institute for Occupational Safety
Health. Registry of Toxic Effects of
Chemical Substances (RTECS). National
Library of Medicine's current MEDLINE file.
83/8209]

NON-HUMAN TOXICITY VALUES

TDLO RATS ORAL 10 G/KG/52 WK- INTERMITTENT;
TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S.
Department of Health and Human Services,
Public Health Service, Center for Disease
Control, National Institute for Occupational
Safety Health. Registry of Toxic Effects of
Chemical Substances (RTECS). National
Library of Medicine's current MEDLINE file.
83/8209]

NON-HUMAN TOXICITY VALUES

TCLO RATS INHALATION 50 PPM/52 WK-
INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC
EFFECTS [U.S. Department of Health and Human
Services, Public Health Service, Center for
Disease Control, National Institute for
Occupational Safety Health. Registry of
Toxic Effects of Chemical Substances
(RTECS). National Library of Medicine's
current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES

TCLO RATS INHALATION 10,000 PPM/4 HR
(12TH-18TH DAY OF PREGNANCY); TOXIC EFFECTS:

CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TDLO RATS INTRAPERITONEAL 21 MG/KG/65 WK-INTERMITTENT; TOXIC EFFECTS: EQUIVOCAL TUMORIGENIC AGENT [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TDLO RATS SUBCUTANEOUS 21 MG/KG/67 WK-INTERMITTENT; TOXIC EFFECTS: EQUIVOCAL TUMORIGENIC AGENT [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TCLO MICE INHALATION 50 PPM/30 WK-INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TCLO HAMSTERS INHALATION 50 PPM/4 HR/30 WK-INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION RATS INHALATION 250 PPM/52 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION MICE INHALATION 50 PPM/47 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety

Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION MICE INHALATION 250 PPM/6 HR/13 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC DOSE RATS ORAL 34 G/KG/3 YR- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION MICE INHALATION 50 PPM/6 HR/4 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION MICE INHALATION 50 PPM/4 HR/30 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION RATS INHALATION 250 PPM/2 YR- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES TOXIC CONCENTRATION HAMSTERS INHALATION 500 PPM/48 WK- INTERMITTENT; TOXIC EFFECTS: NEOPLASTIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of

Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES

TOXIC CONCENTRATION RATS INHALATION 50 PPM/6 HR/43 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES

LCLO GUINEA PIGS INHALATION 20 PPM/30 MIN [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

NON-HUMAN TOXICITY VALUES

TOXIC CONCENTRATION RATS INHALATION 250 PPM/80 WK- INTERMITTENT; TOXIC EFFECTS: CARCINOGENIC EFFECTS [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

TOXICITY VALUES

AQUATIC TOXICITY: TLM: OVER 1000 PPM/96 HR [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

ABSORPTION, DISTRIBUTION AND EXCRETION

FOLLOWING INHALATION EXPOSURE TO 10 PPM (14)C VINYL CHLORIDE FOR 6 HOURS, URINARY (14)C ACTIVITY AND EXPIRED VINYL CHLORIDE ACCOUNTED FOR 68 AND 2%, RESPECTIVELY. AFTER EXPOSURE TO 1000 PPM THE PROPORTION OF RADIOACTIVITY IN THE URINE WAS 56% AND THAT EXPIRED AS VINYL CHLORIDE WAS 12%. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 392]

ABSORPTION, DISTRIBUTION AND EXCRETION

Male Sprague-Dawley rats were given single oral doses (gavage) of 14C vinyl chloride at 0.05, 1.0 or 100 mg/kg, ... routes and rates of elim of 14C activity were followed for 72 hr ... Of the samples examined (liver, skin, plasma, muscle, lung, fat, and carcass), liver retained the greatest percentage of admin radioactivity at all doses. [Watanabe PG et al; Toxicol Appl Pharmacol 36: 339-352

ABSORPTION, DISTRIBUTION
AND EXCRETION

(1976) as cited in USEPA, Office of Drinking Water; Criteria Document (Draft): Vinyl Chloride p.IX-3 (1983)]

Experiments with volunteers showed that 42% of an inhaled dose of vinyl chloride ... was retained in the lungs. This value was independent of /the/ concn of vinyl chloride in the air. Elim of vinyl chloride through the lungs was negligible since its concn in expired air decreased immediately after cessation of exposure. [Krajewski J et al; Br J Ind Med 37(4): 373-374 (1980)]

ABSORPTION, DISTRIBUTION
AND EXCRETION

ORAL DOSES OF 0.05-1.0 MG/KG IN RATS...

PULMONARY EXCRETION WAS MONOPHASIC @ THESE DOSES, & URINARY METABOLITES.../WERE N-ACETYL-S-(2-HYDROXYETHYL)CYSTEINE & THIODIGLYCOLIC ACID/. @...100 MG/KG, PULMONARY EXCRETION...BIPHASIC & A GREATER PERCENTAGE...EXPIRED AS VINYL CHLORIDE--67%, COMPARED WITH 1 OR 2% @ LOWER DOSE.

[National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 783]

ABSORPTION, DISTRIBUTION
AND EXCRETION

The metabolic elim of vinyl chloride in Rhesus monkeys /following inhalation exposure/ is a dose-dependent, saturable process. ... below 200-300 ppm elim is first-order. [Buchter A et al; Tox Letters 6: 33-6 (1980) as cited in USEPA, Office of Drinking Water; Criteria Document (draft): Vinyl Chloride p.IV-8 (1983)]

METABOLISM/METABOLITES

AFTER INHALATION OF (14)C-VINYL CHLORIDE BY RATS... THREE URINARY METABOLITES HAVE BEEN DETECTED:

N-ACETYL-S-(2-HYDROXYETHYL)CYSTEINE, THIODIGLYCOLIC ACID, & AN UNIDENTIFIED SUBSTANCE. [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 783]

METABOLISM/METABOLITES

N-ACETYL-S-(2-CHLOROETHYL)CYSTEINE OR N-ACETYL-S-(2-HYDROXYETHYL)CYSTEINE MAY BE ISOLATED FROM RAT BODY FLUIDS DEPENDING ON METHOD OF PROTECTIVE ESTERIFICATION USED. N-ACETYL-S-VINYLCYSTEINE IS ANOTHER. THESE ARE NOT MUTAGENIC IN SALMONELLA TYPHIMURIUM. [GREEN T, HATHWAY DE; THE CHEMISTRY AND BIOGENESIS OF THE S-CONTAINING METABOLITES OF VINYL CHLORIDE IN RATS; CHEM-BIOL INTERACT 17(2) 137 (1977)]

METABOLISM/METABOLITES

VINYL CHLORIDE IS METABOLIZED BY MICROSOMAL MIXED-FUNCTION OXIDASES TO CHLOROETHYLENE OXIDE, WHICH CAN REARRANGE SPONTANEOUSLY TO CHLOROACETALDEHYDE. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 393]

METABOLISM/METABOLITES

Rats /were subjected/ to an airborne concn

of 14C-vinyl chloride ranging from 200-1,200 ppm in a closed system, ... the rate of decr of vinyl chloride levels in the chamber atmosphere /was measured/. ... saturation of the vinyl chloride-metabolizing enzymes of the rat /was/ achieved at 250 ppm. [Bolt HM et al; Arch Toxicol 7: 179-188 (1977) as cited in USEPA, Office of Drinking Water; Criteria Document (Draft): Vinyl Chloride p.IV-7 (1983)]

METABOLISM/METABOLITES

...DATA...INDICATE DOSE-DEPENDENT FATE OF VINYL CHLORIDE AFTER INHALATION OR ORAL ADMIN IN RATS. PRIMARY MECHANISM OF DETOXIFICATION OF VINYL CHLORIDE OR ITS REACTIVE METABOLITES INVOLVES CONJUGATION WITH HEPATIC GLUTATHIONE. GLUTATHIONE CONJUGATES...SUBJECT TO HYDROLYSIS YIELDING CYSTEINE CONJUGATES... [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 783]

BIOLOGICAL HALF-LIFE

THE PATTERN OF PULMONARY ELIMINATION OF 10 AND 1000 PPM VINYL CHLORIDE WAS DESCRIBED BY APPARENTLY SIMILAR FIRST-ORDER KINETICS, WITH HALF-LIVES OF 20.4 AND 22.4 MINUTES RESPECTIVELY. THE HALF LIVES FOR THE INITIAL PHASE OF EXCRETION OF (14)C RADIOACTIVITY IN URINE WERE 4.6 AND 4.1 HOURS, RESPECTIVELY. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man.

MECHANISM OF ACTION

Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 392] PRECARCINOGEN VINYL CHLORIDE CONVERTED TO ALKYLATING INTERMEDIATE RESPONSIBLE FOR INTRODUCTION OF 2-OXYETHYL GROUP ONTO NUCLEOPHILIC SITES IN DNA & PROTEINS OF MICE. [GOTHE ET AL; BIOCHEM BIOPHYS RES COMMUN 76(2) 259 (1977)]

INTERACTIONS

SRAGUE-DAWLEY MALE RATS RECEIVED EITHER 5% ETHANOL IN DRINKING WATER OR DRINKING WATER ONLY FOR 4 WEEKS PRIOR TO BEGINNING INHALATION OF 600 PPM VINYL CHLORIDE FOR 4 HOURS/DAY ON 5 DAYS/WEEK FOR 12 MONTHS. AFTER 60 WEEKS FROM THE FIRST VINYL CHLORIDE EXPOSURE, LIVER TUMORS WERE FOUND IN 75% OF THE VINYL CHLORIDE-ETHANOL RATS AND IN 38% OF THE VINYL CHLORIDE-ONLY GROUP. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 389]

INTERACTIONS

Vinyl chloride exerts a protective effect on hepatotoxicity when admin with vinylidene chloride. [Jaeger RJ; Ann NY Sci 246: 150-51 (1975) as cited in USEPA, Office of Drinking Water; Criteria Document (draft): Vinyl Chloride p.VI-2 (1983)]

INTERACTIONS

The metabolism of vinyl chloride /was

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INTERACTIONS

inhibited/ by administering a single dose of 320 mg/kg pyrazole one hr prior to inhalation of /vinyl chloride/ gas. [Hefner RE Jr et al; Ann NY Acad Sci 246: 135-148 (1975) as cited in USEPA; Ambient Water Quality Criteria Doc: Vinyl Chloride p.C-21] Vinyl chloride and ethylene are acutely hepatotoxic in rats pretreated with polychlorinated biphenyl. ... Trichloropropane oxide significantly incr vinyl chloride toxicity in fasted but not in fed rats. Diethylmaleate significantly lowered hepatic glutathione during exposure, but did not increase hepatotoxicity of either vinyl chloride or ethylene. ... In polychlorinated biphenyl-treated rats, hepatic glutathione and hepatic epoxide hydrase influence the acute hepatotoxicity of vinyl chloride. ... [Conolly RB, Jaeger RJ; Toxicol Appl Pharmacol 50(3): 523-532 (1979)]

INTERACTIONS

/Combining/ 1 mg/cu m vinyl chloride with 1 mg phenol/cu m antagonized the effects on the nervous system of rats in a 7-month continuous inhalation study. The mixture did not affect the learning ability which was impaired by 1 mg/cu m of either /cmpd/ separately. Vinyl chloride alone ... extended the blood clotting time. [Chyba A; Roczn Panstw Zakl Hig 32(4): 357-361 (1981)] ... older individuals, females, newborns, and alcohol consumers may be particularly sensitive to the effects of vinyl chloride. [USEPA, Office of Drinking Water; Criteria Document (Draft): Vinyl Chloride p.IX-3 (1983)]

POPULATIONS AT SPECIAL RISK

ENVIRONMENTAL FATE/EXPOSURE SUMMARY

Although vinyl chloride is produced in large quantities, almost all of it is used captively for the production of polyvinyl chloride (PVC) and other polymers. Therefore, its major release to the environment will be as emissions and wastewater at these production and manufacturing facilities. Releases to water will be lost primarily through evaporation in hours to days. In the atmosphere, vinyl chloride will degrade rapidly by photooxidation with a half-life of about 1.2 days in relatively clean air or hours in polluted air. If spilled on land, part of the vinyl chloride will evaporate and part will leach into the groundwater where its fate is uncertain. However, a detailed study at a spill site reported that levels were reduced below detection limits in 10 weeks. Since vinyl chloride is primarily used in a limited number of locations, it is unlikely that contamination will be widespread. Vinyl chloride is not expected to bioconcentrate into the food chain. Major human exposure

NATURAL OCCURRING SOURCES

will be from occupational atmospheres and from food and drinking water which has come into contact with PVC packaging material or pipe which has not been treated adequately to remove residual monomer.(SRC)

None(1). [(1)IARC; Monograph Some Monomers, Plastics and Synthetic Elastomers, and Acrolein 19:377-83 (1979)]

ARTIFICIAL SOURCES

Air emission from its production and use as a feedstock in the plastics industry (principally for PVC production) and wastewater from these industries(1).

Spills(2). [(1) IARC; Monograph Some Monomers, Plastics and Synthetic Elastomers, and Acrolein 19:377-83 (1979) (2) Charton J et al; p 245-67 in Hazard Assessment of Chemicals Vol 2; Saxena J ed (1983)]

ENVIRONMENTAL FATE

TERRESTRIAL FATE: When released on land vinyl chloride will partially volatilize (see VWS) and partially leach into the groundwater (see also KOC).(SRC)

ENVIRONMENTAL FATE

AQUATIC FATE: The primary loss process for vinyl chloride released into water is evaporation into the atmosphere (see also VWS). For a variety of natural waters the half-life for this process would be expected to take hours to days. In waters containing photosensitizers such as humic acid, photodegradation will occur fairly rapidly (see also ABIO). Loss by adsorption to sediment will not be appreciable (see also KOC). After a train derailment in Canada on Mar. 10, 1980, in a blizzard in which 2 of 12 boxcars were found to be leaking and large quantities of VC were spilled in the snow, a max of 10 ppm was found in groundwater at the center of the spill site. Levels dropped below the detection limit of .02 ppm 10 weeks after the spill(1).(SRC) [(1) Charlton J et al; p 245-67 in Hazard Assessment of Chemicals Vol 2; Saxena J ed (1983)]

ENVIRONMENTAL FATE

ATMOSPHERIC FATE: Vinyl chloride reacts in the troposphere with photochemically produced hydroxyl radicals with a half-life of 1.2 days. In photochemical smog situations, the half-life would be reduced to a few hours (see also ABIO).(SRC)

BIODEGRADATION

Existing data, which is admittedly scant, indicates that vinyl chloride is resistant to biodegradation in aerobic systems(1,2). No information could be found concerning its biodegradability in anaerobic systems(SRC). [(1) Helfgott TB et al; An index of refractory organics, EPA-600/2-77-174 p 21 (1977) (2) Callahan MA et al; Water-related environmental fate of 129 priority pollutants Vol 2, EPA-440/4-79-029b page 49-1 to 49-10 (1979)]

ABIOTIC DEGRADATION

Vinyl chloride is a reactive chemical in the

atmosphere. Laboratory results for its reaction with hydroxyl radicals give a half-life of 1.2 days or a 43% loss per sunlit day(1,2), a result which is confirmed by its rate of disappearance in air exposed to sunlight(3,5). The products of reaction include chloroacetaldehyde, HCl, chloroethylene epoxide, formaldehyde, formyl chloride, formic acid and carbon monoxide(4,5). In the presence of nitrogen oxides, its reactivity is much higher with a half-life of 3-7 hrs(3,6,7). In water no photodegradation was observed in 90 hours; however, degradation is rapid in the presence of sensitizers such as might be the case in humic waters, etc., or free radicals as might be found in PVC manufacturing effluent streams(8). Hydrolysis will not be a significant loss process(8). [(1) Perry RA et al; J Chem Phys 67:458-62 (1977) (2) Singh HB et al; Atmos Environ 15:601-12 (1981) (3) Carassiti V et al; Ann Chim 67:499-512 (1978) (4) Muller JPH, Korte F; Chemosphere 6:341-6 (1977) (5) Kagiya T et al; Japan Chem Soc Spring Term Mtg, 32nd Tokyo Japan paper 1035 (1975) (6) Woldbaek T, Klaboe P; Spectrochim Acta A 34:481-7 (1978) (7) Gay BW Jr et al; Environ Sci Technol 10:58-66 (1976) (8) Callahan MA et al; Water-related environmental fate of 129 priority pollutants Vol 2 EPA-440/4-79-029b page 49-1 to 49-10 (1979)]

BIOCONCENTRATION

Vinyl chloride's low octanol/water partition ($\log K_{ow} = .6$ (1)) indicates that it will have little tendency to bioconcentrate in the food chain(SRC). While not reporting actual bioconcentration factors, a lack of appreciable bioconcentration in extractable fractions of fish and aquatic invertebrates was reported in an ecosystem study(2). [(1) Callahan MA et al; Water-related environmental fate of 129 priority pollutants Vol 2 EPA-440/4-79-029b page 49-1 to 49-10 (1979) (2) Lu PY et al; Arch Environ Contam Toxicol 9:1042-8 (1977)]

OTHER ENVIRONMENTAL CONCENTRATIONS

Vinyl chloride monomer has been found in polyvinyl chloride resins but these levels can be reduced by new processing techniques in food grade resins(1). For example, PVC delivered to a fabricator contained 250 ppm vinyl chloride monomer which was reduced to .5-20 ppm after fabrication(1). Residual vinyl chloride monomer found in food packing material ranged from .043-71 ppb for film and up to 7.9 ppm for plastic bottles(1). It has been found in domestic and foreign cigarettes and little cigars in concentrations of 5.6-27 mg/cigarette(1). [(1) IARC; Monograph Some Monomers, Plastics and Synthetic Elastomers, and Acrolein

WATER CONCENTRATIONS

19:381-3 (1979)]
 DRINKING WATER: In the National Organic Monitoring Survey (1976-7) 2 samples out of 113 contained detectable levels (>.1 ppb) and these averaged .14 ppb(1). Highest value found in US drinking water is 10 ppb(5,7). 23% of 133 US cities using finished surface water were pos, .1 to 9.8 ppb, .4 ppb median of pos samples(2). A finished groundwater survey in 25 US cities resulted in 4.0% pos, 9.4 ppb mean(2,6). One contaminated drinking water well contained 50 ppb(3). Drinking water from PVC pipes contained 1.4 ppb in a recent installation, while a 9 yr old system had 0.03 to 0.06 ppb(4). GROUNDWATER: 4 of 1060 wells in New Jersey were positive(10) and vinyl chloride was present in the 10 most polluted wells from 408 New Jersey samples; however, it was not quantified(11). 15.4% of 13 US cities sampled were pos - 2.2 to 9.4 ppb, 5.8 ppb median(2,6). In a 9-state survey, 7% of the wells tested were positive, with a maximum value of 380 ppb reported(8). After train derailment in Manitoba on Mar. 10, 1980, in which large amounts of VC was spilled in the snow, 10 ppm max occurred in groundwater which decreased to below .02 ppm by 10 wks after the spill(12). SURFACE WATER: 9.8 ppb max value found in a 1981, 9 state survey(3,8). It was not detected in winter or summer samples from the Delaware Riverr(9). Vinyl chloride has been detected in 21 out of 606 samples from New Jersey(10) and other US samples(5). 7.6% of 105 US cities were positive with pos samples ranging from .2 to 5.1 ppb, 3.25 ppb median(2). [(1) Drury JS, Hammons AS; Investigarions of Selected Environmental Pollutants 1,2-dichloroethane. EPA-560/2-78-006 p 63 (1979) (2) Coniglio WA et al; The occurrence of volatile organics in drinking water. EPA exposure assessment project (1980) (3) Burmaster DE; Environ 24:6-13, 33-6 (1982) (4) USEPA; Ambient Water Quality Criteria for Vinyl Chloride. EPA-440/5-80-078 (1980) (5) Fishbein L; Sci Total Environ 11:111-61 (1979) (6) Council Environmental Quality; Contamination on groundwater by toxic organic chemicals. Washington, DC 84 p (1981) (7) Kraybill HF; NY Acad Sci Annals 298:80-9 (1977) (8) Dyksen JE, Herr AF III; J Amer Water Work Assoc 1982, 394-403 (1982) (9) Sheldon LS, Hites RA; Environ Sci Technol 12:1188-94 (1978) (10) Page GW; Environ Sci Technol 15:1475-81 (1981) (11) Greenberg M et al; Environ Sci Technol 16:14-9 (1982) (12) Charlton J et al; p 245-67 in Hazard Assessment of Chemicals Vol 2; Saxena J ed (1983)]

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EFFLUENTS CONCENTRATIONS

The only industry with appreciable waste water effluents of vinyl chloride is the organic chemicals mfg/plastic industry where mean levels are 750 ppb(1). Waste water from 12 PVC plants in 7 US areas ranged from 0.05 to 20 ppm with typical levels being 2 to 3 ppm(2). Vinyl chloride has been detected in effluents from chemical and latex plants in Long Beach, California(4). It was not detected in effluents from major municipal waste water discharges in Southern California(3). [(1) USEPA; Treatability Manual. EPA-600/2-82-001a page I.12.12-1 to I.12.12-4 (1981) (2) USEPA; Ambient Water Quality Criteria for Vinyl Chloride. EPA-440/5-80-078 (1980) (3) Young DR; Annual Rep Southern California Coastal Water Res Proj p 103-12 (1978) (4) Fishbein L; Sci Total Environ 11:111-61 (1979)]

SEDIMENT/SOIL CONCENTRATIONS

After Mar. 10, 1980 train derailment in Canada in which large quantities of VC were spilled in the snow, soil samples reached levels as high as 500 ppm a meter or two below the surface(1). [(1) Charlton J et al; p 245-67 in Hazard Assessment of Chemicals Vol 2; Saxena J ed (1983)]

ATMOSPHERIC CONCENTRATIONS

RURAL: <5 parts/trillion detected in rural northwest US(1,4) <10 ppb at the Whiteface Mtn in New York(3). No vinyl chloride was detected in 7 samples taken in the Grand Canyon, AZ, detection limit=2.8 ppb(2) and <10 ppb at the Whiteface Mtn in New York(3). URBAN/SUBURBAN: Vinyl chloride has a low frequency of occurrence in studies done in New Jersey(5,7,10,11), with a concn range of a trace to <10 ppb avg(3,5,7,10,11,12). 2 of 8 sites (1 - Staten Island and 7 - New Jersey) were pos - .15 and 46 ppb(6); Baltimore, MD - 38.5 ppb avg(3); SOURCE DOMINATED AREAS: Houston, TX - Gulf Coast area (18 samples) 3.1-1250 ppb, max in Texas City(9); Niagara Falls, NY, upwind from plant - 0 ppb, downwind - 28 ppb and 40 ppb measured in a nearby residential area (13). Delaware City, DE highway intersection - 790 ppb avg(3) Houston, TX area which is the site of 40% of US production capacity of PVC had a range of 3.1-1250 ppb(14,15) with 33.0 ppm being detected 0.5 km from the center of a VC plant(15). Ambient air near 2 vinyl chloride plants n Long Beach, CA - 1.3-3.4 ppm(17); 8 highly industrialized US areas 0 to .513 ppb(2). Not detected in 23 samples from the Kin Buc disposal site in New Jersey(2). <0.05 ppm was detected in ambient air from a petrochemical factory area(16). 2 of 7 new auto interiors gave levels of 0.4 to 1.2 ppm(15), however, <10 ppb was measured in another study involving 16 new or used cars and 4 new or old mobile

homes(17). After Mar 10, 1980 train derailment in Canada in which large quantities of VC were spilled during a blizzard, levels in excess of 200 ppm were found at ground levels near some freight cars but levels outside of the spill area were <.02 ppm the detection limit(18). [(1) Harsch DE et al; J Air Pollut Control Assoc 29:975-6 (1979) (2) Pellizzari ED; Quantification of chlorinated hydrocarbons in previously collected air samples EPA-450/3-78-112 (1978) (3) Lillian D et al; Environ Sci Technol 9:1042-8 (1975) (4) Grimsrud EP, Rasmussen RA; Atmos Environ 9:1014-7 (1975) (5) Bozzelli JW, Kebbehuss BB; Analysis of selected volatile substances in ambient air, final report Apr-Nov 1978. Newark, NJ: New Jersey Institute Tech 80 p (1979) (6) Pellizzari ED; The measurement of carcinogenic vapors in ambient atmospheres. EPA-600/7-77-055 p 288 (1977) (7) Bozzelli JN et al; Analysis of selected toxic and carcinogenic substances in ambient air in New Jersey. New Jersey Dept Environ Protect (1980) (8) Pellizzari ED et al; Formulation of preliminary assessment of halogenated organic compounds in man and environmental media. EPA-560/13-79-006 (1979) (9) Gordon SJ, Meeks SA; AIChE Symp Ser 73:84-94 (1977) (10) Harkov R et al; J Air Pollut Control Assoc 33:1177-83 (1983) (11) Harkov R et al; Toxic and carcinogenic air pollutants in New Jersey - volatile organic substances. Trenton, NJ: Office of Cancer and Toxic Substances Research (1981) (12) Liroy PY et al; J Water Pollut Control Fed 33:649-57 (1983) (13) Gay BW Jr, Noonan RC; Ambient air measurements of vinyl chloride in the Niagara Falls area; environmental monitoring series. EPA-650/4-75-020 19 p (1975) (14) McMurray JR, Tarr J; IES 24 Ann Mtg Fort Worth, Tx 18-20 Apr 78 p 149-53 (1978) (15) Fishbein L; Sci Total Environ 11:111-61 (1979) (16) Marthinsson B et al; Opt Quantum Electron 12:327-34 (1980) (17) IARC; Monograph, Some Monomers, Plastics and Synthetic Elastomers, and Acrolein 19:380-3 (1979) (18) Charleton J et al; p 245-67 in Hazard Assessment of Chemicals Vol 2; Saxena J ed (1983)]

FOOD SURVEY VALUES

20 mg/kg were detected in alcoholic beverages which were packaged in products containing vinyl chloride(1,3). Alcoholic beverages - 0.025 to 1.60 ppm. .44 ppm avg, edible oils - 0.3 to 3.29 ppm, 2.16 ppm avg, vinegars 0 (red wine) to 8.40 ppm (apple cider), detected but not quantified in butter and margarine when these products were packaged in PVC containers(2,3). [(1) IARC; Monograph Some anti-thyroid and

PROBABLE ROUTES OF HUMAN
EXPOSURE

related substances, nitrofurans and industrial chemicals 7:291-318 (1974) (2) USEPA; Ambient Water Quality Criteria for Vinyl Chloride. EPA-440/5-80-078 p 6-7 (1980) (3) Fishbein L; Sci Total Environ 11:111-61 (1979)] Inhalation is the major route of exposure for nearby residents and workers(1). Exposure is also possible by ingestion of contaminated foods, water and absorption through skin from cosmetics(1). Potential risk groups include workers in VC production or use facilities and nearby residents, people coming in contact with recently manufactured PVC in enclosed quarters (e.g., new cars), consumers of food products packaged in PVC and drinking water from PVC pipes(2). [(1) USEPA; Ambient Water Quality Criteria for Vinyl Chloride. EPA-440/5-80-078 p. C-2 (1980) (2) Fishbein L; Sci Total Environ 11:111-61 (1979) (3) Council on Environmental Quality; Contamination of groundwater by organic chemicals. 84 p (1981)]

AVERAGE DAILY INTAKE

AIR INTAKE (assume 0 ppb, see also ATMC) 0 ug; WATER INTAKE (assume 0 ppb, see also WATC) 0 ug; FOOD INTAKE - insufficient data.

PROBABLE EXPOSURES

TO DATE, 48 CASES OF HEPATIC ANGIOSARCOMA...DIAGNOSED IN INDUST...WORKERS AROUND WORLD. ALL AUTHENTICATED CASES...FOUND IN WORKERS ENGAGED IN CLOSED-IN PLANTS HANDLING VERY LARGE QUANTITIES OF LIQUEFIED VINYL CHLORIDE UNDER PRESSURE... EXPOSURE CONCEN WERE HIGH, PROBABLY RANGING FROM 1,000 PPM TO SEVERAL THOUSAND PPM. [National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977. p. 784]

PROBABLE EXPOSURES

A STRONG CORRELATION WAS FOUND BETWEEN VINYL CHLORIDE (VC) CONCEN AT WORKING PLACES AND THE INCR EXCRETION OF THIODIGLYCOLIC ACID OF 18 EXPOSED WORKERS. THE VALUE OBTAINED WERE IN THE RANGE OF 0.14-7.00 PPM. THE EXCRETION OF THIODIGLYCOLIC ACID, MEASURED BY GC-MS ANALYSIS, AMOUNTED TO 0.3-4.0 MG/L. [MUELLER G ET AL; DETERMINATION OF THIODIGLYCOLIC ACID IN URINE SPECIMENS OF VINYL CHLORIDE EXPOSED WORKERS; INT ARCH OCCUP ENVIRON HEALTH 41(3) 199 (1978)]

PROBABLE EXPOSURES

IN 48 WORKERS EXPOSED TO 140-1200 MG/CU M VCM DURING PRODN OF POLYVINYL CHLORIDE...SOME...HAD SIGNS OF IRRITATION OF RESP TRACT & HEPATITIS. TWENTY-THREE...INCR HEMOGLOBIN LEVEL IN...BLOOD... [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V7 303]

PROBABLE EXPOSURES

Avg exposure of a random person living within a 5 mi radius of a plant - 17 ppb(1). The total worldwide work force in VC and PVC industries exceeds 70,000(2). The estimated number of persons at risk is 4.6 million(1). [(1) USEPA; Ambient Water Quality Criteria for Vinyl Chloride. EPA-440/5-80-078 p C-52 (1980) (2) Fishbein L; Sci Total Environ 11:111-61 (1979)]

PROBABLE EXPOSURES

AN EXCESS OF CENTRAL NERVOUS SYSTEM DEFECTS, DEFORMITIES OF THE UPPER ALIMENTARY AND GENITAL TRACTS, AND CLUBFOOT WERE OBSERVED IN STILLBORN AND LIVE CHILDREN IN THREE OHIO CITIES IN WHICH VINYL CHLORIDE POLYMERIZATION PLANTS ARE LOCATED. [IARC.

PROBABLE EXPOSURES

Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 398] ...MORTALITY STUDY OF 8384 MEN.../WITH/ @ LEAST 1 YR...EXPOSURE...BEFORE DEC 31, 1972, DEMONSTRATED THAT CANCERS OF DIGESTIVE SYSTEM (PRIMARILY ANGIOSARCOMA), RESP SYSTEM, BRAIN, & CANCERS OF UNKNOWN SITE, AS WELL AS LYMPHOMAS OCCURRED MORE OFTEN THAN EXPECTED IN...STUDY POPULATION WITH GREATEST ESTIMATED EXPOSURE. [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists, Inc., 1980. p. 430]

PROBABLE EXPOSURES

/INVESTIGATORS/...STUDIED 168 WORKERS...THEY REPORTED NARCOTIC SYMPTOMS, ASTHENIC NERVOUS SYMPTOMS, RAYNAUD'S SYNDROME & LIVER ENLARGEMENT. INCIDENCE OF RAYNAUD'S SYNDROME...6% &...LIVER ENLARGEMENT 30%. [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V7 303]

SOIL ADSORPTION/MOBILITY

No experimental data could be found on the adsorption of vinyl chloride to soil. A low adsorptivity would be predicted on the basis of its low octanol/water partition coefficient ($\log K_{ow} = .6(1)$). A K_{oc} of 51 is calculated from a regression equation relating K_{oc} to $K_{ow}(2, SRC)$. [(1) Callahan MA et al; 1979a Water-related environmental fate of 129 priority pollutants Vol 2 EPA-440/4-79-029b page 49-1 to 49-10 (1975) (2) Kenaga EE, Goring CAI; Aquatic toxicology, Proceed 3rd Ann Symp on aquatic toxicology, ASTM Philadelphia, PA p 78-111 (1980)]

VOLATILIZATION FROM
WATER/SOIL

Vinyl chloride will be expected to volatilize rapidly from water with a half-life of 2.5 hr (wind 3 m/sec, current 3

m/sec, depth 1 m)(1). Due to its high vapor pressure, volatilization from soil would be rapid(SRC). [(1) Lyman WJ et al; Handbook of chemical property estimation methods. Environmental behavior of organic compounds. New York, NY: McGraw-Hill Book Co p 15-25 (1982)]

OSHA STANDARDS

OSHA STD- AIR: TIME WEIGHTED AVG (TWA) 1 PPM; CEILING CONC 5 PPM/15 MINUTES (1975). CRITERIA DOCUMENT: OCCUPATIONAL EXPOSURE TO VINYL HALIDES RECOMMENDED STANDARD- AIR: TIME WEIGHTED AVERAGE (TWA) 1 PPM; CEILING CONC 5PPM/15 MINUTES. [U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLINE file. 83/8209]

THRESHOLD LIMIT VALUES

TLV: TIME WEIGHTED AVERAGE (TWA) 5 PPM (APPROXIMATELY 10 MG/CU M)- APPENDIX A1A- RECOGNIZED CARCINOGEN (1980). [American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists, Inc., 1980. p. 427]

WATER STANDARDS

Listed by EPA under Section 307(a) of the Clean Water Act. [Bureau of Explosives; Hazardous Matls Regs of DOT p.97 (1984) ICC No. BOE-6000D]

ATMOSPHERIC STANDARDS

Listed by EPA under Section 112 of the Clean Air Act. [Bureau of Explosives; Hazardous Matls Regs of DOT p.97 (1984) ICC No. BOE-6000D]

ERCLA REPORTABLE QUANTITIES

1 lb [48 FR 23552 (5/25/83)]

RCRA REQUIREMENTS

Any commercial chemical products, manufacturing chemical intermediates, residues remaining in a container or an inner liner removed from a container, or any residues or contaminated soils, water or other debris containing vinyl chloride are considered toxic wastes according to RCRA. [40 CFR 261.33(f) (7/1/83)]

SAMPLING PROCEDURES

ANALYTE: VINYL CHLORIDE; MATRIX: AIR; PROCEDURE: ADSORPTION ON ACTIVATED CARBON, DESORPTION WITH CARBON DISULFIDE, GAS CHROMATOGRAPHY; RANGE: 0.008 TO 5.2 MG/CU M IN A 5-LITER AIR SAMPLE. [U.S. Department of Health, Education Welfare, Public Health Service. Center for Disease Control, National Institute for Occupational Safety Health. NIOSH Manual of Analytical Methods. 2nd ed. Volumes 1-7. Washington, DC: U.S. Government Printing Office, 1977-present. V1 178-1]

ANALYTIC LABORATORY

A GAS CHROMATOGRAPHIC METHOD FOR DETERMINING

METHODS

VINYL CHLORIDE IN FOODSTUFFS AND IN VINYL CHLORIDE POLYMERS AND COPOLYMERS INTENDED TO COME INTO CONTACT WITH FOOD. COMMISSION OF THE EUROPEAN COMMUNITITES, OFF J EUR COMMUNITIES NUMBER C16 8 (1977). [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 383] ANALYTE: VINYL CHLORIDE; MATRIX: AIR; PROCEDURE: ADSORPTION ON ACTIVATED CARBON, DESORPTION WITH CARBON DISULFIDE, GAS CHROMATOGRAPHY; RANGE: 0.008 TO 5.2 MG/CU M IN A 5-LITER AIR SAMPLE. [U.S. Department of Health, Education Welfare, Public Health Service. Center for Disease Control, National Institute for Occupational Safety Health. NIOSH Manual of Analytical Methods. 2nd ed. Volumes 1-7. Washington, DC: U.S. Government Printing Office, 1977-present. V1 178-1]

ANALYTIC LABORATORY METHODS

ANALYTIC LABORATORY METHODS

A REVIEW CONTAINING OVER 100 REFERENCES OF SAMPLING AND ANALYTICAL METHODS FOR VINYL CHLORIDE IN WORKPLACE ATMOSPHERE, AMBIENT AIR, WATER, FOOD, CIGARETTE SMOKE, AND POLYVINYL CHLORIDE. EGAN H ET AL, EDS, ENVIRONMENTAL CARCINOGENS- SELECTED METHODS OF ANALYSIS VOL 2, VINYL CHLORIDE (IARC SCIENTIFIC PUBLICATIONS NUMBER 22) LYON (1979). [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 383] USEPA; Ambient Water Quality Criteria Doc: Vinyl Chloride (1980) EPA 720-016/5963 USEPA, Office of Drinking Water; Criteria Document (draft): Vinyl Chloride (1983) Environment Canada; Tech Info for Problem Spills: Vinyl Chloride (Draft) (1981) A REVIEW CONTAINING OVER 100 REFERENCES OF SAMPLING AND ANALYTICAL METHODS FOR VINYL CHLORIDE IN WORKPLACE ATMOSPHERE, AMBIENT AIR, WATER, FOOD, CIGARETTE SMOKE, AND POLYVINYL CHLORIDE. EGAN H ET AL, EDS, ENVIRONMENTAL CARCINOGENS- SELECTED METHODS OF ANALYSIS VOL 2, VINYL CHLORIDE (IARC SCIENTIFIC PUBLICATIONS NUMBER 22) LYON (1979). [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1985. (Multivolume work). V19 383]

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