905R81116

HEALTH EFFECTS MANUAL OF APPENDIX VII & APPENDIX VIII SUBSTANCES

PER

40 CFR PART 261 SUBPART D

PREPARED BY

PROCESS EVALUATION UNIT (PEU)
TECHNICAL PROGRAMS & COMPLIANCE SECTION
WASTE MANAGEMENT BRANCH
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

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INTRODUCTION

This manual represents a compilation of information gathered from various sources and deals with the health effects and toxicological properties of the substances listed in Appendix VII and Appendix VIII, 40 CFR, Part 261, Resource Conservation and Recovery Act (RCRA). As stated in the May 19, 1980 Federal Register, Appendix VII identifies those (waste) constituents which resulted in a waste stream being listed as an EP (extraction procedure) toxic waste or as a toxic (T) waste in the lists of hazardous wastes from specific and non-specific sources. The substances in Appendix VIII are those materials which have been shown in reputable scientific studies to have toxic, carcinogenic, mutagenic, or teratogenic effects on humans or other life forms.

The data for each entry was presented under seven headings: SYNONYM, STRUCTURE, USE/OCCURRENCE, HEALTH EFFECTS, TOXICITY DATA, and TLV (threshold limit value). Publications used for the SYNONYM and STRUCTURE included the Merck Index (Stecher, 1968 and 1976), the Farm Chemicals Handbook (Berg, 1976), and EPA document 540/9-75-011 dealing with pesticide labeling (USEPA, 1975). The main sources of information for the USE/OCCURRENCE section were the USEPA Backround Documents for Subtitle C, RCRA (USEPA, 1980), Suspended and Cancelled Pesticides (USEPA, 1979), and Occupational Diseases (Key, 1977). The HEALTH EFFECTS section was compiled using the USEPA Backround Documents (USEPA,

1980), the NIOSH publication by Key (Key, 1977), the NIOSH registry document (Lewis, 1879), Toxicology (Casarett and Doull, 1975), and the Sax book (Sax, 1979) which also provided information on thermal decomposition products. A chemical was listed as a carcinogen if it was so determined by CAG (USEPA Carcinogen assessment Group), or if not evaluated by CAG, then identified as being carcinogenic by IARC (the International Agency for Research on Cancer, World Health Organization), or by NCI (National Cancer Institute). Where no determination had been made, a substance was labeled an experimental carcinogen, mutagen, etc., in this manual if positive animal studies were cited in the NIOSH registry document (Lewis, 1979). The TOXICITY DATA section was developed from the NIOSH registry book (Lewis, 1979). As an aid to the interpretation of this information, a toxicity rating system has been included in Appendix I (MDNR, 1980). This table can be used to obtain the relative acute toxicity of any listed chemical. It should also be kept in mind that USEPA has defined as acutely hazardous those (waste) substances which have been shown to be fatal to humans in low doses or have been shown in mammalian studies to have an oral LD50 of less than 50 mg/kg in rat, an inhalation LC50 of less than 2000 mg/m^3 in rat, or a dermal LD50 of less than 200 mg/kg in rabbit (40 CFR, May, 19, 1980, RCRA).

The reader is encouraged to consult the Definitions page for the meanings of unfamilar abbreviations or words encountered within the text of this report.

JUL 1981

DEFINITIONS

CNS = central nervous system

dermal = relating to the skin

DOT = US Department of Transportation

GI = gastrointestinal

LD50 = Lethal Dose 50; the dose of a substance which leads to the death of 50% of the animals in a test population (Lewis, 1979)

LC = Lethal Concentration (via inhalation)

LCLo = Lethal Concentration Low; the lowest concentration of a substance in air which has been reported to have caused death in humans or animals (Lewis, 1979)

mutagen = a compound which induces alterations in the genetic material (DNA) of an organism (Loomis, 1978)

neoplastic = tumor-forming

TC = toxic concentration

teratogen = a substance which, when administered to a pregnant female, results in malformed offspring (i.e., birth defects)

TLV = Threshold Limit Value, the airborne concentration of a material to which a worker can be exposed day after day without adverse effect (ACGIH, 1980)

TLV/TWA = TLV/Time Weighted Average, the time weighted average concentration for a normal 8-hour workday or 40-hour work week to which nearly all workers may be exposed repeatedly without adverse effect (ACGIH, 1980)

TLV/C = TLV/Ceiling, the exposure concentration of a material that should not be exceeded even instantaneously (ACGIH, 1980)

Alphabetical Listing of Appendix VII and Appendix VIII Chemicals

ACENAPHTHTHENE *
ACETALDEHYDE
ACETONITRILE **
3-(alpha-ACETONYLBENZYL)-4-HYDROXYCOUMARIN and salts
2- ACETYLAMINOFLUORENE
ACETYL CHLORIDE
1-ACETYL-2-THIOUREA
ACROLEIN
ACRYLAMIDE **
ACRYLONITRILE **
AFLATOXINS
ALDRIN
ALLYL ALCOHOL
ALUMINUM PHOSPHIDE
4-AMINOBIPHENYL
5-(AMINOMETHYL)-3-ISOXAZOLOL
4-AMINOPYRIDINE
AMITROLE
ANILINE **
ANTIMONY and compounds, N.O.S. **
ARAMITE
ARSENIC and compounds, N.O.S. **
ARSENIC ACID
ARSENIC PENTOXIDE
ARSENIC TRIOXIDE
AURAMINE
AZASERINE
BARIUM and compounds, N.O.S.
BARIUM CYANIDE
BENZ(c)ACRIDINE
BENZ(a)ANTHRACENE **
BENZENE **
BENZENEARSONIC ACID
BENZENETHIOL
BENZIDINE
BENZO(a)ANTHRACENE
BENZO(b)FLUORANTHENE **
BENZO(j)FLUORANTHENE
BENZO(a)PYRENE **
BENZOQUINONE
BENZOTRICHLORIDE **
BENZYL CHLORIDE **
BERYLLIUM and compounds, N.O.S.
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER **

N,N-BIS(2-CHLOROETHYL)-2-NAPHTHYLAMINE
BIS(2-CHLOROISOPROPYL)ETHER
BIS(CHLOROMETHYL)ETHER **
BIS(2-ETHYLHEXYL)PHTHALATE
BROMOACETONE
BROMOFORM
BROMOMETHANE
4-BROMOPHENYL PHENYL ETHER
BRUCINE
2-BUTANONE PEROXIDE
BUTYL BENZYL PHTHALATE
2-sec-BUTYL-4,6-DINITROPHENOL(DNBP)
CADMIUM and compounds, N.O.S. **
CALCIUM CHROMATE
CALCIUM CYANIDE
CARBON DISULFIDE **
CARBON TETRACHLORIDE *
CHLORAMBUCIL
CHLORDANE **
CHLORINATED BENZENES, N.O.S.
CHLORINATED ETHANE, N.O.S.
CHLORINATED FLUOROCARBONS *
CHLORINATED HYDROCARBONS
CHLORINATED NAPHTHALENE, N.O.S.
CHLORINATED PHENOL, N.O.S.
CHLOROACETALDEHYDE **
CHLOROALKYL ETHERS **
p-CHLOROANILINE
CHLOROBENZENE
CHLOROBENZILATE
1-(p-CHLOROBENZOYL)-5-METHOXY-2-METHYLINDOLE-3-ACETIC ACID
p-CHLORO-m-CRESOL **
1-CHLORO-2,3-EPOXYBUTANE
2-CHLOROETHYL VINYL ETHER
CHLOROFORM
CHLOROMETHANE
CHLOROMETHYL METHYL ETHER
2-CHLORONAPHTHALENE
2-CHLOROPHENOL **
1-(O-CHLOROPHENYL)THIOUREA
3-CHLOROPROPIONITRILE
alpha-CHLOROTOLUENE
CHROMIUM, HEXAVALENT **
CHRYSENE **
CITRUS RED NO. 2
COAL TARS
COPPER CYANIDE
CREOSOTE **
CRESOL **
CRESYLIC ACID **
CROTONALDEHYDE
CYANIDES and CYANIDE SALTS **

CYANIDE, COMPLEXED **
CYANOGEN
CYANOGEN BROMIDE
CYANOGEN CHLORIDE
CYCASIN
2-CYCLOHEXYL-4,6-DINITROPHENOL
CYCLOPHOSPHAMIDE
DAUNOMYCIN
DDD
DDE
DDT
DIALLATE
DIBENZ(a,h)ACRIDINE
DIBENZ(a,j)ACRIDINE
DIBENZ(a,h)ANTHRACENE **
7H-DIBENZO(c,g)CARBAZOLE
DIBENZO(a,e)PYRENE
DIBENZO(a,h)PYRENE
DIBENZO(a,j)PYRENE
1,2-DIBROMO-3-CHLOROPROPANE
1,2-DIBROMOETHANE
DIBROMOMETHANE
DI-n-BUTYL PHTHALATE
DICHLOROBENZENE, N.O.S. **
1,2-DICHLOROBENZENE (ortho-DICHLOROBENZENE) *
1,4-DICHLOROBENZENE *
3,3'-DICHLOROBENZIDINE
1,1-DICHLOROETHANE
1,2-DICHLOROETHANE **
DICHLOROETHYLENE, N.O.S. **
1,1-DICHLOROETHYLENE **
1,2-DICHLOROETHYLENE
trans-1,2-DICHLOROETHYLENE
DICHLOROMETHANE
2,4-DICHLOROPHENOL **
2,6-DICHLOROPHENOL **
2,4-DICHLOROPHENOXYACETIC ACID (2,4-D)
DICHLOROPHENYLARSINE
DICHLOROPROPANE
1,2-DICHLOROPROPANE
DICHLOROPROPANOL, N.O.S. **
DICHLOROPROPENE, N.O.S.
1,3-DICHLOROPROPENE
DIELDRIN
DIEPOXYBUTANE
DIETHYLARSINE
o,o-DIETHYL-S-(2-ETHYLTHIO)ETHYL ESTER of PHOSPHOROTHIOTIC ACID
1,2-DIETHYLHYDRAZINE

o,o-DIETHYLPHOSPHORIC ACID, o-p-NITROPHENYL ESTER
DIETHYL PHTHALATE
O,O-DIETHYL-o-(2-PYRAZINYL)PHOSPHOROTHIDATE
DIETHYLSTILBESTROL
DIHYDROSAFROLE
3,4-DIHYDROXY-alpha-(METHYLAMINO)-METHYL BENZYL ALCOHOL
DI-ISOPROPYLFLUOROPHOSPHATE(DFP)
DIMETHOATE
DIMETHOXYBENZIDINE
p-DIMETHYLAMINOAZOBENZENE
7,12-DIMETHYLBENZIDINE
DIMETHYLCARBAMOYL CHLORIDE
1,1-DIMETHYLHYDRAZINE
1,2-DIMETHYLHYDRAZINE
3,3-DIMETHYL-1-(METHYLTHIO)-2-BUTANONE-O-(METHYLAMINO)CARBONIC)OXIME
DIMETHYLNITROSAMINE
alpha, alpha-DIMETHYLPHENETHYLAMINE
2,4-DIMETHYLPHENOL **
DIMETHYL PHTHALATE
DIMETHYL SULFATE
DINITROBENZENE, N.O.S.
4,6-DINITRO-o-CRESOL and salts
2,4-DINITROPHENOL **
2,4-DINITROTOLUENE **
2,6-DINITROTOLUENE
DI-n-OCTYL PHTHANLATE
1,4-DIOXANE
DIPHENYLAMINE **
1,2-DIPHENYLHYDRAZINE
DI-n-PROPYLNITROSAMINE
DISULFOTON
2,4-DITHIOBIURET
ENDOSULFAN
ENDRIN and metabolites
EPICHLOROHYDRIN **
ETHYL CARBAMATE
ETHYL CYANIDE
ETHYLENEBISDITHIOCARBAMATE (EBDC)
ETHYLENE DIAMINE
ETHYLENE DICHLORIDE *
ETHYLENEIMINE
ETHYLENE OXIDE
ETHYLENETHIOUREA
ETHYL METHANESULFONATE
FLUORANTHENE **
FLUORINE
2-FLUOROACETAMIDE
FLUOROACETIC ACID, SODIUM SALT
FORMALDEHYDE **
FORMIC ACID *
GLYCIDYLALDEHYDE
HALOMETHANE, N.O.S.
HEPTACHLOR **

HEPTACHLOR EPOXIDE (d-,B-, and r-isomers)
HEXACHLOROBENZENE **
HEXACHLOROCYCLOHEXANE
HEXACHLOROCYCLOPENTADIENE **
HEXACHLOROETHANE **
1,2,3,4,10,10,-HEXCHLORO-1,4,4a,5,8,8a-HEXAHYDRO-1,4:5,8-ENDO,ENDO-DIMETHANONAPNTHALENE
HEXACHLOROPHENE
HEXACHLOROPROPENE
HEXAETHYL TETRAPHOSPHATE
HYDRAZINE
HYDROCYANIC ACID **
HYDROFLUORIC ACID
HYDROGEN SULFIDE
INDENO (1,2,3-c,d)PYRENE **
IODOMETHANE
IRON DEXTRAN
ISOBUTANOL/ISOBUTYL ALCOHOL **
ISOCYANIC ACID, METHYL ESTER
ISOSAFROLE
KEPONE LASIOCARPINE
LEAD and compounds, N.O.S. **
LEAD ACETATE
LEAD, INORGANIC **
LEAD PHOSPHATE
LEAD SUBACETATE
MALEIC ANHYDRIDE **
MALONITRILE
MELPHALAN
MERCURY and compounds, N.O.S. **
MERCURY, ALKYL **
MERCURY, NON-ALKYL **
METHAPYRILENE
METHOMYL
METHOXYCHLOR
METHYLAZIRIDINE
3-METHYLCHOLANTHRENE
METHYL CLORIDE *
4,4'-METHYLENE-BIS-(2-CHLOROANILINE)
METHYLENE CHLORIDE *
METHYL ETHYL KETONE (MEK) **
METHYL HYDRAZINE
2-METHYLLACTONITRILE
METHYL METHACRYLATE
METHYL METHANESULFONATE
2-METHYL-2-(METHYLTHIO)PROPIONALDEHYDE-o-(METHYLCARBONY) OXIME
N-METHYL-N'-NITRO-N-NITROSOGUANIDINE
METHYL PARATHION
METHYLTHIOURACIL
MITOMYCIN C
MONOCHLOROBENZENE *

MUSTARD GAS
NAPHTHACENE **
1,4-NAPHTHOQUINONE **
1-NAPHTHYLAMINE
2-NAPHTHYLAMINE
1-NAPHTHYL-2-THIOUREA
NICKEL and compounds, N.O.S. **
NICKEL CARBONYL
NICKEL CYANIDE
NICOTINE and salts
NITRIC OXIDE
p-NITROANILINE
NITROBENZENE **
NITROGEN DIOXIDE
NITROGEN MUSTARD and hydrochloride salt
NITROGEN MUSTARD N-OXIDE and hydrochloride salt
NITROGEN PEROXIDE
NITROGEN TETROXIDE
NITROGLYCERINE
4-NITROPHENOL
4-NITROQUINOLINE-1-OXIDE
NITROSAMINE, N.O.S.
N-NITROSODI-N-BUTYLAMINE
N-NITROSODIETHANOLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
N-NITROSODI-N-PROPYLAMINE
N-NITROSO-N-ETHYLUREA
N-NITROSOMETHYLETHYLAMINE
N-NITROSO-N-METHYLUREA
N-NITROSO-N-METHYLURETHANE
N-NITROSOMETHYLUINYLAMINE
N-NITROSOMORPHOLINE
N-NITROSONORNICOTINE
N-NITROSOPIPERDINE
N-NITEOSOSARCOSINE
5-NITRO-o-TOLUIDINE
OCTAMETHYLPYROPHOSPHORAMIDE
OSMIUM TETROXIDE
OXBICYCLO(2,21)HEPTANE-2,3-DICARBOXYLIC ACID
PARALDEHYDE *
PARATHION
PENTACHLOROBENZENE **
PENTACHLOROETHANE
PENTACHLORONITROBENZENE (PCNB)
PENTACHLOROPHENOL **
PHENACETIN
PHENOL **

PHENOLIC COMPOUNDS *
PHENYLENE DIAMINE **
PHENYL DICHLOROARSINE
PHENYLMERCURY ACETATE
N-PHENYLTHIOUREA
PHORATE *
PHOSGENE
PHOSPHINE
PHOSPHORODITHIOTIC and PHOSPHOROTHIOTIC ACID ESTERS
PHOSPHOROTHIOTIC ACID, o,o-DIMETHYL ESTER, o-ESTER with N,N-DIMETHYL BENZENE SULFONAMIDE
PHTHALIC ACID ESTERS, N.O.S.
PHTHALIC ANHYDRIDE **
2-PICOLINE **
POLYCHLORINATED BIPHENYL, N.O.S.
POTASSIUM CYANIDE
POTASSIUM SILVER CYANIDE
PRONAMIDE
1,3-PROPANE SULTONE
PROPIONITRILE
PROPYLTHIOURACIL
2-PROPYN-1-ol
PYRIDINE **
RESERPINE
RESORCINOL
SACCHARIN
SAFROLE
SELENIOUS ACID
SELENIUM and compounds, N.O.S.
SEUENIUM SULFIDE
SELENOUREA
SILVER and compounds, N.O.S.
SILVER CYANIDE
SODIUM CYANIDE
STREPTOZOTOCIN
STRONTIUM SULFIDE
STRYCHNINE and SALTS
TARS *
1,2,4,5- TETRACHLOROBENZENE
2,3,7,8- TETRACHLORODIBENZO-p-DIOXIN (TCDD)
TETRACHLOROETHANE, N.O.S.
1,1,1,2- TETRACHLOROETHANE **
1,1,2,2- TETRACHLOROETHANE **
TETRACHLOROETHYLENE/TETRACHLOROETHENE **
TETRACHLOROPHENOLS *
TETRAETHYL DITHOPYROPHOS
TETRAETHYL LEAD **
TETRAETHYLPYROPHOSPHATE
TETRAMETHYL LEAD **
THALLIC OXIDE
THALLIUM and compounds, N.O.S.
THALLIUM(I) ACETATE
THALLIUM(I) CARBONATE
THALLIUM(I) CHLORIDE

THALLIUM (I) NITRATE
THALLIUM SELENITE
THALLIUM (I) SULFATE
THIOACETAMIDE
THIOSEMICARBAZIDE
THIOUREA
THIURAM
TOLUENE **
TOLUENE - 2,4 - DIAMINE **
o-TOLUIDINE HYDROCHLORIDE
TOLYLENE DIISOCYANATE/TOLUENE DIISOCYANATE **
TOXAPHENE **
TRIBROMOMETHANE
TRICHLOROBENZENES *
1,2,4-TRICHLOROBENZENE
1,1,1,- TRICHLOROBETHANE **
1,1,2- TRICHLOROETHANE **
TRICHLOROETHYLENE/TRICHOLORETHNENE **
TRICHLOROFLUOROMETHANE *
TRICHLOROMETHANETHIOL
TRICHLOROPHENOLS *
2,4,5- TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,5-TRICHOLOROPHENOXYACETIC ACID (2,4,5-T)
2,4,5-TRICHLOROPHENOXYPROPIONIC ACID (2,4,5-TP) (SILVEX)
TRICHLOROPROPANE, N.O.S.
1,2,3-TRICHLOROPROPANE
1,1,2-TRICHLORO - 1,2,2-TRIFLUOROETHANE *
TRIETHYL PHOSPHOROTHIDATE
TRINITROBENZENE
TRIS(1-AZRIDINYL)PHOSPHINE SULFIDE
TRIS (2,3-DIBROMOPROPYL)PHOSPHATE
TRYPAN BLUE
URACIL MUSTARD
URETHANE
VANADIC ACID, AMMONIUM SALT
VANADIUM PENTOXIDE (dust)
VINYL CHLORIDE **
VINYLIDENE CHLORIDE **
ZINC CYANIDE
ZINC PHOSPHIDE

* appears only in Appendix VII

** appears in both Appendix VII and Appendix VIII

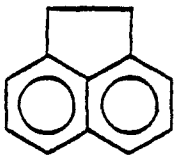
All unasteriked entries appear only in Appendix VIII

ACENAPHTHENE

SYNONYM

peri-etylene naphthalene
3,8-acenaphthenylene

STRUCTURE



USE/OCCURRENCE

Dye intermediate, used in manufacture of plastics, fungicide, insecticide; derived from coal-tar

HEALTH EFFECTS

1) A skin and mucous membrane irritant
2) May cause vomiting if ingested in large amounts
3) An experimental tumor-forming agent

TOXICITY DATA

TLV/TWA = N.A.

ACETALDEHYDE

SYNONYM	STRUCTURE
ethyl aldehyde	CH_3CHO

USE/OCCURRENCE

Chemical intermediate in industrial processes; found in cigarette smoke and in automobile exhaust; a common air contaminant

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label
2) An irritant of the eyes, skin, upper respiratory passages, and bronchi
3) Acute exposures may result in pulmonary edema and narcosis
4) Repeated skin contact may result in dermatitis
5) Chronic effects have not been reported
6) An experimental mutagen and a possible experimental teratogen

TOXICITY DATA

1) Inhalation TCLo causing irritation in human = 134 ppm for 30 minutes
2) Oral LD50 in rat = 1930 mg/kg
3) 40 mg is a severe eye irritant in rabbit
4) 50 ppm for 15 minutes results in eye irritation in human

TLV/TWA = 180 mg/m^3

ACETONITRILE

SYNONYM

methyl cyanide

STRUCTURE

CH_3CN

USE/OCCURRENCE

Solvent, extractant; used in a manufacture of plastics, synthetic fibers, elastomers, and solvents; a component of cigarette smoke

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label
2) Absorbed via inhalation, ingestion, and the skin
3) Exposure may result in eye, nose and throat irritation; and chest tightness
4) Acute exposures may lead to nausea, respiratory depression, shock, and possibly death (fatal poisoning via inhalation has been reported in exposed workers)
5) Acetonitrile and its subsequent metabolic release of cyanide may cause disorders of the CNS, liver, kidneys, cardiovascular system, and the GI tract, unlike the immediate on set of cyanide toxicity, nitrile poisoning displays a delayed onset of symptoms
6) An experimental teratogen
7) No chronic type disease has been reported in humans, although experimental studies have reported the following symptoms following repeated exposures: bronchial inflammation; desquamatization, hyper secretion of mucus, liver and kidney lesions, brain effects, reduction in body weight, poor coordination, and blood cell effects
8) When heated to decompositian nitrites emit toxic fumes containing cyanides

TOXICITY DATA

1) Oral TDLo in human producing CNS effects = 570 mg/kg
2) Oral LD50 in rat = 3800 mg/kg
3) Inhalation LCLo in rat = 8000 ppm for 4 hours
4) Dermal LD50 in rabbit = 1250 mg/kg
5) 20 mg is a severe eye irritant in rabbit
6) 10 mg for 24 hours is a skin irritant dose in rabbit

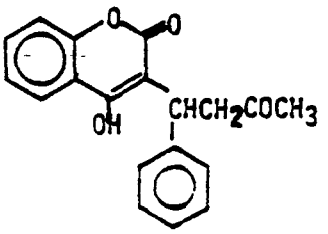
TLV/TWA = 70 mg/m^3

3-(ALPHA-ACETONYLBENZYL)-4-HYDROXYCOUMARIN

SYNONYM

Coumadin
Warfarin

STRUCTURE



USE/OCCURRENCE

Rodenticide (anticoagulant)

HEALTH EFFECTS

1) Teratogenic effects have been reported in human females exposed to this chemical
2) Repeated ingestion of coumarins may result in nose and gum bleeding, bloody stools and urine, pallor, and hemorrhages with possible shock and death
3) Inhibits prothrombin formation during blood clotting and damages blood capillaries

TOXICITY DATA

1) Oral LD50 in rat = 3 mg/kg
2) Oral LD50 in mouse = 374 mg/kg
3) Oral LD50 in dog = 200 mg/kg

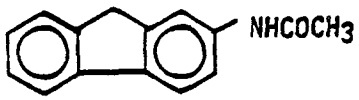
TLV/TWA = 0.1 mg/m^3

2-ACETYLAMINOFLUORENE

SYNONYM

AAF
N-2-fluorenylacetamide

STRUCTURE



USE/OCCURRENCE

Used in cancer research; originally patented as a pesticide

HEALTH EFFECTS

1) CARCINOGEN (OSHA)
2) Experimental mutagen and teratogen

TOXICITY DATA

TLV/TWA = N.A.

ACETYL CHLORIDE

SYNONYM

ethanoyl chloride

STRUCTURE

CH_3COCl

USE/OCCURRENCE

Acetylating agent

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label
2) Irritant and corrosive
3) Death or permanent injury may result after only short exposure
4) when heated to decomposition, emits phosgene fumes
5) May cause severe burns and be extremely irritating to the eyes

TOXICITY DATA

1) Inhalation TCLo in human resulting in irritant effects = 2 ppm for 1 minute

TLV/TWA = N.A.

1-ACETYL-2-THIOUREA

SYNONYM

USAF EK-4890

STRUCTURE

$C_3H_6N_2OS$

USE/OCCURRENCE

HEALTH EFFECTS

1) Thiourea is an experimental carcinogen, poison, goitrogen, and allergen
2) Reacts violently with acrolein

TOXICITY DATA

1) Oral LD50 in rat = 50 mg/kg

TLV/TWA = N.A.

ACROLEIN

SYNONYM

acrylic aldehyde
propenal
Aqualin

STRUCTURE

$H_2C{=}CHCHO$

USE/OCCURRENCE

Chemical feedstock for plastics, synthetic fibers, etc., biocide, crosslinking agent; generated via combustion of fuels and cellulosic materials

HEALTH EFFECTS

1) Intense irritant of the eye, and respiratory tract membranes
2) Repeated exposure may result in skin burns and dermatitis
3) Acute exposure may result in pulmonary edema
4) A possible experimental mutagen
5) Flammable
6) Toxic effects are antagonized by ascorbic acid and thiol groups
7) May be explosive if allowed to polymerize in a closed system in the presence of alkaline materials and strong acids

TOXICITY DATA

1) 500 ppb for 12 minutes is an eye irritant in human
2) Oral LD50 in rat = 46 mg/kg
3) Inhalation TCLo in man producing an irritant effect = 1ppm
4) 1 mg is a severe eye irritant in rabbit
5) 562 mg/kg is a dermal LD50 in rabbit
6) Inhalation LCLo in human = 153 ppm for 10 minutes
7) Inhalation LC50 in mouse = 66 ppm for 6 hours

TLV/TWA = 0.025 mg/m^3

ACRYLAMIDE

SYNONYM

acrylic amide

STRUCTURE

$CH_2=CHCONH_2$

USE/OCCURRENCE

Dye and polymer synthesis, etc.

HEALTH EFFECTS

1) Can be absorbed through unbroken skin
2) Intoxication has caused peripheral neuropathy, erythema, and peeling of the palms
3) Toxic effects on the central nervous system (CNS)
4) An experimental mutagen
5) When heated to decomposition, emits acrid fumes

TOXICITY DATA

1) Oral LD50 in rat = 170 mg/kg
2) 50 mg for 3 days = mild skin irritant in rabbit
3) 100 mg for 24 hours = severe eye irritant in rabbit
4) Dermal LDLo in rabbit = 1000 mg/kg

TLV/TWA = 0.3 mg/m^3

ALLYL ALCOHOL

SYNONYM

propenyl alcohol
vinyl carbinol
2-propene-1-ol

STRUCTURE

$H_2C{=}CHCH_2OH$

USE/OCCURRENCE

chemical intermediate in allyl ester, glycerol, and pharmaceutical production, a fungacide and herbicide, esters of allyl alcohol are used as food flavorings

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQIUD/POISON
2) Highly irritating to eyes, upper respiratory tract, and skin
3) Systemic effects may include muscle spasm at sites of skin absorption
4) May be absorbed via oral, inhalation, and dermal routes
5) Moderate air exposures have led to lacrimation, eye pain, and blurred vision in man
6) Effects of exposure including pulmonary edema, liver and skin damage, convulsions and death reported experimentally
7) When heated, emits toxic fumes
8) The vapor is extremely hazardous

TOXICITY DATA

1) 25 ppm is a severe eye irritant in human
2) 4270 ug is a severe eye irritant in rabbit
3) Inhalation TCLo in human producing an irritant effect = 25 ppm
4) Oral LD50 id rat = 64 mg/kg
5) Dermal LD50 in rabbit = 53 mg/kg

TLV/TWA = 5 mg/m^3 (skin)

ACRYLONITRILE

SYNONYM

vinyl cyanide
acrylon
Acritet
cyanoethylene

STRUCTURE

$CH_2=CHCN$

USE/OCCURRENCE

Chemical intermediate for rubber and plastics manufacture ; may be liberated by the burning of polyacrylonitrile fiber ; pesticide use restricted

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQUID AND POISON
3) Exposure may result in eye and skin irritation, skin blistering, flushing of the face, increased salivation, mild jaundice, CNS effects, and leucocytosis (increased white blood cell count)
4) Acute exposures may lead to nausea, asphyxia, and death
5) Little evidence of cumulative action on repeated exposures
6) An experimental mutagen, teratogen, and neoplastic agent
7) Toxicity is due to the acrylonitrile molecule itself as well as to the metabolically released cyanide ion
8) HCN and CO enhance acrylonitrile toxicity
9) Penetrates leather and causes rubber to swell and soften

TOXICITY DATA

1) Oral LD50 in rat = 82 mg/kg
2) 20 mg is a severe eye irritant in rabbit

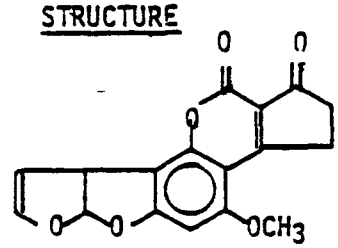
TLV/TWA = N.A. (human carcinogen)

AFLATOXINS

SYNONYM

aflatoxins B_1, B_2, G_1, G_2

STRUCTURE



(B_1)

USE/OCCURRENCE

Toxic fungal metabolites found most commonly in grains, peanuts, tree nuts, and cotton seed meal or oil

HEALTH EFFECTS

1) Probable HUMAN CARCINOGEN (IARC)
2) An experimental carcinogen, mutagen, and teratogen
3) Extremely toxic when ingested

TOXICITY DATA

1) Oral LDLo in human = 229 ug/mg
2) Oral LD50 in monkey = 1750 ug/kg

TLV/TWA = N.A.

ALDRIN

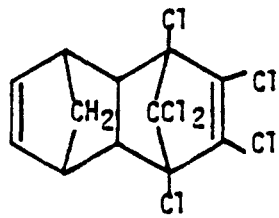
SYNONYM

octalene

Seedrin

hexachlorohexahydro-endo,exo-dimethanonaphthalene

STRUCTURE



USE/OCCURRENCE

cyclodiene insecticide; biologically altered in the environment to dieldrin which is more stable and equally toxic; most uses cancelled by US EPA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) POISON B (DOT); the DOT labelis POISON
3) An experimental teratogen and mutagen
4) Experimental chronic exposure studies have resulted in shortened lifespans, changes in liver structure, etc.
5) Inhalation, ingestion, or dermal absorption may result in irritability, convulsions, and depression

TOXICITY DATA

1) Oral LDLo in human child = 1250 ug/kg
2) Oral LD50 in rat = 39 mg/kg
3) Dermal LD50 in rabbit = 15 mg/kg

TLV/TWA = 0.25 mg/m^3

ALUMINUM PHOSPHIDE

SYNONYM	STRUCTURE
phostoxin	AlP

USE/OCCURRENCE

Insecticide and fumigant, and an animal food additive; see PHOSPHINE listing

HEALTH EFFECTS

1) FLAMMABLE SOLID (DOT); the DOT label is FLAMMABLE SOLID AND DANGEROUS WHEN WET
2) A poison with high toxicity via oral and inhalation routes
3) Moisture releases phosphine gas (a CNS toxicant)
4) Emits highly toxic fumes of PO_x when heated to decomposition
5) See PHOSPHINE listing

TOXICITY DATA

1) Oral LD50 in human = 20 mg/kg
2) Inhalation LCLo in mammal = 1 ppm

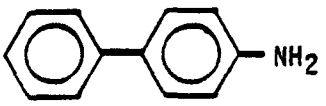
TLV/TWA = 0.4 mg/m^3 (phosphine)

4-AMINOBIPHENYL

SYNONYM

aminodiphenyl
p-xenylamine

STRUCTURE



USE/OCCURRENCE

Present usage only in research; formerly was a rubber antioxidant and dye intermediate

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC) of the bladder
2) Acute exposure produces headache, cyanosis, urinary burning, and hematuria (blood in the urine)
3) An experimental mutagen and carcinogen
4) Emits toxic fumes when heated strongly

TOXICITY DATA

1) Oral LD50 in rat = 500 mg/kg
2) Oral LDLo in dog = 25 mg/kg

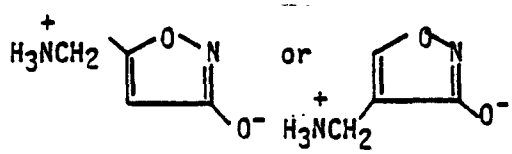
TLV/TWA = N.A. (human carcinogen)

5-AMINOMETHYL-3-ISOXYZOLE

SYNONYM

agarin
pantherine

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

TOXICITY DATA

1) Oral LD50 in rat = 45 mg/kg
2) 109 ug/kg resulted in CNS effect in human (unknown route of administration)

TLV/TWA = N.A.

4-AMINOPYRIDINE

SYNONYM

Avitrol
4-pyridinamine

STRUCTURE

USE/OCCURRENCE

Pesticide (bird repellant)

HEALTH EFFECTS

1) High toxicity via oral route

TOXICITY DATA

1) Oral LD50 in rat = 20 mg/kg

TLV/TWA = N.A.

AMITROLE

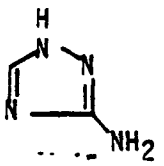
SYNONYM

3-amino-1,2,4-triazole

amizol

Weedazol

STRUCTURE



USE/OCCURRENCE

Herbicide; use restricted

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Low acute toxicity
3) A potent anti-thyroid agent which has induced goiter formation, thyroid adenomas (gland-like tumors), and adenocarcinomas in experimental studies
4) When heated strongly, emits highly toxic fumes

TOXICITY DATA

1) Oral LD50 in rat = 1100 mg/kg
2) Oral LD50 in mouse = 14700 mg/kg

TLV/TWA = N.A.

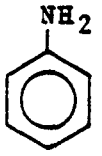
ANILINE

SYNO

SYNONYM

aminobenzene
phenylamine

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in production of dyestuffs, resins, pharmaceuticals, etc.

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Absorption via the skin, inhalation, routes
3) The liquid is a mild eye irritant
4) Absprption leads to the formation of methemoglobin with subsequent anoxia (lack of oxygen in the blood) and cyanosis,leading to headache, drowsiness and possible death
5) Repeated exposures may result in hemolysis of red blood cells, liver damage, and dark colored urine, anemia, weight loss, and cutaneous lesions
6) When heated to decomposition, emits highly toxic fumes
7) The reported incidence of tumors of the urinary bladder due to aniline has been linked to intermediates present in the manufacture of coal tar (aniline) dyes and not to aniline itself

TOXICITY DATA

1) LDLo in man = 150 mg/kg (unknown route of administration)
2) Oral LD50 in rat = 440 mg/kg
3) Oral LD50 in dog = 195 mg/kg
4) Dermal LD50 in rabbit = 820 mg/kg

TLV/TWA = 10 mg/m^3 (skin)

ANTIMONY

SYNONYM

STRUCTURE

Sb
(elemental symbol)

USE/OCCURRENCE

Alloy material, plasticizer, abrasive, therapeutic agent, etc.

HEALTH EFFECTS

1) Absorption mainly via inhalation and ingestion
2) A primary skin irritant
3) Acute and/or chronic poisoning may occur
4) The most severe human health effects due to chronic antimony exposure are cardiovascular changes; other systems also effected include pulmonary, dermal, and reproductive
5) Some studies have reported reproductive effects in female workers
6) Antimony trichloride, pentachloride, and fluoride are highly toxic
7) Acute poisoning symptoms (ingestion) are similar to those seen in arsenic poisoning and may include vomiting, watery diarrhea, collapse, irregular respiration, lowered temperature, with possible death resulting
8) Industrial poisoning (inhalation) may result in upper respiratory tract irritation, pneumonitis, dizziness, diarrhea, vomiting, and dermatitis
9) Antimony miners have been reported to contract benign forms of silicosis
10) Stilbine gas may be produced by dissolving Zn-Sb or Mg-Sb in HCl or it may be released from antimony-containing alloys after acid contact: stilbine gas is a powerful hemolytic and CNS poison
11) Antimony (III) chloride, antimony (V) chloride, and antimony (V) pentafluoride are CORROSIVE MATERIALS (DOT)

TOXICITY DATA

1) LDLo in man = 15 mg/kg (unknown route)
2) Inhalation TCLo in human producing pulmonary and GI effects = 73 mg/m^3 (/kg) ($SbCl_3$)
3) Oral LD50 in rat = 525 mg/kg($SbCl_3$)
4) Oral LD50 in rat = 1115 mg/kg ($SbCl_5$)
5) Oral LD50 in rat = 115 mg/kg ($C_4H_4O_7Sb \cdot K$)
6) Oral LDLo in human = 2 mg/kg ($C_4H_4O_7Sb \cdot K$)
7) Ihhalation TCLo in human producing blood and GI effects = 580 ug/m^3 for 35 weeks (Sb_2S_3)

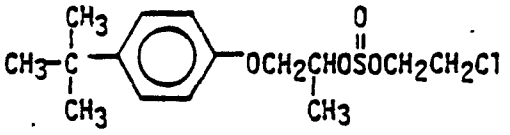
TLV/TWA = 0.5 mg/m^3

ARAMITE

SYNONYM

2-(p-t-butylphenoxy)-1-methyl-ethyl-2-chloroethyl ester sulfurous acid

STRUCTURE



USE/OCCURRENCE

Miticide

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) May cause skin irritation
3) Acute exposure may result in CNS depression
4) Emits highly toxic fumes of chlorides when heated to decomposition

TOXICITY DATA

1) Oral LDLo in human = 429 mg/kg
2) Oral LD50 in rat = 3900 mg/kg

TLV/TWA = N.A.

ARSENIC,N.O.S.

SYNONYM

colloidal arsenic

STRUCTURE

As

USE/OCCURRENCE

Hide and wood preservative, glass manufacturing component, pesticide, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) POISONB(DOT) ; the DOT label is POISON
3) absorption via inhalation and ingestion routes
4) skin exposures may lead to dermatitis formation and keratoses (skin thickening)
5) symptoms of poisoning include constriction of the throat, severe stomach and intestine irritation, bloody stools and vomiting, and diarrhea with possible shock and death
6) symptoms associated with inhalation poisoning include headache, chest pain, and extreme general weakness
7) Reported chronic toxicity has resulted in weight loss, diarrhea and constipation, skin thickening and a gangrenous condition of the hands and feet, liver damage, polyneuritis, and numbness of the extremities ("glove and stocking"), and blood system changes
8) Levels of arsenic are maintained for long peroids of time in bone, hair, and nails
9) arsenic hydride and its methyl derivatives are considered to be the most toxic of the inorganic arsenic compounds
10) an experimental mutagen and teratogen
11) arsine gas (AsH_3) is FLAMMABLE (DOT) and a POISONA(DOT) : it may be generated when inorganic As compounds contact sources of nascent H_2, in metal pickling and in metal drossing, the TLV/TWA for Arsine gas is 0.05 ppm

TOXICITY DATA

1) Intramuscular LDLo in rat = 20 mg/kg
2) Oral LD50 in rat = 48 mg/kg (arsenic acid)
3) Oral LD50 in rat = 20 mg/kg (arsenic acid, calcium salt)
4) Oral LD50 in rat = 14 mg/kg (arsenious acid, potassium salt)

TLV/TWA = 0.2 mg/m^3 (As)

ARSENIC ACID

See ARSENIC listing

ARSENIC PENTOXIDE

SYNONYM

arsenate

STRUCTURE

AsO_5

USE/OCCURRENCE

agricultural pesticide, etc.

HEALTH EFFECTS

1) POISON8(DOT); the DOT label is POISON
2) experimental studies have shown high absorption via GI tract
3) skin exposure may produce sensitization and contact dermatitis
4) an experimental teratogen and carcinogen

TOXICITY DATA

1) oral LD50 in rat = 8 mg/kg
2) oral LD50 in mouse = 55 mg/kg

TLV/TWA = 0.2 mg/m^3 (As)

ARSENIC TRIOXIDE

SYNONYM

arsenite
white arsenic
arsenous oxide

STRUCTURE

As_2O_3

USE/OCCURRENCE

Pesticide, manufacture of pharmaceuticals, source of other arsenic compounds; a by-product of ore smelting

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) POISON B (DOT); the DOT label is POISON
3) corrosive to the skin, mucous membranes, and conjunctiva; may see nasal septum perforation
4) wrists and genitalia can be common sites of dermatitis
5) exposure may produce skin sensitization and contact dermatitis
6) the symptoms of acute exposures are due to severe inflammation of mucous membranes and a greatly heightened permeability of blood capillaries
7) only slightly soluble in water, but a high absorption via the GI tract has been reported in humans

TOXICITY DATA

1) oral LD50 in man = 1430 ug/kg
2) oral LD50 in rat = 20 mg/kg

TLV/TWA = N.A. (SUSPECTED HUMAN CARCINOGEN/IARC)

AURAMINE

SYNONYM

4,4'-(imidocarbonyl)bis-
(N,N-dimethyl)aniline

yellow pyoctanine

STRUCTURE

$C_{17}H_{21}N_3$

USE/OCCURRENCE

miticide

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC)
2) an experimental mutagen

TOXICITY DATA

TLV/TWA = N.A.

AZASERINE

SYNONYM

diazoacetate(ester)L-serine

STRUCTURE

$N_2CHCOOCH_2CH(NH_2)COOH$

USE/OCCURRENCE

Antineoplastic drug

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 170 mg/kg
2) Oral LD50 in mouse = 150 mg/kg

TLV/TWA = N.A.

BARIUM, N.O.S.

SYNONYM

none

STRUCTURE

Ba

USE/OCCURRENCE

Alloy material, residual gas remover from vacuum tubes, component in varied manufacturing processes, etc.; primary sources are the minerals barite ($BaSO_4$) and witherite ($BaCO_3$)

HEALTH EFFECTS

1) Absorption reported via ingestion or inhalation
2) Alkaline compounds of barium may cause eye, nose, throat and skin irritation
3) Ingestion of soluble ionized forms of barium markedly increases the contractility of all muscles; can lead to GI tract effects, CNS paralysis, and heart stoppage
4) Barium cyanide is a POISON (DOT)
5) Inhalation of barium sulfate dust may result in dust deposits in the lung ("baritosis")

TOXICITY DATA

1) Oral LDLo in human = 57 mg/kg (barium carbonate)
2) Oral LD50 in rat = 630 mg/kg (barium carbonate)
3) Oral LDLo in human = 11 mg/kg (barium chloride)
4) Oral LD50 in rat = 118 mg/kg (barium chloride)
5) Oral Ld50 in rat = 355 mg/kg (barium(II)nitrate)

TLV/TWA = 0.5 mg/m^3 (as soluble barium)

BARIUM CYANIDE

see BARIUM and CYANIDE listings

BENZ(c)ACRIDINE

SYNONYM

alpha-chrysidine
alpha-naphthacridine

STRUCTURE

USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

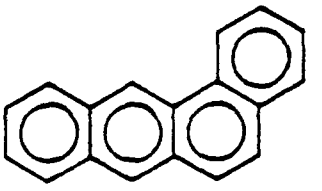
TLV/TWA = N.A.

BENZ(A)ANTHRACENE

SYNONYM

naphthanthracene
tetraphene
benzo(a)anthracene

STRUCTURE



USE/OCCURRENCE

a PAH, see TARS listing; a polycyclic aromatic hydrocarbon (PAH) which has been found among the by-products of incomplete organic material incineration, ubiquitous in the environment

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) an experimental mutagen.
3) due to metabolism and excretion, it is unlikely that the PAH accumulate in the body with chronic low-level exposure

TOXICITY DATA

1) intravenous LDLo in mouse = 10 mg/kg

TLV/TWA = N.A.

BENZENE

SYNONYM

benzol

STRUCTURE

USE/OCCURRENCE

solvent, extractant, chemical intermediate

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE LIQUID (DOT) same DOT label
3) leukemogenic in man (causing leukemia)
4) A primary irritant of skin, eyes, and upper respiratory tract
5) Aspiration of liquid can lead to pulmonary edema and hemorrhage
6) Acute exposure leads to CNS depression and possible death
7) A cumulative-acting toxic compound
8) An experimental teratogen

TOXICITY DATA

1) Inhalation TCLo in human producing blood effects = 210 ppm
2) Inhalation TCLo in human producing a carcinogenic effect = 100 ppm for 10 years (intermittant exposure)
3) oral LD50 in rat = 3800 mg/kg
4) Inhalation LCLo in human = 20000 ppm for 5 minutes
5) Inhalation LC50 in rat = 10000 ppm for 7 hours
6) Inhalation TC in man producing a carcinogenic effect = 2100 mg/m^3 for 4 years (intermittant exposure)

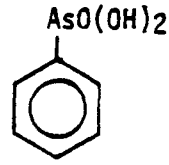
TLV/TWA = 10 ppm

BENZENEARSONIC ACID

SYNONYM

phenylarsenic acid

STRUCTURE



USE/OCCURRENCE

Reagent for tinproduction

HEALTH EFFECTS

See BENZENE and ARSENIC listings.

TOXICITY DATA

1) Oral LD50 in rat = 50 mg/kg
2) oral LD50 in mouse = 270 ug/kg

TLV/TWA = N.A.

BENZENETHIOL

SYNONYM

phenyl mercaptan
thiophenol

STRUCTURE

USE/OCCURRENCE

Mosquito larvicide

HEALTH EFFECTS

1) Exposure may lead to severe dermatitis, headache, and dizziness
2) When heated to decomposition, emits highly toxic fumes of SO_x

TOXICITY DATA

1) Oral LD50 in rat = 46 mg/kg
2) Inhalation LC50 in rat = 33 ppm for 4 hours

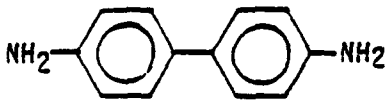
TLV/TWA = N.A.

BENZIDINE

SYNONYM

4,4'-diaminobiphenyl

STRUCTURE



USE/OCCURRENCE

dyestuffs intermediate, various other uses

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) inhalation, and especially, dermal route are modes of absorption
3) initial symptoms of benzidine-induced bladder cancer in man are hematuria, frequency of urination, and pain
4) occupational benzidine-induced dermatitis has been reported
5) an experimental mutagen
6) emits highly toxic fumes when heated to decomposition

TOXICITY DATA

1) inhalation TCLo in man producing a carcinogenic effect = 18 mg/m^3 for 13 years (intermittant exposure)
2) oral LD50 in rat = 309 mg/kg

TLV/TWA = N.A. (HUMAN CARCINOGEN)

BENZO(A)ANTHRACENE

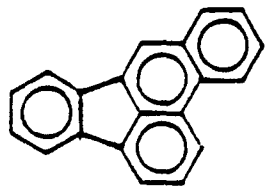
see BENZ(a)ANTHRACENE listing

BENZO(B)FLUORANTHENE

SYNONYM

benz(e)acephenanthrylene

STRUCTURE



USE/OCCURRENCE

a polycyclic aromatic hydrocarbon; see TARS listing

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) exposure to carcinogenic PAH may produce widespread tissue damage as well as selective destruction of proliferating tissues (hematopoietic and lymphoid)
3) an experimental mutagen
4) Occupational exposure criteria have been established for coke oven emissions, coal tar products, and coal tar pitch volatiles, all of which contain large amounts of PAH
5) See TARS listing

TOXICITY DATA

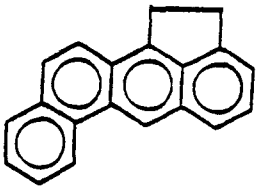
TLV/TWA = N.A.

BENZO(J)FLUORANTHENE

SYNONYM

benz(j)aceanthrylene
cholanthrene

STRUCTURE



USE/OCCURRENCE

a PAH; see TARS listing

HEALTH EFFECTS

1) an experimental carcinogen
2) See TARS listing

TOXICITY DATA

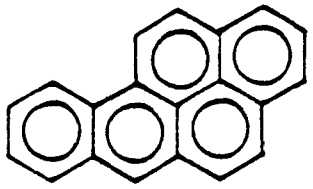
TLV/TWA = N.A.

BENZO(A)PYRENE

SYNONYM

BP

STRUCTURE



USE/OCCURRENCE

a PAH; see TARS listing

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) among the most potent animal carcinogens known, regardless of tissue site or route of administration
3) readily transported across the intestinal mocosa and respiratory membranes

TOXICITY DATA

TLV/TWA = N.A.

BENZOQUINONE

see PHENOLIC COMPOUNDS listing

BENZOTRICHLORIDE

SYNONYM

alpha, alpha, alpha-trichlorotoluene

STRUCTURE

USE/OCCURRENCE

Intermediate in dye production

HEALTH EFFECTS

1) May cause local irritation of the skin and mucous membranes
2) Large doses may result in CNS depression
3) Decomposes in moist air to benzoic and hydrochloric acids

TOXICITY DATA

1) 50 ug = severe eye irritation in rabbit
2) 10 mg for 24 hours causes severe irritation on rabbit skin
3) 125 ppm inhalation dose for 4 hours in rat was an LCLo

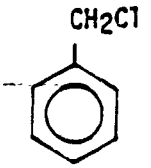
TLV/TWA = N.A.

BENZYLCHLORIDE

SYNONYM

alpha-chlorotoluene

STRUCTURE



USE/OCCURRENCE

Chemical intermediate, especially in benzaldehyde production

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) CORROSIVE MATERIAL (DOT); the DOT label is CORROSIVE
3) Occupational exposures have reportedly led to lacrimation, conjunctivitis, and irritation of the respiratory tract and eyes
4) Liquid benzylchloride has the potential for skin irritation based upon release of HCl upon hydrolysis
5) A weak, experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 1231 mg/kg
2) Inhalation LD50 in rat = 150 ppm for 2 hours

TLV/TWA = 1 ppm

BERYLLIUM, N.O.S.

SYNONYM	STRUCTURE
none	Be

USE/OCCURRENCE

alloy material, various uses in atomic energy production, etc; produced during combustion of fossil fuels

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) poorly absorbed orally, but the soluble forms are efficiently absorbed via inhalation route
3) the soluble salts are skin sensitizers, primary irritants (which can result in lesions on broken skin), and respiratory irritants
4) acute inhalation exposure may result in severe chemical pneumonitis and pulmonary edema
5) chronic inhalation of beryllium may result in pulmonary symptoms, pain in the joints, shortness of breath, liver and spleen changes, weight loss, spontaneous skin changes and lesions, decreased lung capacity, pneumothorax, physical wasting, and possible death due to heart or respiratory failure

TOXICITY DATA

1) inhalation TCLo resulting in pulmonary effects = 300 mg/kg
2) oral LD50 in rat = 86 mg/kg (beryllium chloride)
3) oral LD50 in rat = 82 mg/kg (beryllium sulfate)

TLV/TWA = 2 ug/m^3

BIS(2-CHLOROETHOXY)METHANE

SYNONYM

BCEXM
dichloroethyl formal

STRUCTURE

$CH_2(OCH_2CH_2CH_2Cl)_2$

USE/OCCURRENCE

chloroalkyl ehters are used as intermediates in organic syntheses, textile treatment, polymer manufacturing, and as solvents and degreasers

HEALTH EFFECTS

1) high toxicity via oral, dermal, and inhalation routes

TOXICITY DATA

1) oral LD50 in rat = 65 mg/kg
2) 500 mg is an irritant dose in rabbit eye
3) 10 mg for 24 hours is an irritant dose on rabbit skin

TLV/TWA = N.A.

BIS(2-CHLOROETHYL)ETHER

SYNONYM

dichloroethyl ether

STRUCTURE

$ClCH_2CH_2OCH_2CH_2Cl$

USE/OCCURRENCE

solvent, chemical intermediate, soil fumigant

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) an eye and respiratory tract irritant
3) can cause a mild bronchitis
4) may see drowsiness at higher exposure concentrations
5) an experimental mutagen
6) when heated to decomposition, emits highly toxic fumes, reacts with water or steam to evolve toxic and corrosive fumes
7) readily absorbed orally
8) in man, brief exposures can lead to irritation of the nasal passages and eyes with profuse lacrimation
9) the beta-chloroalkyl ethers, due to their stability and low water solubility, may have a high tendency to bioaccumulate

TOXICITY DATA

1) oral LD50 in rat = 75 mg/kg
2) 20 mg is an irritating dose in rabbit eye
3) dermal LD50 in rabbit = 720 mg/kg

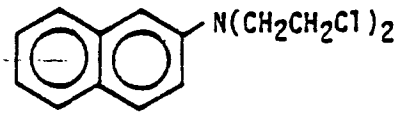
TLV/TWA = 30 mg/m^3 (skin)

N,N-BIS(2-CHLOROETHYL)2-NAPHTHYLAMINE

SYNONYM

chlornaphazin
naphthyl amine mustard
dichloroethyl-beta- naphthylamine

STRUCTURE



USE/OCCURRENCE

some use as an antineoplastic agent

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) an experimental mutagen and carcinogen

TOXICITY DATA

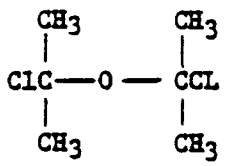
TLV/TWA = N.A.

BIS(2-CHLOROISOPROPYL)ETHER

SYNONYM

BCIE
dichloroisopropyl ether

STRUCTURE



USE/OCCURRENCE

a beta- chloroalkyl ether, see BIS(2-CHLOROETHOXY)METHANE listing

HEALTH EFFECTS

1) CORROSIVE MATERIAL (DOT); the DOT label is CORROSIVE
2) readily absorbed orally
3) BCIE is an isomeric form of other chloroalkyl ethers which have been reported to be potentially carcinogenic
4) experimental studies have indicated possible liver and pulmonary system damage as a result of chronic exposures
5) an experimental mutagen

TOXICITY DATA

1) oral LD50 in rat = 240 mg/kg
2) dermal LD50 in rabbit = 3000 mg/kg
3) 500 mg is an irritant dose in rabbit eye

TLV/TWA = N.A.

BIS(CHLOROMETHYL)ETHER+

SYNONYM

BCME

STRUCTURE

$ClCH_2OCH_2Cl$

USE/OCCURRENCE

alkylating agent in polymer production, organic syntheses intermediate, ion exchange resin intermediate; may form spontaneously in warm moist air or by combination of formaldehyde and HCl

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) very irritating to skin, mucous membranes, and the cornea
3) has a suffocating odor
4) the initiating activity of several chloroalkyl ethers indicates that these compounds will interact with other substances to produce skin papillomas (benign skin growths which may undergo cancerous changes

TOXICITY DATA

1) oral LD50 in rat = 210 mg/kg
2) dermal LD50 in rabbit = 280 mg/kg
3) inhalation LCLo in man = 100 ppm

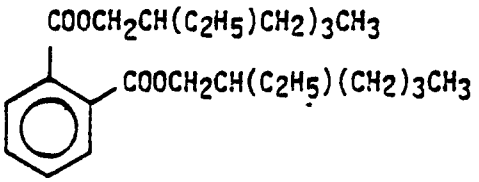
TLV/TWA = 0.001 ppm (HUMAN CARCINOGEN)

BIS(2-ETHYLHEXYL)PHTHALATE

SYNONYM

dioctyl phthalate
DEHP
di-(2-ethylhexyl)phthalate

STRUCTURE



USE/OCCURRENCE

PVC platicizer

HEALTH EFFECTS

1) readily absorbed from the intestinal tract and the lungs: experimental studies have indicated absorption via the dermal route as well
2) animal studies have indicated that liver damage is a consequence of chronic exposure
3) an experimental mutagen and teratogen

TOXICITY DATA

1) oral TDLo in man producing gastrointestinal effects = 143 mg/kg
2) oral LD50 in rat = 31 gm/kg
3) dermal LD50 in rabbit = 25 gm/kg
4) 500 mg for 24 hours is a mild eye irritant in rabbit

TLV/TWA = N.A.

BROMOACETONE

SYNONYM

bromo-2-propanone

STRUCTURE

$CH_2BrCOCH_3$

USE/OCCURRENCE

chemical warfare agent

HEALTH EFFECTS

1) POISON A (DOT); the DOT label is POISON GAS
2) a powerful lacrimator and strong irritant

TOXICITY DATA

1) inhalation LCLo in human = 572 ppm for 10 minutes
2) Inhalation LCLo in mouse = 600 mg/m^3

TLV/TWA = N.A.

BROMOFORM

See TRIBROMOMETHANE listing

BROMOMETHANE

SYNONYM	STRUCTURE
methyl bromide monobromomethane	CH_3Br

USE/OCCURRENCE

insect fumigant, chemical intermediate, refrigerant, solvent, extraction agent, etc.

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) inhalation and percutaneous routes of adsorption
3) an irritant of the eyes, skin, and mucous membranes of the upper respiratory tract; severe skin burns may result
4) acute inhalation exposure may result in pulmonary edema and death; symptoms are usually delayed and include visual disturbances, convulsions, headache, vertigo, nausea, tremor, coma, and death due to pulmonary/cardiac failure
5) kidney and permenent brain damage may result after recovery from a toxic exposure
6) chronic poisoning results mainly in CNS damage
7) nonfatal poisoning has resulted from exposure to concentrations of 100-500 ppm bromomethane

TOXICITY DATA

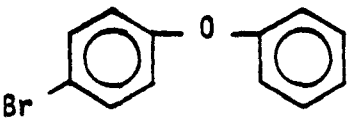
1) inhalation TCLo in human producing gastrointestinal disturbances = 35 ppm
2) inhalation LCLo in rabbit= 2000 mg/m^3 for 11 hours
3) Inhalation LCLo in rat = 3120 ppm for 15 minutes

TLV/TWA = 60 mg/m^3 (skin)

4-BROMOPHENYL PHENYL ETHER

SYNONYM

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

TOXICITY DATE

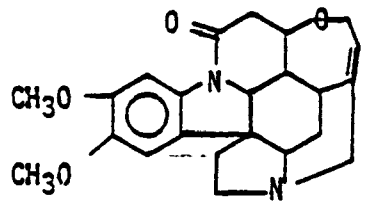
TLV/TWA = N.A.

BRUCINE

SYNONYM

dimethoxy strychnine

STRUCTURE



USE/OCCURRENCE

a plant alkaloid

HEALTH EFFECTS

1) POISON (DOT)
2) emits toxic fumes when heated

TOXICITY DATE

1) oral LD50 in rat = 1 mg/kg
2) oral LD50 in rabbit = 4 mg/kg

TLV/TWA = N.A.

2-BUTANONE PEROXIDE

SYNONYM

methyl ethyl ketone peroxide

STRUCTURE

$CH_3COOCH_2CH_3$

USE/OCCURRENCE

HEALTH EFFECTS

1) an irritant
2) an experimental neoplastic agent

TOXICITY DATE

1) oral in LD50 in rat = 484 mg/kg
2) oral TDLo in human producing GI effects = 480 mg/kg

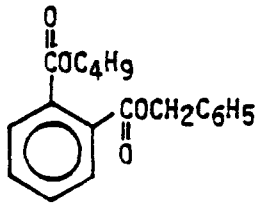
TLV/C = 1.5 mg/m^3

BUTYL BENZYL PHTHALATE

SYNONYM

benzyl butyl phthalate
phthalic acid, benzl butyl ester

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

See PHTHALIC ACID ESTER listing

TOXICITY DATA

1) Intraperitoneal LD50 in mouse = 3160 mg/kg

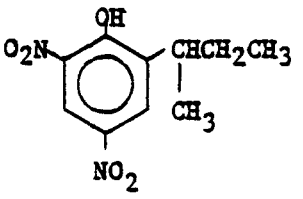
TLV/TWA = N.A.

2-sec-BUTYL-4,6-DINITROPHENOL

SYNONYM

DNBP
dinitro-o-sec-butyl phenol
butaphene
Dinoseb

STRUCTURE



USE/OCCURRENCE

herbicide, dormant fruit spray, dessicant

HEALTH EFFECTS

1) high toxicity via oral and dermal routes
2) an experimental neoplastic agent and teratogen

TOXICITY DATE

1) oral LD50 in rat = 25 mg/kg
2) dermal LD50 in rabbit = 80 mg/kg

TLV/TWA = N.A.

CADMIUM

SYNONYM

STRUCTURE

Cd

USE/OCCURRENCE

electroplating, paint, and pigment manufacture, a plastics stabilizer; is strongly adsorbed to clays, muds, humic and organic materials and some hydrous oxides; universally associated with zinc in natural deposits; sources of environmental pollution include emissions from metal refining and smelting plants, incineration of polyvinyl chloride plastics, emissions from use of fossil fuels, use of certain phosphate fertilizers, and leaching of galvanized iron pipes, food, and tobacco smoke

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) well absorbed via inhalation, retained in kidney, pancreas, and liver; poorly absorbed orally
3) a respiratory tract irritant; in acute exposures, 15% fatalities may result
4) chronic exposure may lead to lung and kidney effects (Itai-Itai disease) and emphysema
5) an experimental teratogen and mutagen
6) cadmium body burden in humans increases with age: in liver, kidneys, pancreas, and salivary glands
7) low protein diets enhance the uptake of cadmium from the GI tract

TOXICITY DATA

1) oral LD50 in rat = 225 mg/kg
2) inhalation LCLo in man = 39 mg/m^3 for 20 minutes

TLV/TWA = 0.05 mg/m^3

CALCIUM CHROMATE

SYNONYM

chromic acid, calcium salt(1:1) dihydrate
calcium chrome yellow
pigment yellow 33

STRUCTURE

$CrO_4Ca \cdot 2H_2O$

USE/OCCURRENCE

pigment, corrosion inhibitor, etc.

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC)
2) see CHROMIUM, HEXAVALENT listing

TOXICITY DATA

1) oral LD50 in rat = 327 mg/kg

TLV/TWA = 0.05 mg/m^3 (as Cr)

CALCIUM CYANIDE

SYNONYM

cyanogas
calcyanide

STRUCTURE

$Ca(CN)_2$

USE/OCCURRENCE

fumigant

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) see CYANIDE listing

TOXICITY DATE

1) oral LD50 in rat = 39 mg/kg

TLV/TWA = 5 mg/m^3 (as CN)

CARBON DISULFIDE

SYNONYM

carbon bisulfide

STRUCTURE

CS_2

USE/OCCURRENCE

solvent, degreaser, chemical intermediate, etc.

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same label
2) vapor can be severely irritating to eyes, skin, and mucous membranes
3) the liquid may cause skin blistering
4) may see localized degeneration of peripheral nerves
5) intoxication is manifested by psychological, neurological, and cardiovascular disorders
6) repeated exposure can lead to neuritis, visual disturbances, pain in effected limbs, and often, gradual loss of strength
7) An experimental teratogen

TOXICITY DATE

1) oral LDLo in human = 14 mg/kg
2) inhalation LCLo in human = 4000 ppm/30 minutes
3) Inhalation LCLo in mammal = 2000 ppm for 5 minutes

TLV/TWA = 30 mg/m^3 (skin)

CARBON TETRACHLORIDE

SYNONYM

tetrachloromethane
perchloromethane

STRUCTURE

CCl_4

USE/OCCURRENCE

Solvent, drying agent, chemical intermediate, fumigant, antihelmintic, etc.; banned from household use by the USFDA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Consequences of acute exposure may include nausea, vomiting, abdominal pain, diarrhea, liver and lidney damage, CNS depression, coma, and death due to acute renal failure
3) Effects of chronic toxicity may include liver and kidney damage and visual disturbances
4) Liver damage may result from either acute or chronic exposures; CCl_4 has been reported to cause cirrhosis of the liver
5) Repeated skin exposure may result in dermatitis (defatting of skin)
6) Marked variation in susceptibility exists among individuals
7) An experimental teratogen and carcinogen
8) Toxic effects are pontentiated by alcohol ingestion
9) When heated to decomposition, emits highly toxic fumes of phosgene

TOXICITY DATA

1) Oral LDLo in human = 43 mg/kg
2) Oral TCLo in woman producing systemic effects = 1800 mg/kg
3) Inhalation TCLo in man producing CNS effects = 1700 mg/kg
4) Inhalation LCLo in human = 1000 ppm
5) Inhalation TCLo in human producing gastrointestinal effects = 317 ppm for 30 minutes
6) Oral LD50 in rat = 2800 mg/kg
7) Oral LD50 in mouse = 12800 mg/kg
8) Inhalation LC50 in mouse = 9526 ppm for 8 hours
9) Dermal LD50 in rat = 5070 mg/kg

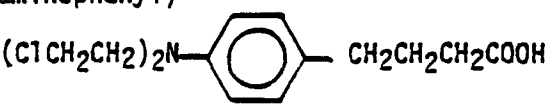
TLV/TWA = 65 mg/m^3 (skin)

CHLORAMBUCIL

SYNONYM

phenylbutyric acid nitrogen mustard
butyric acid, 4-(p-bis(2-chloroethyl)aminophenyl)-

STRUCTURE



USE/OCCURRENCE

anttneoplastic/anti-leukemic agent

HEALTH EFFECTS

1. POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2. Has been reported to be teratogenic in women
3. Experimental teratogen
4. Possible side effects include anorexia (loss of appetite), nausea, and vomiting

TOXICITY DATA

1. intravenous LDLo in dog = 3mg/kg
2. intravenous LDLo in monkey = 3mg/kg

TLV/TWA = N.A.

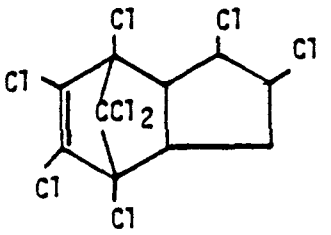
CHLORDANE

SYNONYM

octachloro-4,7-methanotetrahydroindane

Chlorkill

STRUCTURE



USE/OCCURRENCE

chlorinated hydrocarbon insecticide; persists for prolonged periods in the environment

HEALTH EFFECTS

1. CARCINOGENIC (CAG)
2. COMBUSTIBLE LIQUID (DOT); no DOT label requirement
3. Quite toxic to humans; poisoning has resulted in fatalities
4. Readily absorbed in oral and dermal routes
5. Implicated in the development of aplastic anemia
6. A CNS stimulant, convulsant, and emetic
7. May be a cumulative neurotoxin
8. Ability to deposit in fatty tissues
9. An experimental mutagen

TOXICITY DATA

1. Oral LDLo in human = 40 mg/kg
2. Dermal LD50 in rat = 700 mg/kg
3. Dermal LD50 in rabbit = 780 mg/kg
4. Oral LD50 in rabbit = 100 mg/kg

TLV/TWA = 0.5 mg/m^3

CHLORINATED BENZENES, N.O.S.

see CHLOROBENZENE listing

CHLORINATED ETHANE, N.O.S.

see individual listings

CHLORINATED FLUROCARBONS

SYNONYM

Freon II, Freon 113, etc

STRUCTURE

Various

USE/OCCURRENCE

Refrigerants, polymer intermediates, propellants, etc.

HEALTH EFFECTS

1) In general, fluorocarbons are of relating low toxicity and their predominant hazard is from simple asphyxia
2) Exposure to very high levels of fluorocarbons may result in mild CNS depression, tremor, incoordination, dizziness, and unconsciousness; cardiac arrythmias with sudden death have occurred
3) Liver and kidney damage have been reported following chronic exposure to fluoroalkenes but not to fluoroalkanes
4) Thermal decomposition (or contact with hot metal) of chlorine-containing fluoromethanes produces HCl, HF, phosgene, CO_2 and Cl_2
5) Also see individual listings for TRICHLOROFLUOROMETHANE and TRICHLOROTRIFLUOROETHANE

TOXICITY DATA

1) Inhalation LC50 in rat = 72 pph for 30 minutes (dichlorotetrafluoroethane)
2) Inhalation LC50 in mouse = 700,000 ppm for 30 minutes (1,2-dichloro-1,1,2,2-tetrafluoroethane)
3) Inhalation TC50 in human producing eye effects = 50,000 ppm for 30 minutes
4) Inhalation LC50 in mouse = 10 pph for 30 minutes (trichlorofluoromethane)

TLV/TWA = 7000 mg/m^3 (dichlorotetrafluoroethane)
4950 mg/m^3 (dichlorodifluoromethane)
40 mg/m^3 (dichlorofluoromethane)
3500 mg/m^3 (chlorodifluoromethane)
5600 mg/m^3 (trichlorofluoromethane)

CHLORINATED HYDROCARBONS

see individual listings for further information

SYNONYM

STRUCTURE

USE/OCCURRENCE

HEALTH EFFECTS

1) chlorinated hydrocarbon insecticides (DDT, dieldrin, lindane, etc.) persist in the environment, are efficiently absorbed via ingestion route, and act on the CNS causing dizziness, and abdominal pain, with possible coma and death
2) aliphatic chlorinated hydrocarbons (chloroform, etc.) have a greater anethestic effect than aliphatic hydrocarbons and can act not only on the CNS but also on the liver, heart, and kidney
3) aromatic chlorinated hydrocarbon toxicity is for the most part no greater than the related aromatic hydrocarbon (except for naphthalene)
4) when heated to decomposition, emit highly toxic fumes

TOXICITY DATA and TLV

see individual listings

CHLORINATED NAPHTHALENE, N.O.S.

SYNONYM

chloronaphthalenes

STRUCTURE

$C_{10}H_{8-x}Cl$

USE/OCCURRENCE

components of eletrical condensers, wire insulation production, lubricant additives, coatings, fabric dyeing

HEALTH EFFECTS

1) adsorption via inhalation of fumes dermal passage of liquid
2) chronic skin exposure may result in chloracne
3) systemic poisoning after inhalation of fumes may result in headache, vertigo, anorexia, and weight loss
4) the more chlorinated forms seem to be the most toxic (Cl_4 and higher)
5) severe poisoning has been reported to produce damage to the liver, pancreas, gall bladder, lungs, adrenal glands, and kidneys

TOXICITY DATE

TLV/TWA = 5 mg/m^3 (trichloronaphthalene)
2 mg/m^3 (tetra " ")
0.5 mg/m^3 (penta " ")
0.2 mg/m^3 (hexa " ")
0.1 mg/m^3 (octa " ")

CHLORINATED PHENOLS, N.O.S.

see individual listings for further information

SYNONYM

STRUCTURE

USE/OCCURRENCE

HEALTH EFFECTS

1) also see individual listings for CHLOROPHENOL, DICHLOROPHENOL, etc.
2) uncouplers of oxidative phosphorylation and affect carbohydrate metabolism
3) exposures may result in nervous system effects
4) when heated to decomposition, emit highly toxic fumes of chlorides
5) highly toxic polychlorinated dibenzo-p-dioxins may be formed during the chemical synthesis of some chlorophenols
6) 2,4,5-trichlorophenol and 3-chlorophenol have been reported to experimentally promote papilloma formation
7) chronic 4-chloophenol exposures have been reported to result in neurological disorders among workers

TOXICITY DATA and TLV

see individual listings

CHLOROACETALDEHYDE

SYNONYM

2-chloro-1-ethanal

STRUCTURE

$ClCH_2CHO$

USE/OCCURRENCE

fungicide, chemical intermediate, bark remover

HEALTH EFFECTS

1) highly irritating via dermal, oral, and inhalation routes
2) an experimental mutagen
3) a severe irritant of the eyes, mucous membranes, and skin

TOXICITY DATE

1) oral LD50 in rat = 23 mg/kg
2) oral LD50 in mouse = 21 mg/kg
3) dermal LD50 in rabbit = 67 mg/kg

TLV/C = 3 mg/m^3

CHLOROALKYL ETHERS

SYNONYM	STRUCTURE
chloromethyl methyl ether (CMME) bis(chloromethyl)ether (BCME) bis(2-chloroethyl)-ether (BCEE) bis(2-chloroisopropyl)ether (BCIE)	various

USE/OCCURRENCE

organic sysntheses, textile treatmant, insecticide and polymer manufacturing, degreasing agents, ion exchange resin preparation

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) experimental mutagens
3) see individual listings

TOXICITY DATA

TLV/TWA =

p-CHLOROANILINE

SYNONYM

1-amino-4-chlorobenzene
4-chlorophenylamine

STRUCTURE

USE/OCCURRENCE

HEALTH EFFECTS

1) an allergen
2) effects of exposure include blood damage
3) possible experimental, tumorgenic agent and mutagen

TOXICITY DATA

1) oral LD50 in rat = 420 mg/kg
2) dermal LD50 in rabbit = 360 mg/kg
3) 250 mg for 24 hours is a severe eye irritant in rabbit
4) 500 mg for 24 hours is a mild skin irritant in rabbit

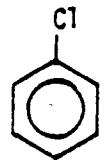
TLV/TWA = N.A.

CHLOROBENZENE

SYNONYM

monochlorobenzene

STRUCTURE



USE/OCCURRENCE

Solvent, intermediate in dye-stuffs, phenol, and DDT production

HEALTH EFFECTS

1 FLAMMABLE LIQUID (DOT) ; same label requirements
2 Irritating to skin, conjunctiva, and upper respiratory tract mucous membranes
3 Prolonged contact with liquid may cause skin burns
4 Acute exposure may cause drowsiness, incoordination, and unconsciousness
5 Chronic exposure may result in liver, kidney, and lung damage
6 Highly lipophilic and hydrophobic

TOXICITY DATA

1. Oral LD50 in rat = 2910 mg/kg
2. Oral LD50 in rabbit = 2830 mg/kg

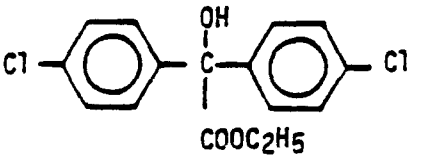
TLV/TWA = 350 mg/m^3

CHLOROBENZILATE

SYNONYM

4,4'-dichlorobenzilic acid ethyl ester
acaraben

STRUCTURE



USE/OCCURRENCE

Pesticide

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) Symptoms similar to those seen with DDT exposures

TOXICITY DATA

1. Oral LD50 in rat = 700 mg/kg
2. Oral LD50 in mouse = 729 mg/kg
3. 25 mg is a moderate eye irritant in rabbit

TLV/TWA = N.A.

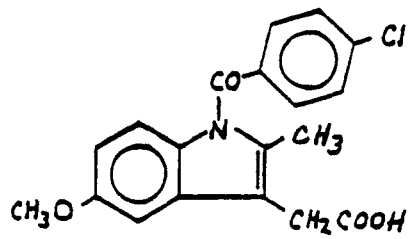
1-(p-CHLOROBENZOYL)-5-METHOXY-2-METHYLINDOLE-3-ACETIC ACID

SYNONYM

indomethazine

indomethacin

STRUCTURE



USE/OCCURRENCE

1) Anti-inflammatory, anti-pyretic, analgesic agent

HEALTH EFFECTS

1) Blocks prostaglandin synthesis
2) Use may induce psychological effects

TOXICITY DATA

1) oral TDLo in human woman producing psychological effects = 20 gm/kg for 4 years
2) oral TDLo in human producing psychological effects = 2433 mg/kg for 4 years
3) oral LD50 in rat = 12 mg/kg
4) oral LD50 in mouse = 20 mg/kg

TLV/TWA = N.A.

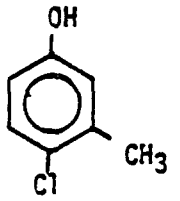
P-CHLORO-M-CRESOL

SYNONYM

4-chloro-m-cresol

2-chloro-hydroxytoluene

STRUCTURE



USE/OCCURRENCE

external germicide and preservative; can be formed during water chlorination of effluent from a domestic sewerage treatment facility, and during chlorination of water receiving cooling waters from electric power-generating plants.

HEALTH EFFECTS

1. highly irritating via subcutaneous and oral routes
2. an allergen
3. see CRESOL listing: cresol is very corrosive to all tissues and is a systemic poison.

TOXICITY DATA

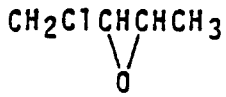
1. oral LDLo in rat 500 mg/kg
2. subcutaneous LD50 in rat = 400 mg/kg

TLV/TWA = 22 mg/m^3 (as cresol;skin)

1-CHLORO-2,3-EPOXYBUTANE

SYNONYM

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

TOXICITY DATA

TLV/TWA = N.A.

2-CHLOROETHYL VINYL ETHER

SYNONYM

vinyl-2-chloroethyl ether

2-chloroethoxy ethene

STRUCTURE

$CH_2ClCH_2OCH{=}CH_2$

USE/OCCURRENCE

in rubber, plastic, chemical products, leather, fabricated metal products, etc. and in manufacture of anesthetics, sedatives, and cellulose ethers

HEALTH EFFECTS

1) an eye irritant
2) potential for bioaccumulation related to stability towards hydrolysis
3) the hydrolysis product (2-chloroethanol) has been reported to be mutagenic

TOXICITY DATA

1) oral LD50 in rat = 250 mg/kg
2) inhalation LCLo in rat = 250 ppm for 4 hours
3) 500 mg is an eye irritant in rabbit
4) 525 mg is a severe skin (open) irritant in rabbit

TLV/TWA = N.A.

CHLOROFORM

SYNONYM	STRUCTURE
trichloromethane	$CHCl_3$

USE/OCCURRENCE

Solvent, manufacturing process intermediate, etc.; ubiquitous distribution in the environment due to chlorination of water and wastewater; use in cosmetic/drug, and food packaging products banned by FDA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) GI absorption by humans is essentially 100 per cent, also absorbed via inhalation and dermal routes to a lesser extent
3) May cause skin burns
4) Intoxicating exposures can exert an anesthetic action with possible liver damage, cardiac arrest, and death
5) Chronic effects are liver, kidney, and nervous system damage
6) Epidemiologic studies have associated trihalomethanes in drinking water with increased incidence of bladder cancer in humans
7) An experimental teratogen

TOXICITY DATA

1) Oral LD50 in rat = 800 mg/kg
2) Oral LDLo in human = 140 mg/kg
3) 10 mg for 24 hours (open) results in mild skin irritation in rabbit
4) 148 mg is an irritant dose in rabbit eye

TLV/TWA = 50 mg/m^3

CHLOROMETHANE

SYNONYM

methyl chloride

STRUCTURE

CH_3Cl

USE/OCCURRENCE

Methylating and chlorinating agent, solvent, refrigerant, propellant, chemical intermediate, etc.; also, natural sources of synthesis (oceans); chloromethane is the predominant halomethane in indoor air.

HEALTH EFFECTS

1) FLAMMABLE GAS (DOT); same DOT label
2) Chronic exposure symptoms include staggering gait, difficulty in speech, nausea, headache, increased mucous flow, dizziness and blurred vision (latent period)
3) Acute exposure symptoms include coma, or convulsive seizures via CNS depression, renal and hepatic damage, and possible bone marrow depression
4) When heated to decomposition, highly toxic fumes of chloride are emitted
5) Readily absorbed via the lungs
6) An experimental mutagen

TOXICITY DATA

1) Inhalation LC50 in rat = 15,200 mg/m^3 for 30 minutes
2) Inhalation LC50 in mouse = 3146 ppm for 7 hours

TLV/TWA = 210mg/m^3

CHLOROMETHYL METHYL ETHER

SYNONYM

chloromethoxymethane
methylchloromethyl ether
CMME

STRUCTURE

$ClCH_2OCH_3$

USE/OCCURRENCE

Highly reactive methylating agent

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) FLAMMABLE LIQUID (DOT); DOT label is FLAMMABLE LIQUID AND POISON
3) Absorption via inhalation and possibly via the skin: CMME only moderately toxic via oral route
4) Actue inhalation exposure results in pulmonary edema and pneumonia
5) Vapor exposure results in severe eye, skin, and nose irritation
6) An experimental carcinogen

TOXICITY DATA

1) Oral LD50 in rat = 817 mg/kg
2) Inhalation LC50 in rat = 55 ppm for seven hours

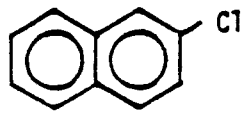
TLV/TWA = N.A.

2-CHLORONAPHTHALENE

SYNONYM

beta-chloronaphthalene

STRUCTURE



USE/OCCURRENCE

Engine crankcase, gauge fluids, heat exchange fluids, specialty solvents, etc.; formerly used as a wood preservative; industrial pollutant.

HEALTH EFFECTS

1. Appears to bioconcentrate in animals
2. See CHLORINATED NAPHTHALENES listing

TOXICITY DATA

1. Oral LD50 in rat = 2078 mg/kg
2. Oral LD50 in mouse = 886 mg/kg

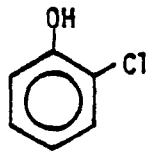
TLV/TWA = N.A.

2-CHLOROPHENOL

SYNONYM

ō-chlorophenol

STRUCTURE



USE/OCCURRENCE

Chemical intermediate, extractant in coal processing; can be formed during the chlorination of phenol-contaminated water.

HEALTH EFFECTS

1) Moderately irritating via oral, subcutaneous, and inhalation routes
2) An experimental tumor promoting agent
3) A convulsant and weak uncoupler of oxidative phosphorylation
4) See CHLORINATED PHENOLS listing

TOXICITY DATA

1) Oral LD50 in rat = 670 mg/kg
2) Oral LD50 in mammal = 440 mg/kg

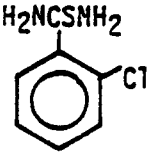
TLV/TWA = N.A.

1-(O-CHLOROPHENYL) THIOUREA

SYNONYM

1-(-o-chlorophenyl)-2-thiourea
2-chlorophenyl thiourea

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) Very toxic via oral route of entry

TOXICITY DATA

1) Oral LD50 in rat = 4600 ug/kg
2) Oral LD50 in rat = 25 mg/kg(3-chlorophenyl thiourea)
3) Oral LD50 in rat = 15 mg/kg(4-chlorophenyl thiourea)

TLV/TWA = N.A.

3-CHLOROPROPIONITRILE

SYNONYM

3-chloropropanonitrile

STRUCTURE

$ClCH_2CH_2CN$

USE/OCCURRENCE

Pharmaceutical and polymer production

HEALTH EFFECTS

1) Penetrates skin to produce systemic cyanide poisoning
2) Chlorine atom is more reactive than would be expected, due to the presence of the cyano group
3) See CYANIDES listing

TOXICITY DATA

1) Oral LD50 in rat = 50 mg/kg

TLV/TWA = N.A.

ALPHA-CHLOROTOLUENE

See BENZYL CHLORIDE listing

CHROMIUM, HEXAVALENT

SYNONYM	STRUCTURE
none	Cr^{+6} (various)

USE/OCCURRENCE

Chromium compounds are used as pigments, mordants, in alloys, and in refractories production, in chrome plating, and in chrome tanning of leather goods; chromic acid, chromates, chromium carbonyl, dichromate, and chromium (VI) oxide are in the hexavalent form; chromic acid anhydride mixed with H_2O gives chromic acid and dichromic acid

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Chromate salts are recognized carcinogens of the lungs, nasal cavity, and paranasal sinus
3) Chromium (VI) compounds are irritants and corrosive via inhalation, ingestion, and dermal absorption
4) Acute exposures may result in dypsnea, headache, fever, nasal damage, and bronchospasm
5) Chronic exposures may result in damage to the liver, kidneys, skin, nose, and respiratory system
6) Allergic dermatitis is a pronounced property of exposure to either tri- or hexavalent forms
7) Working in the chromate-producing industry increases the risk of developing lung cancer
8) Hexavalent chromium is reduced to the trivalent form in the skin
9) Chromium has a relatively long biological half life
10) Chromium (VI) dioxychloride is a CORROSIVE MATERIAL (DOT)
11) Chromium (VI) oxide (1:3) is an OXIDIZER (DOT) and an experimental teratogen
12) Chromium (Cr^{+6}) is an experimental mutagen

TOXICITY DATA

1) Inhalation TCLo in man producing a carcinogenic effect = 800 ug/m^3 for 7 years/intermittant dosing (chromic acid, disodium salt)
2) Inhalation TCLo in human producing a carcinogenic effect = 110 ug/m^3 (chromium (VI) oxide, 1:3)

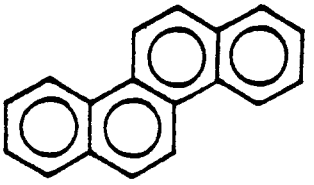
TLV/TWA = 0.05 mg/m^3 (chromates,chromic acid)

CHRYSENE

SYNONYM

1,2-benzphenanthrene

STRUCTURE



USE/OCCURRENCE

A PAH air pollutant; see BENZANTHRACENE listing

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Highly toxic via dermal, subcutaneous, and probably inhalation routes
3) Experimental mutagen

TOXICITY DATA

TLV/TWA = N.A.

CITRUS RED NO. 2

SYNONYM

1-((2,5-dimethoxyphenyl)azo)-2-naphthol
solvent red 80

STRUCTURE

$C_{18}H_{16}N_2O_3$

USE/OCCURRENCE

Coloring agent for orange skins not intended for processing; a monoazo color made from diazonium and phenol (Winter, 1978)

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental mutagen
3) Contains 2-naphthol which is toxic to skin, the eye lens, kidney, GI tract and circulatory system (Winter, 1978)

TOXICITY DATA

TLV/TWA = N.A.

COAL TARS

see CREOSOTE and TARS listings

COPPER (II) CYANIDE

SYNONYM

copper cyanide (DOT)
cupric cyanide (DOT)

STRUCTURE

$CuCN_2$

USE/OCCURRENCE

See CYANIDES listing

HEALTH EFFECTS

1) POISON B (DOT); DOT label requirement is POISON
2) See CYANIDES listing

TOXICITY DATA

1) Intraperitoneal LDLo in rat = 50 mg/kg

TLV/TWA = 5 mg/m^3 (as CN)

CREOSOTE

SYNONYM

creosote, coal tar (DOT)

naphthalene oil

coal tar oil

STRUCTURE

variable

USE/OCCURRENCE

Wood preservative, animal dip, waterproofing agent, pesticide, etc.; produced by the destructive distillation of wood or coal tar (its composition is highly variable and contains PAH)

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) COMBUSTIBLE LIQUID (DOT) ; no label requirement
3) A recognized carcinogen of the skin, forearm, scrotum, face, neck, and penis
4) An experimental carcinogen of the lungs
5) A strong skin and eye irritant
6) Systemic effects can lead to convulsions, respiratory difficulties, and death
7) Human fatalities have occured after ingestion of seven grams by adults or one to two grams by children
8) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 725 mg/kg
2) Oral LDLo in dog = 600 mg/kg

TLV/TWA = 0.2 mg/m^3 (coal tar pitch volatiles, as benzene solubles)

CRESOLS

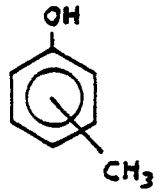
SYNONYM

cresylic acid

cresylol

tricresol

STRUCTURE



USE/OCCURRENCE

Disinfectant, ore floatation agent, chemical intermediste, metal cleaner, motor oil additive; a mixture of o-, m-, and p- cresols, cresylic acid is the refined product from coal tar and contains the three isomers

HEALTH EFFECTS

1) Cresol is very corrosive to all tissues and exposure results in burning, loss of feeling, skin softening, and possible blindness
2) A systemic poison, especially of the liver and kidney
3) A tumor-promoting agent
4) Unlikely to bioaccumulate in mammals due to rapid metabolism
5) An oral dose of 8 grams or more will produce rapid circulatory collapse and death
6) Chronic poisoning may result in digestive and nervous disorders, jaundice, kidney damage, and skin eruptions

TOXICITY DATA

1) Oral LD50 in rat = 1454 mg/kg (cresol)
2) 517 mg for 24 hours produces severe skin irritation in rabbit
3) 103 mg is a severe eye irritant in rabbit
4) Oral LD50 in rat = 242 mg/kg (3-cresol)
5) Oral LD50 in rat = 121 mg/kg (2-cresol)
6) Oral LD50 in rat = 207 mg/kg (4-cresol)
7) Dermal LD50 in rabbit = 2000 mg/kg (cresol)
8) Dermal LD50 in rabbit = 2050 mg/kg (3-cresol)
9) Dermal LD50 in rabbit = 890 mg/kg (2-cresol)
10) D rmal LD50 in rabbit = 301 mg/kg (4-cresol)

TLV/TWA = 22 mg/m^3 (skin) (all isomers)

CRESYLIC ACID

See CRESOL listing

CROTONALDEHYDE

SYNONYM

trans-2-butenal
β-methyl acrolein
propylene aldehyde

STRUCTURE

$CH_3CH{=}CHCHO$

USE/OCCURRENCE

Solvent, leather tanning, insecticides, alcohol denaturant, intermediate in manufacture of n-butanol, crotonic acid, and sorbic acid, etc.; a reactive component of auto exhaust

HEALTH EFFECTS

1) FLAMMABLE LIQUID; DOT label is FLAMMABLE LIQUID AND POISON
2) Associated with increased incidence of malignant tumors in aldehyde factory workers
3) Very dangerous to the eyes; can cause corneal burns; a lacrimator
4) A strong mucous membrane irritant
5) Reacts violently with 1,3-butadiene
6) Not expected to bioaccumulate

TOXICITY DATA

1) Inhalation TCLo in human producing irritant effects = 12 mg/m^3 for 10 minutes
2) Oral LD50 in rat = 300 mg/kg
3) Dermal LD50 in rabbit = 380 mg/kg
4) 45 ppm is an eye irritant in human
5) Inhalation LC50 in rat = 4000 mg/m^3 for 30 minutes

TLV/TWA = 6 mg/m^3

CYANIDE AND CYANIDE SALTS

SYNONYM	STRUCTURE
hydrogen cyanide (prussic acid)	HCN
sodium cyanide	NaCN
potassium cyanide	KCN
etc.	etc.

USE/OCCURRENCE

Steel, plastics, synthetic fibers, chemical electroplating, and metallurgical industries; HCN vapor is released when cyanide saltscome into contact with any acid; all pesticide uses of sodium cyanide have been cancelled and suspended by US EPA except for regulated use in mammalian predator control

HEALTH EFFECTS

1) Hydrogen cyanide is a POISON A (DOT); the DOT label is POISON GAS AND FLAMMABLE GAS
2) Deaths from acute exposures are due to chemical asphyxia at the cellular level
3) Hydrogen cyanide and its soluble salts are rapidly acting poisons
4) Common inorganic cyanides are rapidly absorbed across the skin, stomach, duodenum, and lungs
5) Repeated sublethal doses do not result in cumulative adverse effects

TOXICITY DATA

1) Oral LDLo in human = 570 ug/kg (HCN)
2) Oral LD50 in rat = 10 mg/kg (HCN)
3) Oral LDLo in human = 2857 ug/kg (KCN and NaCN)
4) Intraperitoneal LD50 in mouse = 3 mg/kg

TLV/C = 5 mg/m^3 (skin) (cyanides, as CN)
10 mg/m^3 (skin) (HCN)

CYANIDE, COMPLEXED

see individual listings:

ACETONITRILE
ACRYLONITRILE
CALCIUM CYANAMIDE
METHYLENE BISPHENYL ISOCYANATE
TOLUENE DIISOCYANATE

CYANOGEN

SYNONYM

ethane dinitrile
prussite
dicyan

STRUCTURE

N≡C–C≡N

USE/OCCURRENCE

Chemical intermediate

HEALTH EFFECTS

1) POISON A (DOT); DOT label is FLAMMABLE GAS AND POSON GAS
2) Reacts to form highly toxic fumes when in contact with acid, acid fumes, water or steam, or when heated to decomposition
3) See CYANIDES listing

TOXICITY DATA

1) Inhalation TCLo producing irritant effects in human = 16 ppm
2) 16 ppm for six minutes is an eye irritant in human
3) Inhalation LC50 in rat = 350 ppm for one hour

TLV/TWA = 20 mg/m^3

CYANOGEN BROMIDE

SYNONYM	STRUCTURE
bromine cyanide	BrCN

USE/OCCURRENCE

Chemical intermediate

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Strong irritant
3) See CYANIDE listing

TOXICITY DATA

1) Inhalation LCLo in human = 92 ppm for 10 minutes
2) Inhalation LCLo in mouse = 500 mg/m^3 for 10 min tes

TLV/TWA = 20 mg/m^3 (as cyanogen)

CYANOGEN CHLORIDE

SYNONYM

chlorcyan
chlorine cyanide

STRUCTURE

CNCl

USE/OCCURRENCE

In chemical synthesis, military poison gas, metal cleaner, fumigant, ore refining

HEALTH EFFECTS

1) NONFLAMMABLE GAS and POISON GAS (DOT) label; a DOT POISON A
2) Readily converted to hydrogen cyanide *in vivo*
3) Eye and throat irritant
4) See CYANIDES listing
5) Produces highly toxic and corrosive fumes when heated to decomposition, or brought into contact with water and steam

TOXICITY DATA

1) Inhalation TCLo in human producing toxic eye effects = 10 mg/m^3
2) 100 mg/m^3 for two minutes is a severe eye irritant in human
3) Inhalation LCLo in mouse = 780 mg/m^3 for seven and one half minutes

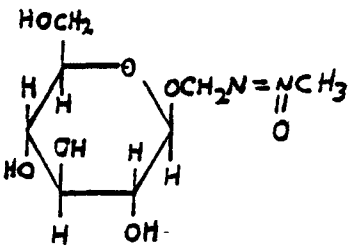
TLV/C = 0.6 mg/m^3

CYCASIN

SYNONYM

methylazoxymethanol B-glucoside

STRUCTURE



USE/OCCURRENCE

Toxic material from Cycas seeds, etc.

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC) and POSITIVE ANIMAL CARCINOGEN (NCI)
2) Experimental mutagen and teratogen

TOXICITY DATA

1) Oral LD50 in rat = 270 mg/kg
2) Oral LD50 in mouse = 500 mg/kg

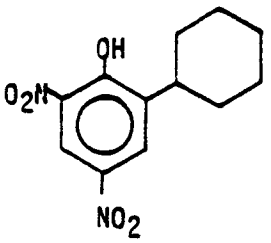
TLV/TWA = N.A.

2-CYCLOHEXYL-4,6-DINITROPHENOL

SYNONYM

dinitro-o-cyclohexylphenol

STRUCTURE



USE/OCCURRENCE

Insecticide (especially miticide)

HEALTH EFFECTS

1) High toxicity via oral route

TOXICITY DATA

1) Oral LD50 in rat = 65 mg/kg
2) Oral LD50 in mouse = 50 mg/kg
3) Oral LD50 in mammal = 50 mg/kg

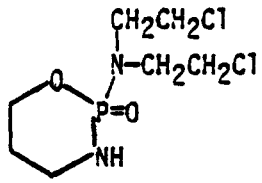
TLV/TWA = N.A.

CYCLOPHOSPHAMIDE

SYNONYM

Cytoxan
endoxan

STRUCTURE



USE/OCCURRENCE

Antineoplastic agent (in lymphomas and certain leukemias)

HEALTH EFFECTS

1. SUSPECTED HUMAN CARCINOGEN (IARC) and a POSITIVE ANIMAL CARCINOGEN (NCI)
2. Human teratogenic agent
3. Experimental teratogen and mutagen
4. Side effects may include GI disturbances, leukopenia (decreased white blood cell count), nausea, alopecia (hair loss), and liver dysfunction.
5. When heated to decomposition, emits highly toxic fumes of PO_x and NO_x

TOXICITY DATA

1. Oral TDLo in human producing GI effects = 20 mg/kg
2. Oral TDLo in woman producing glandular effects = 45 mg/kg
3. Oral LD50 in rat = 94 mg/kg

TLV/TWA = N.A.

DAUNOMYCIN

SYNONYM

acetyladriamycin
leukaemomycin C

STRUCTURE

$C_{27}H_{29}NO_{10}$

USE/OCCURRENCE

Antibiotic of the rhodomycin group used as an antineoplastic agent.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental teratogen and mutagen

TOXICITY DATA

1) Oral LDLo in human = 6 mg/kg
2) Intravenous LD50 in rat = 13 mg/kg
3) Intravenous LD50 in dog = 4 mg/kg

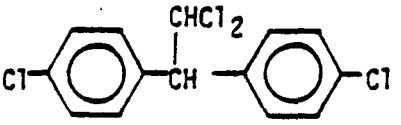
TLV/TWA = N.A.

DDD

SYNONYM

1,1-dichloro-2,2-bis(p-chlorophenol)-ethane
TDE
dichloro diphenyl dichloroethane

STRUCTURE



USE/OCCURRENCE

A contaminant of commercial grade DDT; first metabolite of DDT breakdown in the body; all products containing DDD have been cancelled by the USEPA.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Storage of DDD in human adipose tissue is less than that of either DDT or DDE
3) Experimental mutagen
4) Highly toxic fumes of chlorides are released during decomposition by heating

TOXICITY DATA

1) Oral LDLo in human = 5000 mg/kg
2) Oral LD50 in rat = 113 mg/kg
3) Dermal LD50 in rabbit = 1200 mg/kg

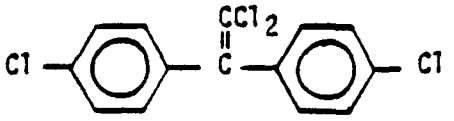
TLV/TWA = N.A.

DDE

SYNONYM

1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene
DDT dehydrochloride

STRUCTURE



USE/OCCURRENCE

Contaminant of technical DDT; one end product of DDT metabolism; most of the biological residues in the U. S. from DDT applications are p,p'-DDE.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (NCI)
2) A highly lipophilic compound which is efficiently absorbed from the GI tract
3) Undergoes no further metabolism in the body
4) Human adipose storage of DDE is greater than that for DDT, and DDE is eliminated from the body very slowly
5) Most DDE stored in tissue is from ingested DDE and not from DDT metabolism

TOXICITY DATA

1) Oral LD50 in rat = 880 mg/kg
2) Oral LD50 in mouse = 200 mg/kg

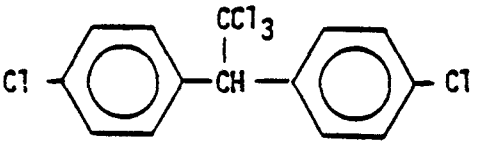
TLV/TWA = N.A.

DDT

SYNONYM

1,1-(2,2,2-trichloroethylidene)-
bis-4-chlorobenzene

STRUCTURE



USE/OCCURRENCE

A broad spectrum insecticide (especially against the malaria mosquito) banned from general use in the U.S.; still in use in other countries; very persistant in the environment; technical grades contain DDD and DDE as contaminants

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Absorption from the GI tract has been reported to be over 90% efficient when ingested with dietary fat
3) DDT acts on the CNS and poisoning may result in vomiting, nausea, diarrhea, partial paralysis of the extremities, and mild convulsions
4) Effects of chronic exposure in man are not known
5) Toxic reproductive effects have not been observed in man, although such damage has been reported in rodents and birds
6) Preferentially is stored in adipose (fat) tissue; DDT has a long residency in the body
7) An experimental carcinogen in mice
8) A strong inducer of the mixed function oxidase system in the body which could effect the metabolism of other ingested foreign compounds
9) An experimental mutagen
10) Biomagnification results from ingestion of contaminated water and and from passage of DDT residues up the food chain; may be very highly concentrated in aquatic organisms

TOXICITY DATA

1) Oral LDLo in infant = 150 mg/kg
2) Oral TDLo in human producing CNS effects = 6 mg/kg
3) LDLo in man = 221 mg/kg (unknown route of administration)
4) Oral LD50 in rat = 113 mg/kg

TLV/TWA = 1 mg/m^3

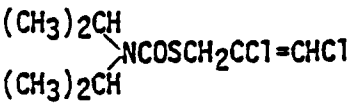
DIALLATE

SYNONYM

2,3-dichloroallyl diisopropyl thiocarbamate

avadex

STRUCTURE



USE/OCCURRENCE

herbicide

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental mutagen

TOXICITY DATA

1) Oral rat LD50 = 395 mg/kg
2) Dermal LD50 = 2000 mg/kg

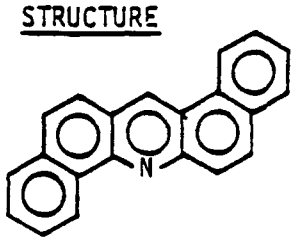
TLV/TWA = N.A.

DIBENZ(A,H)ACRIDINE

SYNONYM

1,2,5,6-dinaphthacridine

STRUCTURE



USE/OCCURRENCE

Heterocyclic aromatic hydrocarbon
See TARS listing

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

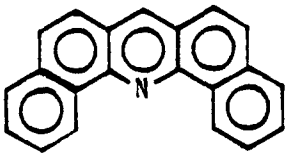
TLV/TWA = N.A.

DIBENZ(A,J)ACRIDINE

SYNONYM

3,4,5,6-dinaphthacridine

STRUCTURE



USE/OCCURRENCE

Heterocyclic aromatic hydrocarbon

See TARS listing

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental mutagen

TOXICITY DATA

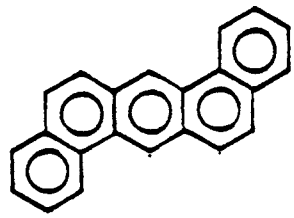
TLV/TWA = N.A.

DIBENZ (A,H) ANTHRACENE

SYNONYM

DB(a,h)A

STRUCTURE



USE/OCCURRENCE

A polynuclear (polycyclic) aromatic hydrocarbon; a fraction of coal tar; see BENZANTHRACENE listing

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) An experimental mutagen
3) Chronic feeding of carcinogenic PAH have resulted in lymph node changes, decreased growth, and decreased spleen weight

TOXICITY DATA

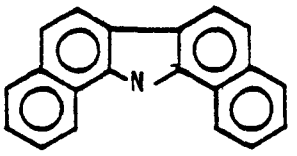
TLV/TWA = N.A.

7H-DIBENZO(c,g) CARBAZOLE

SYNONYM

3,4,5,6-dinaphthacarbazde

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

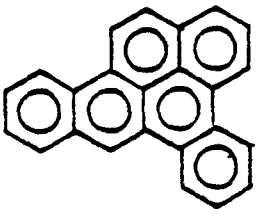
TLV/TWA = N.A.

DIBENZO(A,E) PYRENE

SYNONYM

naphtho(1,2,3,4-def) chrysene

STRUCTURE



USE/OCCURRENCE

See TARS listing; a PAH

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

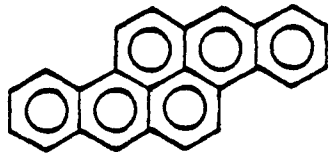
TLV/TWA = N.A.

DIBENZO(A,H) PYRENE

SYNONYM

dibenzo (b,def) chrysene
1,2,6,7-dibenzopyrene

STRUCTURE



USE/OCCURRENCE

See TARS listing; a PAH

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

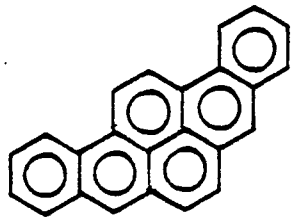
TLV/TWA = N.A.

DIBENZO(A,J) PYRENE

SYNONYM

benzo(rst) pentaphene
1,2,7,8-dibenzopyrene

STRUCTURE



USE/OCCURRENCE

A PAH; see TARS listing

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental mutagen

TOXICITY DATA

TLV/TWA = N.A.

1,2-DIBROMO-3-CHLOROPROPANE

SYNONYM

DBCP
nemagon
fumazone

STRUCTURE

$CH_2BrCHBrCH_2Cl$

USE/OCCURRENCE

Soil fumigant, nematocide; registration for all uses (except on pineapples) has been suspended by the U. S. Environmental Protection Agency (USEPA)

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) Has been linked to sterility in male factory workers
3) Skin and mucous membrane irritant
4) Narcotic in high doses
5) Experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 173 mg/kg
2) Dermal LD50 in rabbit = 1400 mg/kg
3) Ten grams is a severe skin irritant in rabbit
4) One percent solution is a mild eye irritant in rabbit

TLV/TWA = N.A.

1,2-DIBROMOETHANE

SYNONYM

ethylene dibromide
glycol dibromide

STRUCTURE

CH_2BrCH_2Br

USE/OCCURRENCE

Fumigant, constituent of ethyl gasoline, solvent, etc.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) Routes of absorption are inhalation and dermal
3) Eye and mucous membrane irritant
4) Skin exposure may result in ulceration
5) Acute inhalation of vapor may result in CNS depression, respiratory tract injury, and extreme vomiting
6) Repeated exposures may result in liver damage
7) Has been linked to cases of sterility in factory workers
8) Experimental mutagen
9) When heated to decomposition, emits highly toxic fumes of bromides
10) Can penetrate most rubber and leather protective clothing

TOXICITY DATA

1) Oral LDLo in woman = 90 mg/kg
2) Oral LD50 in rat = 108 mg/kg
3) Dermal LD50 in rabbit = 300 mg/kg

TLV/TWA = (Potential human carcinogen) = N.A.

DIBROMOMETHANE

SYNONYM

methylene bromide

STRUCTURE

CH_2Br_2

USE/OCCURRENCE

HEALTH EFFECTS

1) Toxic fumes of bromide are given off when heated to decomposition

TOXICITY DATA

1) Subcutaneous LD50 in mouse = 3738 mg/kg

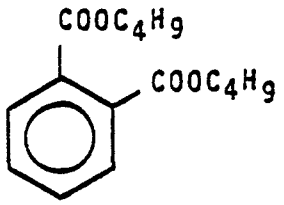
TLV/TWA = N.A.

DI-N-BUTYL PHTHALATE

SYNONYM

phthalic acid, dibutyl ester

STRUCTURE



USE/OCCURRENCE

Plasticizer in polyvinyl acetate emulsions, insect repellent

HEALTH EFFECTS

1) Experimental mutagen and teratogen
2) Phthalic acid esters are readily absorbed via lungs, intestinal tract, and the peritoneal cavity
3) Associated with toxic polyneuritis incidence in exposed workers

TOXICITY DATA

1) Oral TDLo in human producing eye effects = 140 mg/kg
2) Oral LD50 in mouse = 12,000 mg/kg

TLV/TWA = 5 mg/m^3

DICHLOROBENZENES

SYNONYM

Paramoth
dichloricide } p-isomer

STRUCTURE

-o-,-m-,-p-,dichlorobenzenes

USE/OCCURRENCE

See individual listings; 1,3-dichlorobenzene is found as a contaminant in the other two isomeric forms

HEALTH EFFECTS

1) Lipophilic chemicals which deposit in fatty tissues
2) Chronic exposures (1,2-, 1,3-, or 1,4- dichlorobenzene) result in liver, blood, CNS, and respiratory effects
3) Absorbed via lungs, GI tract, and intact skin
4) Induce drug metabolizing enzymes

TOXICITY DATA

See individual listings

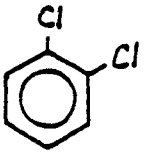
TLV/TWA = See individual listings

1,2-DICHLOROBENZENE

SYNONYM

o-dichlorobenzene

STRUCTURE



USE/OCCURRENCE

Solvent, fumigant, insecticide, chemical intermediate; may be produced during the chlorination of water containing organic precursor material.

HEALTH EFFECTS

1) Irritating to the skin, conjunctiva, and mucous membranes of the upper respiratory tract
2) Repeated contact with the liquid can cause skin burns
3) Acute exposure may cause drowsiness, incoordination, and unconsciousness
4) Chronic exposure may result in liver, kidney, blood, CNS, and lung damage
5) An experimental carcinogen
6) O- isomer is probably more toxic than the m- or p- forms
7) Deposits in fatty tissues

TOXICITY DATA

1) Oral in rat = 500 mg/kg LD50
2) 100 mg for 30 seconds a mild irritant in rabbit eye

TLV/C = 300 mg/m^3

1,4-DICHLOROBENZENE

SYNONYM

PDCB
paracide
p-dichlorobenzene

STRUCTURE

USE/OCCURRENCE

Air deodorant, insecticide; produced as a by-product of monochlorobenzene manufacture

HEALTH EFFECTS

1) Significant absorption via GI tract
2) Chronic toxicity in experimental studies using animals resulted in growth depression, liver pathology, and increased liver and kidney weights
3) Induces drug metabolizing compounds
4) Exposure to vapor may result in irritation of skin, eyes, and throat

TOXICITY DATA

1) Oral TDLo in humans showing systemic effects = 300 mg/kg
2) LDLo in man (unknown route of administration) = 221 mg/kg
3) Eighty ppm is an eye irritant in human
4) Oral LD50 in rat = 500 mg/kg

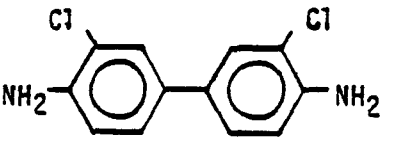
TLV/TWA = 450 mg/m^3

3,3'-DICHLOROBENZIDINE

SYNONYM

DCB
3,3'-dichloro-4,4'-diaminobiphenyl

STRUCTURE



USE/OCCURRENCE

Used in the manufacture of azo dyes

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Experimental mutagen
3) Crosses the placenta

TOXICITY DATA

1) Oral LDLo in rat = 4740 mg/kg

TLV/TWA = N.A. (suspected human carcinogen)

1,1-DICHLOROETHANE

SYNONYM

ethylidene dichloride

STRUCTURE

Cl_2CH-CH_3

USE/OCCURRENCE

Solvent, cleaning agent, degreasing agent, chemical intermediate

HEALTH EFFECTS

1) Chloroethanes are rapidly absorbed via oral or inhalation routes of exposure; it has been indicated that 1,1-dichloroethane can also be significantly absorbed through the skin; may cause liver damage
2) An experimental teratogen and possible neoplastic agent
3) Poisoning results in respiratory tract irritation and CNS depression; marked excitation of the heart

TOXICITY DATA

1) Oral LD50 in rats = 725 mg/kg

TLV/TWA = 810 mg/m^3

1,2-DICHLOROETHANE

SYNONYM

ethylene dichloride

STRUCTURE

$ClCH_2CH_2Cl$

USE/OCCURRENCE

Fumigant, chemical intermediate, solvent, anti-knock agent, degreaser, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE LIQUID (DOT); same label
3) Absorbed rapidly via oral or inhalation route, significant dermal absorption can probably occur
4) Can see skin and cornea damage
5) Narcotic effects of exposure can include nausea and dizziness
6) Symptoms of chronic poisoning include diffuse dystrophic changes in the brain and spinal cord, and liver and kidney damage
7) Experimental mutagen

TOXICITY DATA

1) Oral LDLo in man = 210 mg/kg
2) Oral LD50 in rat = 680 mg/kg
3) Inhalation TCLo in human producing CNS effects = 4000 ppm/hour
4) Sixty-three mg is a severe eye irritant in rabbit

TLV/TWA = 40 mg/m^3

DICHLOROETHYLENES

See individual listings

1,1-DICHLOROETHYLENE

SYNONYM	STRUCTURE
Vinylidene Dichloride	$Cl_2C{=}CH_2$

USE/OCCURRENCE

As a vinyl monomer in the manufacture of polyvinyl chloride and other resins; as a chemical intermediate, and as a solvent

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Suspected carcinogen based upon structural similarity to vinyl chloride $H_2C{=}CHCl$
3) Chronic exposures during experimental studies have resulted in liver damage and increased mortality
4) An experimental mutagen

TOXICITY DATA

1) Inhalation TCLo in human resulting in systemic effects = 25 ppm
2) Oral LD50 in rat = 200 mg/kg
3) Inhalation LCLo in rat = 10,000 ppm for 24 hours

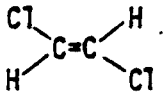
TLV/TWA = N.A.

1,2-DICHLOROETHYLENE, N. O. S.

SYNONYM

trans-1,2-dichloroethylene
sym-dichloroethylene
acetylene dichloride

STRUCTURE



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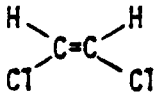


(sym-)

USE/OCCURRENCE

Solvent for waxes, resins, and acetyl cellulose; an oil and rubber extractant; a refrigerant; a chemical intermediate

HEALTH EFFECTS

1) Primary irritant producing dermatitis and mucous membrane irritation (liquid)
2) Exerts a narcotic effect resulting in CNS depression
3) Acute exposure to vapor may result in dizziness, nausea, frequent vomiting, and transient kidney effects
4) Gradual decomposition results in HCl formation in the presence of UV light or upon contact with hot metal

TOXICITY DATA

1) Oral LD50 in rat = 770 mg/kg (sym-)
2) Inhalation TCLo in human producing CNS effects = 4800 mg/m^3 for 10 minutes (trans-)

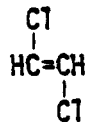
TLV/TWA = 790 mg/m^3 (acetylene dichloride)

TRANS-1,2-DICHLOROETHYLENE

SYNONYM

trans-acetylene dichloride
trans-dichloroethylene
ethylene 1,2-dichloro-, (E)-
acetylene dichloride

STRUCTURE



USE/OCCURRENCE

Manufacture of ethyl glycol, diaminoethylene, nylon, various plastics, photography, xerography, water softening, cosmetics, pharmaceuticals; solvent for fats, phenol, camphor, etc.; retards fermentation

HEALTH EFFECTS

1) High concentrations of vapors may cause nausea, vomiting, weakness, tremor, and cramps
2) Dermatitis may result from defatting action on skin
3) Recovery is prompt following removal from exposure
4) Quantitatively less toxic than 1,1-dichloroethylene, however, the toxicity appears qualitatively the same with depression of the CNS as well as liver and kidney damage

TOXICITY DATA

1) Inhalation TCLo in human producing CNS effects = 4800 mg/m^3 for 10 minutes
2) Inhalation LCLo in mouse = 75000 mg/m^3 for 2 hours

TLV/TWA = 790 mg/m^3 (1,2-dichloroethylene)

DICHLOROMETHANE

SYNONYM

methylene chloride
methylene dichloride

STRUCTURE

CH_2Cl_2

USE/OCCURRENCE

Low temperature extractant, degreaser, solvent

HEALTH EFFECTS

1) Experimental carcinogen/experimental mutagen/animal teratogen
2) Very dangerous to the eyes
3) metabolized to carbon monoxide, etc.; may see elevated carboxyhemoglobin levels in the blood placing persons with cardiovascular disease and those who are pregnant at increased risk of disease
4) Exposure can result in skin burns, dermatitis, pulmonary edema, and CNS narcosis with possible encephalopathy

TOXICITY DATA

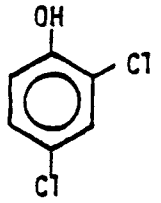
1) Inhalation TCLo in human which produced blood effects = 500 ppm for eight hours
2) Inhalation TCLo in human which produced CNS effects = 500 ppm for one year (intermittant exposure)
3) Oral LD50 in rat = 167 mg/kg
4) Ten mg is a mild eye irritant in rabbit
5) 810 mg for 24 hours is a severe skin irritant in rabbit

TLV/TWA = 700 mg/m^3

2,4-DICHLOROPHENOL

SYNONYM

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in the manufacture of industrial and agricultural products

HEALTH EFFECTS

1) Possible agent in causation of chloracne in exposed workers
2) An apparent tumor promoting agent in mice

TOXICITY DATA

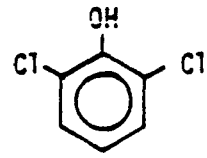
1) Oral LD50 in rat = 580 mg/kg
2) Oral LD50 in mouse = 1600 mg/kg

TLV/TWA = N.A.

2,6-DICHLOROPHENOL

SYNONYM

STRUCTURE



USE/OCCURRENCE

Starting material in the manufacture of various phenol compounds

HEALTH EFFECTS

1) Chronic exposure in rats induces liver damage
2) Dichlorophenols are less likely to be absorbed through the skin than monochlorophenols and are less toxic by skin contact: by comparison with other chlorophenols, it is expected that 2,6-dichlorophenol is absorbed through the skin and from the GI tract, and is then rapidly eliminated.
3) At relatively high concentrations, 2,6-dichlorophenol affects the nervous system

TOXICITY DATA

1) Oral LD50 in rat = 2940 mg/kg
2) 250 μg for 24 hours is a severe eye irritant in rabbit
3) 500 mg for 24 hours is a severe dermal irritant in rabbit

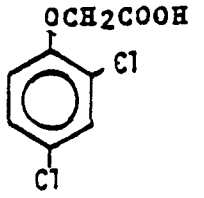
TLV/TWA = N.A.

2,4-DICHLOROPHENOXY ACETIC ACID (2,4-D)

SYNONYM

2,4-D

STRUCTURE



USE/OCCURRENCE

Herbicide; to increase latex output of old rubber trees

HEALTH EFFECTS

1) SUSPECTED ANIMAL CARCINOGEN (IARC)
2) Can cause nausea, vomiting, and central nervous system depression
3) Liver and kidney injury have been reported in experimental animals
4) Exposures have produced sarcomas in experimental studies as well as tumors
5) An experimental mutagen and teratogen

TOXICITY DATA

1) Inhalation TCLo in human producing CNS effects = 10 mg/m^3
2) Oral LD50 in human = 80 mg/kg
3) Inhalation TCLo in man producing gastrointestinal tract effects = 10 mg/m^3
4) Oral LD50 in rat = 375 mg/kg
5) Skin LD50 in rat = 1500 mg/kg

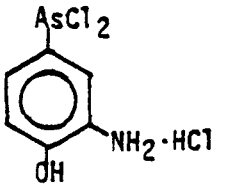
TLV/TWA = 10 mg/m^3

DICHLOROPHENYLARSINE (HYDROCHLORIDE)

SYNONYM

(3-amino-4-hydroxyphenyl) dichloroarsine, hydrochloride

STRUCTURE



USE/OCCURRENCE

Medical use: Has been used as antisyphilitic; Veterinary use: against adult Dirofilaria immitis

HEALTH EFFECTS

TOXICITY DATA

1) Parenteral TDLo in humans producing gastrointestinal tract effects = 957 µg/kg
2) Oral LDLo in rats = 500 mg/kg

TLV/TWA = N.A.

DICHLOROPROPANE

SYNONYM	STRUCTURE
propylidene dichloride (1,1-isomer)	$CH_3CH_2CHCl_2$
propylene dichloride (1,2-isomer)	$CH_3CHClCH_2Cl$
trimethylene dichloride (1,3-isomer)	$CH_2ClCH_2CH_2Cl$

USE/OCCURRENCE

Soil fumigant; oil and fat solvent (1,2-isomer)

HEALTH EFFECTS

1) Shown to be mutagenic in the Ames assay
2) 1,2-dichloropropane is a DOT FLAMMABLE LIQUID (same label)
3) The 1,2-isomer may be irritating to the eyes, mucous membranes; may be narcotic in high concentrations; has caused liver and kidney damage in experimental studies

TOXICITY DATA

1) Oral LD50 in rat = 6500 mg/kg (1,1-isomer)
2) Dermal LD50 in rabbit= 14 g/kg (1,1-isomer)
3) Inhalation LCLo in rat = 4000 ppm for 4 hours (1,1-isomer)
4) Oral LD50 in rat = 1900 mg/kg (1,2-isomer)
5) Dermal LD50 in rabbit = 8750 mg/kg (1,2-isomer)
6) Inhalation LCLo in rat = 1500 ppm for 4 hours (1,2-isomer)
7) 5 mg is a severe eye irritant in rabbit (1,2-isomer)
8) Oral LDLo in dog = 5000 mg/kg (1,2-isomer)
9) Oral LDLo in dog = 3000 mg/kg (1,3-isomer)

TLV/TWA = 350 mg/m^3 (1,2-isomer)

1,2-DICHLOROPROPANE

SYNONYM

propylene dichloride

STRUCTURE

$ClCH_2CHClCH_3$

USE/OCCURRENCE

Used for degreasing and dry cleaning; also as a soil fumigant

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT) ; same DOT label
2) Route of entry, inhalation of vapors;causes dermatitis by defatting the skin
3) Moderately irritating to the eyes, but does not cause permanent injury
4) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rats = 1900 mg/kg
2) Skin LD50 in rabbit = 8750 mg/kg
3) Inhalation LCLo in rat = 1500 ppm for four hours
4) Five mg is a severe eye irritant in rabbit
5) 500 mg for 24 hours is a severe skin irritant in rabbit

TLV/TWA = 350 mg/m^3

DICHLOROPROPANOLS

SYNONYM

1,3-dichloro-2-propanol
2,3-dichloropropanol

STRUCTURE

$CH_2ClCHOHCH_2Cl$

USE/OCCURRENCE

Solvent, chemical intermediate, a cement for celluloid, a binder for water colors

HEALTH EFFECTS

1) May decompose at high temperatures to phosgene gas
2) Experimental mutagens
3) Irritant effect
4) Intoxication symptoms are similar to carbon tetrachloride poisoning

TOXICITY DATA

1) Oral LD50 in rat = 90 mg/kg (2,3-dichloropropanol)
2) Dermal LD50 in rabbit = 200 mg/kg (2,3-dichloropropanol)
3) Ten mg for 24 hours is an irritant on rabbit skin (2,3-dichloropropanol)
4) Oral LD50 in rat = 490 mg/kg (1,3-dichloro 2-propanol)
5) Dermal LD50 in rabbit = 800 mg/kg (1,3-dichloro 2-propanol)
6) Ten mg for 24 hours is a mild (open) skin irritant in rabbit

TLV/TWA = N.A.

DICHLOROPROPENE

See listing for 1,3-Dichloropropene

1,3-DICHLOROPROPENE

SYNONYM	STRUCTURE
1,3-dichloropropylene	$ClCH_2CH{=}CHCl$

USE/OCCURRENCE

A mixture of dichloropropenes and dichloropropanes has been used as a soil fumigant compound

HEALTH EFFECTS

1) A tumor initiator or promoter on mouse skin (*in vivo*)
2) When heated to decomposition, gives off toxic fumes of chlorides
3) An experimental mutagen
4) An irritant of the skin, eyes, and mucous membranes
5) Has produced liver and kidney damage in experimental studies

TOXICITY DATA

1) Oral LD50 in rat = 250 mg/kg

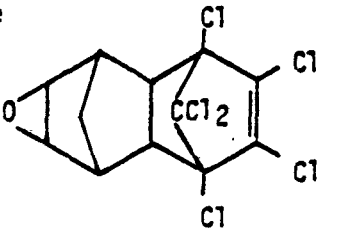
TLV/TWA = 5 mg/m^3 (skin)

DIELDRIN

SYNONYM

hexachloroepoxyoctahydro-endo,exo-dimethanonaphthalene
compound 497

STRUCTURE



USE/OCCURRENCE

Was used as a broad spectrum insecticide until 1974; most uses cancelled by US EPA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) An experimental mutagen and teratogen
3) Absorption via oral route, readily absorbed through the skin

TOXICITY DATA

1) Oral LD50 in rat = 46 mg/kg
2) Inhalation LC50 in rat = 43 $mg/m^3/4H$
3) Skin LD50 in rat = 60 mg/kg
4) Skin LD50 in rabbit = 45 mg/kg
5) Unk LDLo in human = 28 mg/kg

TLV/TWA = 0.25 mg/m^3 (skin)

DIEPOXYBUTANE

SYNONYM

Butadiene Dioxide
Erythritol Anhydride

STRUCTURE

$H_2CO\ CH_2\ CH_2OCH_2$

USE/OCCURRENCE

HEALTH EFFECTS

1) An experimental Mutagen and possible experimental neoplastic agent

TOXICITY DATA

1) Oral LD50 in rat. = 78 mg/kg
2) Inhalation LD50 in Rats = 90 ppm for 4 hours
3) Skin LD50 in Rabbits = 89 mg/kg
4) Oral LD50 in mouse = 72 mg/kg
5) 10mg for 24 hours is a severe skin irritant in rabbit
6) 250 µg is a severe eye irritant in rabbit

TLV/TWA = N.A.

DIETHYLARSINE

(information given for Arsine)

SYNONYM

STRUCTURE

$(C_2H_5)_2$ ASH

USE/OCCURRENCE

not used in any industrial process, but this gas is generated by side reactions or unexpectedlys occurs as an impurity in acetylene.

HEALTH EFFECTS

1) Route of entry: Inhalation of gas
2) Can be fatal if inhaled in sufficient quantities.
3) In high concentration will cause damage to the eyes.

TOXICITY DATA

1) Inhalation TCLO in man producing systemic effects = 230 gm/m^3
2) " LCLO " humans = 25ppm/30 minutes
3) " " " Rats = 300mg/m^3/15 minutes
4) " " " Rabbit = 500mg/m^3/15minutes
5) " TCLO in human producing RBC effects = 3ppm

TLV/TWA = 0.2 mg/m^3. (arsine)

O,O-DIETHYL-S-(2-ETHYLTHIO) ETHY ESTER OF PHOSPHOROTHIOIC ACID

See DISULFOTON listing

1,2-DIETHYLHYDRAZINE

SYNONYM

hydrazoethane

STRUCTURE

$CH_3CH_2HNCH_2CH_3$

USE/OCCURRENCE

Hydrazines are used in liquid rocket fuels.

HEALTH EFFECTS

1) POSITIVE, ANIMAL CARCINOGEN (IARC)
2) Routes of Entry: Inhalation and percutaneous absorption.
3) highly irritating to the eyes, upper respiratory fact, and skin; severe exposure may produce temporary blindness.

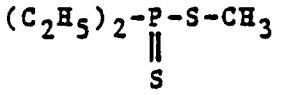
TOXICITY DATA

TLV/TWA = N.A.

O,O-DIETHYL-S-METHYL ESTER PHOSPHORODITHIOTIC ACID

SYNONYM

STRUCTURE



USE/OCCURRENCE

Structurally related to the phosphorodithioate insecticides (i.e., azinphosmethyl, phorate, disulfoton)

HEALTH EFFECTS

TOXICITY DATA

1) Oral LD50 in mouse = 156 mg/kg

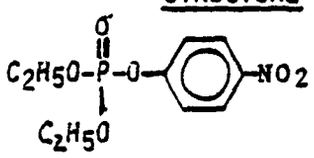
TLV/TWA = N.A.

O,O-DIETHYLPHOSPHORIC ACID, O-P-NITROPHENYL ESTER

SYNONYM

Diethyl p-nitrophenyl Phosphate
Parathion

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide; the use of parathion (ethyl) has been restricted by USEPA

HEALTH EFFECTS

1) POISON B(DOT); the DOT label is POISON
2) A cholinesterase inhibitor which effect smooth muscle, skeletal muscle, nerve endings, and the CNS
3) An experimental mutagen and teratogen
4) Onset of symptoms after organophosphate compound poisoning is usually rapid (2-3 hours)
5) A variety of symptoms may result including chest tightness, wheezing expiration, increased bronchial secretion and salivation, nausea, vomiting, cramps, diarrhea, heart rate changes, involuntary urination and defecation, constriction of the pupils, muscular fatigue, twitching, dyspnea, cyanosis, pallor, blood pressure elevation, and a variety of CNS effects.
6) Exposure to lethal concentrations may result in death by asphyxia due to respiratory failure

TOXICITY DATA

1) Oral LDLo in human = 240 µg/kg
2) oral TDLo in woman producing CNS effects = 5670 µg/kg
3) LDLo in man = 1471 µg/kg (unknown route
4) Oral LD50 in rat = 2 mg/kg
5) Oral LD50 in mouse = 6 mg/kg
6) dermal LD50 in rabbit = 40 mg/kg
7) Inhalation LCLo in rat = rat = 10 mg/m^3 for 2 hours
8) Intraperitoneal LD50 in rat = 1500 ug/kg

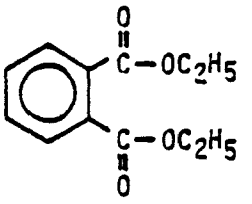
TLV/TWA = 0.1 mg/m^3 (skin)

DIETHYL PHTHALATE

SYNONYM

ethyl Phthalate

STRUCTURE



USE/OCCURRENCE

solvent for cellulose acetate in manuf. varnishes and dopes; fixative for perfumes.

HEALTH EFFECTS

1) Irritating to mucous membranes, and in high concentration, narcotic.
2) an experimental teratogen

TOXICITY DATA

1) Inhalation TCLo in human producing an irritant effect = 1000 mg/m^3
2) Intraperitoneal LD50 in Rats = 5058 mg/kg
3) Oral LDLo in Rabbits = 1000 mg/kg
4) 112 mg is an eye irratant dose in rabbit

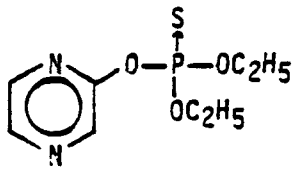
TLV/TWA = 5 mg/m^3

O,O-DIETHYL-O-(2-PYRAZINYL) PHOSPHOROTHIOATE

SYNONYM

zinophos
thionazin

STRUCTURE



USE/OCCURRENCE

Organophosphate nematocide and insecticide

HEALTH EFFECTS

1) Cholinesterase inhibitor; see PARATHION listing
2) Highly toxic via oral and dermal routes
3) When heated to decomposition, emits highly toxic fumes

TOXICITY DATA

1) Oral LD50 in Rats = 3500 ug/kg
2) Skin LD50 in Rats = 8 mg/kg

TLV/TWA = N.A.

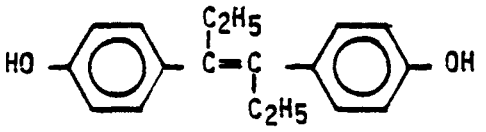
DIETHYLSTILBESTROL

SYNONYM

3,4-bis(P-hydroxyphenyl)-3-hexene

Stilbesterol

STRUCTURE



USE/OCCURRENCE

Medicinal use in estrogenic hormone therapy; veterinary use in replacement therapy for underdeveloped females

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC)
2) Has been reported to be a human teratogen
3) An experimental mutagen, teratogen, carcinogen, and neoplastic agent

TOXICITY DATA

1) Oral TDLo in woman producing a carcinogenic effect = 35 mg/kg (2-17 weeks of pregnancy)
2) Dermal TDLO in human producing glandular effects = 60 µg/kg for 14 days.
3) TDLO in woman producing teratogenic effects = 240 mg/kg for 35 wks*
4) TDLO in man producing possible tumorigenic effects = 180 mg/kg for 12 years (intermittant dosing, unknown route)

* intermittant dosing, unknown route of administration

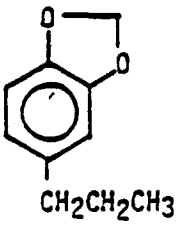
TLV/TWA = N.A.

DIHYDROSAFROLE

SYNONYM

1,2-methylene dioxy-4-propylbenzene

STRUCTURE



USE/OCCURRENCE

A safrole derivative

HEALTH EFFECTS

(1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

(1) Oral LD50 in rat = 2260 mg/kg
(2) Oral LD50 in mouse = 3700 mg/kg

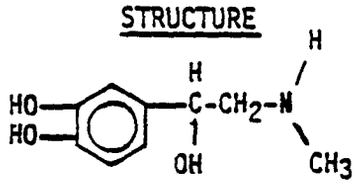
TLV/TWA = N.A.

3,4- DIHYDROXY-ALPHA-(METHYL AMINO)-METHYL BENZYL ALCOHOL

SYNONYM

Epinephrine
Adrenaline

STRUCTURE



USE/OCCURRENCE

A natural body hormone which mimics the effects of stimulation of the sympathetic nervous system; medicinal usage in treatment of bronchial spasms, allergic reactions, constricts peripheral blood vessels, may restore heartbeat in cases of acute cardiac arrest; produced in the adrenal glands

HEALTH EFFECTS

1) Use may result in a sharp rise in blood pressure
2) Side effects of use may include weakness, headache, dizziness, anxiety, fear, and respiratory difficulties
3) an experimental teratogen

TOXICITY DATA

1) Subcutaneous LDLo in man = 735 ug/kg
2) Oral LD50 in mouse = 50 mg/kg
3) Intravenous LD50 rat = 980 µg/kg
4) skin LD50 in Rat = 62 mg/kg
5) Oral LDLo in Rat = 30 mg/kg

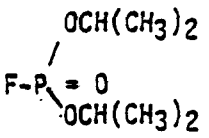
TLV/TWA = N.A.

DIISOPROPYLFLUROPHOSPHATE

SYNONYM

DFP
Diisopropoxyphosphoryl fluoride

STRUCTURE



USE/OCCURRENCE

An early organophosphate insecticide; used in Germany as a basis for nerve gases

HEALTH EFFECTS

1) High toxicity via oral, inhalation, and dermal routes
2) A cholinesterase inhibitor: see PARATHION listing
3) Can cause damage to eyes, nausea, vomiting

TOXICITY DATA

1) Oral LD50 in Rat = 6 mg/kg
2) Inhalation LC50 in Rat = 360 mg/m^3 for 10 minutes
3) oral LD50 in mouse = 37 mg/kg
4) dermal LD50 in mouse = 72 mg/kg
5) Oral LD50 in rabbit = 9780 ug/kg
6) 19 mg/m^3 for 10 minutes is an irritant dose in human eye

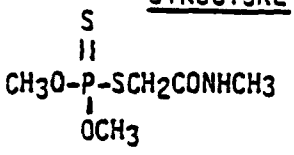
TLV/TWA = N.A.

DIMETHOATE

SYNONYM

O,O-Dimethyl S-(2-(methylamino)-2-Oxoethyl) Phosphorodithioate

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide, acaricide

HEALTH EFFECTS

1) Acts as irreversible inhibitors of the enzyme cholinesterase: See PARATHION listing
2) Absorbed by ingestion, skin, eye and inhalation.
3) Causes symptoms of headache, fatigue, sweating and vomiting in mild organophasphate poisoning; moderate poisoning signs may be: unable to walk, marked miosis, and muscle twitchings; in severe poisoning, unconsciousness, and seizures may result
4) An experimental mutagen, teratogen, and carcinogen

TOXICITY DATA

1) Oral LD50 in human = 30 mg/kg
2) Oral LD50 in Rat = 152 mg/kg
3) Dermal LD50 in Rat = 353 mg/kg
4) Oral LD50 in Rabbit = 300 mg/kg

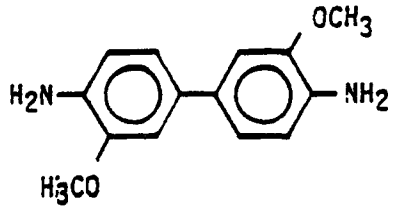
TLV/TWA = N.A.

3,3'-DIMETHOXYBENZIDINE

SYNONYM

Dianisidine

STRUCTURE



USE/OCCURRENCE

manufacture of Azo dyes.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Can cause skin irritation
3) An experimental neoplastic agent

TOXICITY DATA

1) ral LD50 in rat = 1920 mg/kg
2) ral LDLo in dog = 600 mg/kg

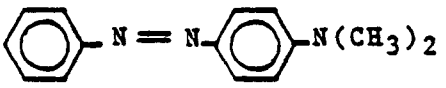
TLV/TWA = N.A.

P-DIMETHYLAMINO AZO BENZENE

SYNONYM

aniline, N,N-dimethyl-P-phenylazo
Sudan yellow
butter ye low

STRUCTURE



USE/OCCURRENCE

Used for research purposes; formerly used as a dye in margarine; reagent for determination of free HCl in gastric juice; a PH indicator (red at PH = 2.9, yellow at PH = 4.0

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Route of entry by inhalation, percutaneous, and oral absorption
3) An experimental mutagen, teratogen, and neoplastic agent

TOXICITY DATA

1) Oral LD50 in rat = 200 mg/kg
2) Oral LD50 in mouse = 300 mg/kg
3) Intraperitoneal LD50 in rat = 500 mg/kg

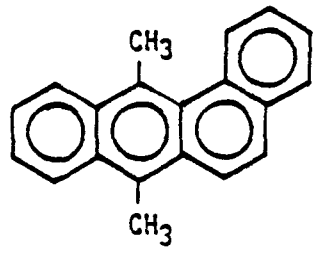
TLV/TWA = N.A. (OSHA carcinogen)

7,12-DIMETHYL BENZ(A) ANTHRACENE

SYNONYM

9,10-Dimethyl-1,2-
benzanthracene
Dimethyl Benzanthrene

STRUCTURE



USE/OCCURRENCE

A PAH; see TARS listing

HEALTH EFFECTS

1) See TARS listing
2) An experimental mutagen, teratogen, Carcinogen, neoplastic agent

TOXICITY DATA

1) Oral LD50 in Rat = 327 mg/kg
2) Intravenous LD50 in Rat = 54 mg/kg
3) Oral LD50 in mouse = 340 mg/kg

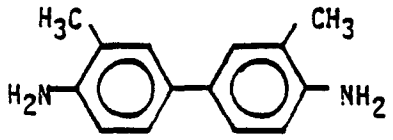
TLV/TWA = N.A.

3,3'-DIMETHYL BENZIDINE

SYNONYM

O-Tolidine

STRUCTURE



USE/OCCURRENCE

Dyes manufacture; a sensitive reagent for gold determination and for free chlorine in water

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

1) Oral LD50 in Rat = 404 mg/kg
2) Oral LDLo in dog = 600 mg/kg

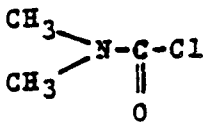
TLV/TWA = N.A.

DIMETHYLCARBAMOYLCHLORIDE

SYNONYM

di methyl carbamyl chloride
n,n-Dimethyl Carbonyl Chloride

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) A lachrymator (tear-producing agent)
3) Produces strong local irritating action
4) Reacts with water or steam to produce toxic and corrosive fumes
5) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in Rat = 1000 mg/kg
2) Inhalation LCLo in mouse = 1000 mg/m^3 for 10 minutes
3) Intraperitoneal LD50 in mouse = 300 mg/kg

TLV/TWA = N.A. (potential human carcinogen)

1,1-DIMETHYLHYDRAZINE

SYNONYM

N, N - dimethylhydrazine

STRUCTURE

$(CH_3)_2 NNH_2 \cdot HCl$

USE/OCCURRENCE

Base in rocket fuel formulation

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQUID and POISON
3) Highly corrosive and irritating to skin, eyes, mucous membranes, and upper respiratory tract
4) An experimental mutagen
5) When heated to decomposition, emits highly toxic fumes
6) A sensitization dermatitis may be produced
7) A convulsant poison

TOXICITY DATA

1) Inhalation LC50 in Rat = 252 ppm/4H
2) Intraperitonal LD50 in Rat = 102 mg/kg
3) Inhalation LC50 in Mouse = 172 ppm for 4 hours

TLV/TWA = 1 mg/m^3 (skin)

1,2-DIMETHYLHYDRAZINE

SYNONYM

N, N' - dimethylhydrazine

STRUCTURE

$CH_3-NH-NH-CH_3$

USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen
3) See 1,1-DIMETHYLHYDRAZINE listing

TOXICITY DATA

1) Oral LD50 in Rat = 100 mg/kg
2) Inhalation LCLo in Rat = 280 ppm for 4 hours
3) Intramuscular LD50 in Hamster = 95 mg/kg

TLV/TWA = N.A.

3,3-DIMETHYL-1-(METHYLTHIO)-,O-(METHYLAMINO) CARBONYL)-OXIME

SYNONYM

Thiofanox

Dacamox

STRUCTURE

$C_9H_{18}N_2O_2S$

USE/OCCURRENCE

Carbamate insecticide

HEALTH EFFECTS

1) Highly toxic via oral route
2) Cholinesterase inhibitor (reversible action)

TOXICITY DATA

1) Oral LD50 in rat =8500 µg/kg
2) Dermal LD50 in rabbit = 39 mg/kg

TLV/TWA = N.A.

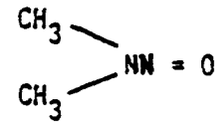
DIMETHYLNITROSAMINE

SYNONYM

N - nitrosodimethylamine

DMN

STRUCTURE



USE/OCCURRENCE

Intermediate in the formation of dimethylhydrazine, rubber industry chemical; a component of tobacco smoke; environmental occurrence and formation known

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) A highly potent carcinogen in animals via ingestion or inhalation (liver, kidney and lung tumors)
3) Highly toxic in most species, including man
4) Exposure may result in nausea, vomiting, abdominal cramps, diarrhea, fera, weakness, and jaundice
5) Chronic exposure may result in liver damage
6) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 26 mg/kg
2) Oral LDLo in dog = 20 mg/kg

TLV/TWA =

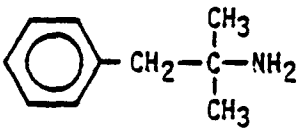
N.A. (OSHA - carcinogen)

ALPHA, ALPHA-DIMETHYLPHENETHYLAMINE

SYNONYM

Phentermine
Phenyl - tert butylamine

STRUCTURE



USE/OCCURRENCE

Anorexigenic agent

HEALTH EFFECTS

TOXICITY DATA

1) Intravenous LD50 in mouse = 14 mg/kg
2) Oral LD50 in mouse = 105 mg/kg
3) Intraperitoneal LD50 in mouse = 71 mg/kg

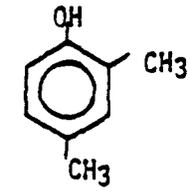
TLV/TWA = N.A.

2,4-DIMETHYLPHENOL

SYNONYM

2, 4 - xylenol

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in a number of industrial and agricultural products; occurs naturally in tea, tobacco, and marijuana; used in the preparation of coal tar disinfectants (xylenol)

HEALTH EFFECTS

1) Absorbed readily through the skin
2) Chronic exposure in a rat study led to liver, spleen, kidney, and heart damage
3) May be a cancer-promoting agent
4) May inhibit vasoconstriction

TOXICITY DATA

1) Oral LD50 in rat = 3200 mg/kg
2) Oral LD50 in mouse = 809 mg/kg
3) Dermal LD50 in rat = 1040 mg/kg

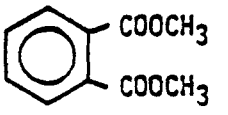
TLV/TWA = N.A.

DIMETHYL PHTHALATE

SYNONYM

phthalic acid dimethyl ester
methyl phthalate
DMP

STRUCTURE



USE/OCCURRENCE

Solvent and plasticizer for cellulose acetate, insect repellant; environmental contamination may occur through leaching from plastics

HEALTH EFFECTS

1) Route of Entry: Inhalation of dust, fume or vapor
2) A potent irritant of the eyes, skin and respiratory tract
3) Repeated exposure may result in bronchitis, emphysema, allergic asthma, and chronic eye irritation
4) An experimental mutagen and teratogen
5) One experimental study has indicated kidney damage as a result of chronic exposures
6) A comparison of LD50 values in mice after intraperitoneal dosing for a series of phthalate esters showed dimethyl phthalate was the most toxic of the compounds tested
7) Ingestion may result in CNS depression
8) Not appreciably absorbed through the skin

TOXICITY DATA

1) Oral LD50 in rat = 6900 mg/kg
2) Intraperitoneal LD50 in rat = 3375 mg/kg
3) Oral LD50 in rabbit = 4400 mg/kg
4) 119 mg is an eye irritant dose in rabbit

TLV/TWA = 5 mg/m^3

DIMETHYL SULFATE

SYNONYM

sulfuric acid, dimethyl ester

STRUCTURE

$(CH_3)_2SO_4$

USE/OCCURRENCE

Used in the manufacture of methyl esters, ethers, and amines, in dyes, drugs, perfumes, phenol derivatives and other organic chemicals; a war gas

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) CORROSIVE MATERIAL (DOT); the DOT label is CORROSIVE AND POISON
3) The liquid is highly irritating to eyes, mucous membranes, and skin: may cause skin vessiculation
4) Lesions are slow healing and may result in scar tissue formation
5) An experimental mutagen and carcinogen
6) No symptoms may be apparent until toxic quantities have been absorbed
7) Dermal absorption may result in poisoning
8) Following a latent period, vapor exposures may result in severe inflammation and necrosis of eyes, mouth, respiratory tract with possible fatal pulmonary damage
9) Symptoms of chronic poisoning may include prostration, convulsions, delirium, paralysis, coma, and damage to liver, kidney, and heart

TOXICITY DATA

1) Inhalation LDLo in human = 97 ppm for 10 minutes
2) Inhalation LCLo in rat = 32 ppm for 4 hours
3) Oral LDLo in rabbit= 45 mg/kg
4) Inhalation LCLo in mouse = 75 ppm for 17 minutes
5) Oral LD50 in rat = 440 mg/kg
6) 50 ug for 24 hours is a severe eye irritant in rabbit
7) 50 mg for 24 hours is a severe skin irritant in rabbit

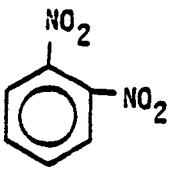
TLV/TWA = 0.5 mg/m^3 (skin)

DINITROBENZENE, N.O.S.

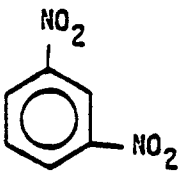
SYNONYM

o-dinitrobenzene
m-dinitrobenzene
p-dinitrobenzene

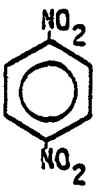
STRUCTURE



(o-isomer)



(m-isomer)



(p-isomer)

USE/OCCURRENCE

Dinitrobenzenes are used in dyestuffs, explosives, celluloid production; of the three isomers of dinitrobenzene, the meta-form (m-) is the most widely used

HEALTH EFFECTS

1) Dinitrobenzene, solid, is a POISON B (DOT); the DOT label requirement is POISON
2) Dinitrobenzene is readily absorbed through intact skin and also via inhalation
3) The most potent methemoglobin-forming compound among the nitroaromatics; rapid cyanosis may result following exposure
4) Exposure may produce methemoglobinemia with resultant headache, irritability, dizziness, weakness, nausea, vomiting, dyspnea, drowsiness, unconsciousness, and possible death: other sumptoms of exposure may include a bitter almond taste or burning sensation in the mouth, dry throat, thrist, reduced vision, liver damage, hearing loss, and ringing of the ears
5) Repeated or excessive exposures may result in anemia
6) Toxic effects are intensified by alcohol consuption. sunlight, or hot baths
7) Contact with dinitrobenzenes may result in a yellowish discoloration of the skin, eyes, and hair
8) The o-isomer is highly explosive, and when heated to decomposition, emits highly toxic fumes of nitrogen oxides and explodes
9) The m-isomer is an experimental mutagen

TOXICITY DATA

1) Dermal TDLo in man producing blood effects = 4 mg/kg for 2 days (intermittant exposure) (m-isomer)
2) Oral LD50 in wild bird = 42 mg/kg (m-isomer)
3) Oral LDLo in cat = 27 mg/kg (m-isomer)
4) Oral LDLo in cat = 29 mg/kg (p-isomer)

TLV/TWA = 1 mg/m^3 (all isomers of dinitrobenzene)

M-DINITROBENZENE

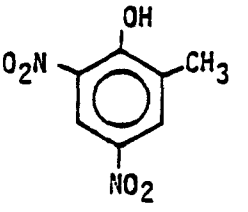
See DINITROBENZENE listing

4,6-DINITRO-O-CRESOL AND SALTS

SYNONYM

DNOC
3, 5 - dinitro - 2 - hydroxytoluene
3, 5 - dinitro - O - cresol

STRUCTURE



USE/OCCURRENCE

Used primarily as a blossom thinning agent on fruit trees and as a fungicide, insecticide and miticide on fruit trees during the dormant season;

HEALTH EFFECTS

1) Readily absorbed via the skin, respiratory tract, and GI tract
2) Human use of DNOC as a dieting aid has resulted in reported poisonings at accepted therepotic dose levels: overdoses have resulted in some cases of cataract formation
3) An uncoupler of oxidative phosphorylation; a cumulative poison
4) Dermal exposures may result in local necrosis and toxic systemic effects
5) Symptoms of exposure are similar to those seen with dinitrophenol, but more toxicity seen

TOXICITY DATA

1) Inhalation TCLo in human producing CNS effects = 1 mg/m^3
2) LDLo in man = 29 mg/kg (unknown route of administration)
3) Oral LD50 in rat = 10 mg/kg
4) Dermal LD50 in rat = 200 mg/kg
5) Oral LD50 in mouse = 47 mg/kg

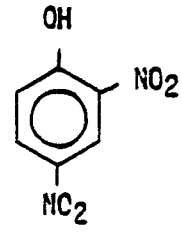
TLV/TWA = 0.2 mg/m^3 (skin)

2,4-DINITROPHENOL

SYNONYM

2,4-DNP

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in explosives, pesticides, dyes, etc.

HEALTH EFFECTS

1) Dinitrophenol solution is a (DOT) POISON B; the DOT label is POISON
2) Readily abosrbed orally, dermally, and via inhalation
3) Acute poisoning leads to repid respiration, nausea, headache, possible jaundice and death
4) Phytotoxic
5) When used as a human dieting aid, has led to cataract formation
6) May see yellow staining of skin with dermatitis
7) An experimental mutagen

TOXICITY DATA

1) Oral LDLo in human = 4300 µg/kg
2) Oral LD50 in rat = 30 mg/kg
3) Oral LD50 in dog = 30 mg/kg
4) Oral LD50 in bird = 13 mg/kg
5) 300 mg over 4 weeks (intermittant) is a mild skin irritant in rabbit

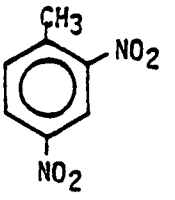
TLV/TWA = N.A.

2,4-DINITROTOLUENE

SYNONYM

dinitrotoluol
DNT

STRUCTURE



USE/OCCURRENCE

Intermediate in the manufacture of explosives and dyes in organic synthesis

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Known to be absorbed via inhalation and dermal routes
3) Can produce anoxia due to the formation of methemoglobin, cyanosis can result with headache, dizziness, vomiting, etc., and death will result if not treated
4) An irritant and allergen
5) Can cause anemia and liver damage
6) A experimental mutagen

TOXICITY DATA

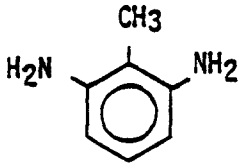
1) Oral LD50 in rat = 268 mg/kg
2) Oral LD50 in mouse = 1625 mg/kg

TLV/TWA = 1.5 mg/m^3 (skin)

2,6-DINITROTOLUENE

SYNONYM

STRUCTURE



USE/OCCURRENCE

Dinitrotoluene isomers are intermediates in the manufacture of toluene diisocyanates, toluenediamides, and trinitrotoluene; ingredient in explosives manufacturing

HEALTH EFFECTS

1) Routes of entry include oral and inhalation routes and absorption through the skin
2) Exposure may result in anoxia (severe lack of oxygen) due to the formation of methemoglobin; other effects include cyanosis with headache, dizziness, nausea, unconsciousness and possible death depending on dose
3) Chronic exposure may result in anemia
4) Repeated dosing in experimental studies have resulted in decreased muscular coordination, weight loss, decreased appetite, methemoglobinemia, anemia, tissue lesions in the liver, spleen, brain and testes.
5) Experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 177 mg/kg
2) Oral LD50 in mouse = 1000 mg/kg

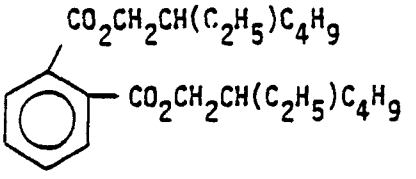
TLV/TWA = 1.5 mg/m^3 (as dinitrotoluene)

DI-N-OCTYL PHTHALATE

SYNONYM

Octyl Phthalate
DOP
di-2-ethylhexyl phthalate

STRUCTURE



USE/OCCURRENCE

Platicizer in plastics production; environmental contaminant resulting from leaching, volatilization, and incineration of plastics

HEALTH EFFECTS

1) Experimental teratogen which has also produced other reproductive effects in animal models

TOXICITY DATA

1) 5 mg is a severe eye irritant in rabbit
2) 500 mg for 24 hours is a mild skin irritant in rabbit
3) Oral LD50 in rat = 31 gm/kg (di-sec-octyl phthalate)
4) Dermal LD50 in rabbit = 25 gm/kg (di-sec-octyl phthalate)

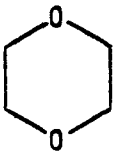
TLV/TWA = 5 mg/m^3 (di-sec-octyl phthalate)

p-DIOXANE

SYNONYM

1,4-Diethylene dioxide
1,4-Dioxane
Glycol ethylene ether
para-dioxane

STRUCTURE



USE/OCCURRENCE

Solvent for cellulose compounds, resins, oils, waxes, fats, dyes, paints, lacquers, mineral oil, etc; wetting and dispersing agent; used in paint and varnish strippers, and in the preparation of histological slides

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) FLAMMABLE LIQUID (DOT); same DOT label
3) A skin and eye irritant
4) May be absorbed through the skin and produce systemic toxicity
5) Fatal industrial poisonings have been reported showing lung and brain congestion, and liver and kidney damage; death resulting from acute inflammation of the kidney; repeated exposure to low concentrations has resulted in human fatalities
6) Acute exposures may result in eye and nose irritation, headache, drowsiness, nausea, and vomiting
7) Chronic exposure symptoms may include anorexia, nausea, vomiting, abdominal pain, malaise, liver enlargement, kidney damage, and death
8) May form explosive peroxides during storage

TOXICITY DATA

1) Oral LD50 in rat = 4200 mg/kg
2) Dermal LD50 in rabbit = 7600 mg/kg
3) 300 ppm for 15 minutes is an irritant dose in human eye
4) Inhalation LDLo in human = 470 ppm for 3 days
5) Inhalation TCLo producing eye effects = 5500 ppm for 1 minute
6) Inhalation LD50 in rat = 46 grams/m^3 for 2 hours

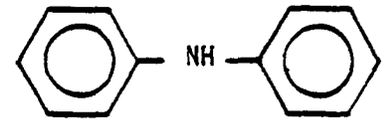
TLV/TWA = 180 mg/m^3 (skin) (technical grade dioxane)

DIPHENYLAMINE

SYNONYM

phenylaniline
anilinobenzene
DPA

STRUCTURE



USE/OCCURRENCE

Chemical intermediate, stabilizer, dyes manufacture

HEALTH EFFECTS

1) Experimental teratogen
2) When heated to decomposition, emits highly toxic fumes
3) May cause mucous membrane irritation

TOXICITY DATA

1) Oral LDLo in rat = 3000 mg/kg
2) Oral LD50 in guinea pigs = 300 mg/kg

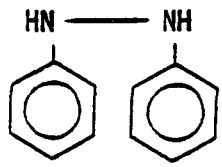
TLV/TWA = 10 mg/m^3

1,2-DIPHENYLHYDRAZINE

SYNONYM

DPH
hydrazobenzene
N, N'-bianiline

STRUCTURE



USE/OCCURRENCE

Intermediate in the synthesis of benzidine for use in dyes and phenyl butazone (anti-arthritic drug)

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Experimental studies have indicated that one metabolite of diphenyl hydrazine is benzidine, a known carcinogen
3) Chronic exposures in experimental studies have resulted in liver and kidney damage

TOXICITY DATA

1) Oral LD50 in rat = 301 mg/kg

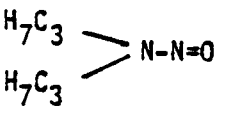
TLV/TWA = N.A.

DI-N-PROPYLNITROSAMINE

SYNONYM

N-nitrosodipropylamine
DPN

STRUCTURE



USE/OCCURRENCE

Nitrosamines can be readily synthesized by the interaction of common precursors, nitrites or oxides of nitrogen, and amines: this process of nitrosation may take place in the environment, within the digestive systems of higher organisms, etc.

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) Experimental carcinogen, neoplastic agent, and mutagen
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 480 mg/kg

TLV/TWA = N.A.

DISULFOTON

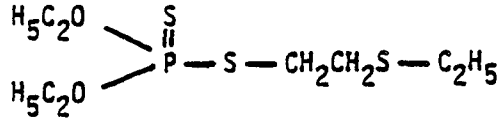
SYNONYM

0,0-diethyl-s-2-(Ethylthio) ethyl phosphorodithioate

Disyston

Demeton

STRUCTURE



USE/OCCURRENCE

Agricultural insecticide used mainly to control sucking insects such as aphids and plant feeding mites

HEALTH EFFECTS

1) A highly toxic organophosphorus insectide which produces symptoms of central and peripheral nervous system toxicity following sublethal dose exposures
2) Causes anorexia, nausea, vomiting, diarrhea, excessive salivation, bronchoconstriction, muscle twitching, convulsions, coma, and respiratory failure
3) Readily absorbed through skin
4) Cholinesterase inhibitor

TOXICITY DATA

1) Oral LDLo in human is estimated to be 5 mg/kg
2) Oral LD50 in rat = 5 mg/kg
3) Dermal LD50 in rat = 6 mg/kg
4) Oral LD50 in mouse = 5500 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin)

2,4-DITHIOBIURET

SYNONYM

2-Thio-1-(Thiocarbamoyl-urea).

STRUCTURE

$NH_2CSNHCSNH_2$

USE/OCCURRENCES

Use as plasticizer, rubber, accelerator, intermeidate in resin manufacturing.

HEALTH EFFECTS

1) High toxicity via oral route

TOXICITY DATA

1) Oral LD50 in rat = 5 mg/kg
2) Intraperitoneal LDLo in rat = 80 mg/kg

TLV/TWA = N.A.

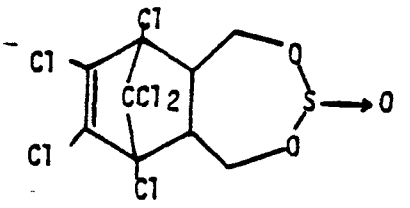
ENDOSULFAN

SYNONYM

hexachlorohexahydromethano -
2,4,3-benzdioxathiepin 3-oxide

Thiodan

STRUCTURE



USE/OCCURRENCE

Broad spectrum insecticide of the organo-chlorocyclodiene group, an acaricite; on USEPA restricted list.

HEALTH EFFECTS

1) Slowly and incompletely absorbed from the mammalian tract in the undiluted form; absorption increased when dissolved in (cottonseed) oil.

2) At high levels of exposure, see CNS toxicity: Endosulfan is a convulsant and causes fainting, tremors, mental confusion irritability, difficulty in urination, loss of memory, and impairment of visual-motor coordination.

3) High levels seen in liver and kidney after poisoning (human).

4) Chronic effects are manifested in CNS disorders.

5) Chronic exposures in experimental studies have resulted in kidney damage, parathyroid hyperplasia (overgrowth), testicular atrophy, and lowered survival rates.

6) A nonspecific inducer of drug metabolizing enzymes.

7) Has been reported to be an experimental teratogen and neoplastic agent.

8) Does not accumulate significantly in human tissue.

9) See DIELDRIN listing:

ENDOSULFAN (CONT.)

TOXICITY DATA

1) Oral LD50 in rat = 18 mg/kg.

2) Dermal LD50 in rat = 74 mg/kg

3) Dermal LD50 in rabbit = 167 mg/kg

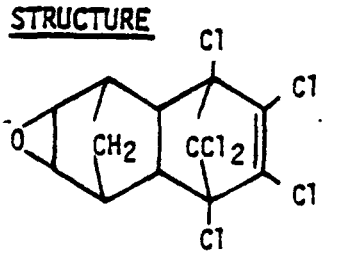
TLV TWA = 100 ug/m^3 (skin)

ENDRIN AND METABOLITES

SYNONYM

hexachloroepoxyoctahydro-endo, endo-dimethanonaphthalene

STRUCTURE



USE/OCCURRENCE

Broad spectrum pesticide of the polycychic chlorinated cyclodrine group; also see DIELDRIN and ALDRIN; use restricted by USEPA

HEALTH EFFECTS

1) Known to absorbed via the skin, lungs, and GI tract
2) Not significantly stored in human tissues; one of the least persistent chlorinated hydrocarbon pesticides
3) More toxic than other cyclodrine insecticides in both acute and chronic studies
4) Human poisoning have resulted in convulsions, vomiting, mental confusion, abdominal pain, nausea, dizziness, muscle twitching, and headache; such symptoms have resulted from exposure to doses as low as 0.2 mg/kg body weight; death may result as a consequence of respiratory failure (see next page)

TOXICITY DATA

1) Oral LD50 in rat = 3 mg/kg
2) Dermal LD50 in rat = 12 mg/kg
3) Oral LD50 in rabbit = 7 mg/kg
4) Dermal LD50 in rabbit = 60 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin)

ENDRIN (CONT.)

HEALTH EFFECTS - cont'd

5) In experimental studies, chronic exposures have resulted in CNS toxicity, convulsions, lung, liver, kidney, and heart changes

6) An experimental teratogen which also has caused other reproductive effects

EPICHLOROHYDRIN

SYNONYM

1-chloro-2,3-epoxy propane

STRUCTURE

USE/OCCURRENCE

Chemical intermediate for glycerol, glycidol derivatives, epoxy resins, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQUID and POISON
3) Absorption via oral, respiratory and dermal routes
4) Highly irritating to eyes, skin and respiratory tract
5) Can see delayed skin blistering
6) Occasionally can see allergic eczematous contact dermatitis
7) Intoxication can lead to GI distress, labored breathing, cyanosis, with possible chemical pneumonitis several hours post exposure
8) Can produce temporary sterility
9) In chronic poisoning, there is kidney damage
10) One epidermiologic study of exposed workers showed some increased incidence of leukemia and respiratory tract cancers
11) When heated to decomposition, emits phosgene
12) An experimental mutagen

TOXICITY DATA

1) Inhalation TCLo in human causing eye effects = 20 ppm
2) Oral LD50 in rat = 90 mg/kg
3) Dermal LD50 in rabbit = 515 mg/kg
4) 23 mg is an irritating dose in rabbit eye
5) 10 mg for 24 hours is an irritating dose on rabbit skin

TLV/TWA = 10 mg/m^3 (skin)

ETHYL CARBAMATE

SYNONYM

urethane

carbamic acid, ethylester

STRUCTURE

$NH_2COOC_2H_5$

USE/OCCURRENCE :

Solvent, chemical intermediate in resin production: monomer in polyurethane production

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen, neoplastic agent, and teratogen
3) Causes depression of bone marrow and occasionally focal degeneration in the brain: can also produce CNS depression, nausea, and vomiting
4) Emits toxic fumes when heated

TOXICITY DATA

1) Oral LD50 in mouse = 2500 mg/kg
2) Intraperitoneal LD50 in rat = 1500 mg/kg

TLV/TWA = N.A.

ETHYL CYANIDE

SYNONYM

propionitrile

STRUCTURE

$CH_3\ CH_2\ C{\equiv}N$

USE/OCCURRENCE

HEALTH EFFECTS

1) Route of Entry: Oral, inhalation, and dermal
2) SEE CYANIDE listing

TOXICITY DATA

1) Oral LD50 in rat = 39 mg/kg
2) Dermal LD50 in rabbit = 210 mg/kg
3) Inhalation LCLo in rat = 500 ppm for 4 hours

TLV/TWA = N.A.

ETHYLENEBISDITHIOCARBAMATES (EBDC)

SYNONYM

Nabam (disodium salt)
Maneb
Zineb

STRUCTURE

$C_4H_6N_2S_4 \cdot 2Na$ (Nabam)
$C_4H_6N_2S_4 \cdot Mn$ (Maneb)
$C_4H_6N_2S_4 \cdot Zn$ (Zineb)

USE/OCCURRENCE

Carbamate pesticides

HEALTH EFFECTS

1) Both the zinc and maganese derivatives are suspected animal carcinogens (IARC) and have been reported to be experimental teratogens
2) Cholinesterase inhibitors
3) Symptoms of carbamate pesticide poisoning may include blurred vision, nausea, blood pressure changes, vomiting and profuse sweating

TOXICITY DATA

1) Oral LD50 in rat = 395 mg/kg (disodium ethylenebis(Nabam dithiocarbamate)
2) Oral LD50 in rat = 4500 mg/kg (manganese ethylenebis(dithiocarbamate), maneb)
3) Oral LD50 in rat = 5200 mg/kg (zinc ethylene bisdithiocarbamate, zineb)

TLV/TWA = N.A.

ETHYLENE DICHLORIDE

See: 1,2-DICHLOROETHANE listing

ETHYLENEIMINE

SYNONYM

dimethylenimine
azacyclopropane

STRUCTURE

USE/OCCURRENCE

Manufacture of triethylenemilamine; used in organic synthesesis, a fumigant base, etc.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Irritating to eyes, mucous membranes
3) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 15 mg/kg
2) Inhalation LCLo in rat = 25 mg/kg
3) Intraperitoneal LD50 in rat = 3800 ug/kg
4) Dermal LD50 in guinea pig = 14 mg/kg
5) 2 mg is a severe eye irritant in rabbit
6) 10 mg for 24 hours is a skin irritant in rabbit

TLV/TWA = 1 mg/m^3 (skin)

ETHYLENE DIAMINE

SYNONYM

1,2-Diaminoethane

STRUCTURE

$H_2N\ CH_2\ CH_2\ WH_2$

USE/OCCURRENCE

Solvent, an emulsifier for casein, chemical intermediate, and insecticides and resins, etc.

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same label requirements
2) Entry Route: by Inhalation or vapors and percutaneous absorption
3) May cause irritation of the nose and tingling of the face
4) Animals exposed to high concentration suffered irritation of the eye and corneal damage; and damage to liver, lungs and kidneys

TOXICITY DATA

1) Inhalation TCLo in human resulting in irritation effects = 200 ppm
2) Inhalation LC50 in rat = 4000 ppm/8H
3) Dermal LC50 in rabbit = 730 mg/kg
4) 675 ug is a severe eye irritant in rabbit
5) 10 mg for 24 hours is a severe skin irritant in rabbit

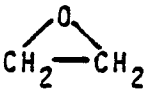
TLV/TWA = 25 mg/m^3

ETHYLENE OXIDE

SYNONYM

1,2-Epoxyethane
dimethylene
oxirane

STRUCTURE



USE/OCCURRENCE

As an intermediate in organic synthesis, fumigant for food stuffs, textiles, an agricultural fungicide, a sterilization agent for surgical instruments

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label requirement
2) Entry Route: Inhalation of gas
3) Irritant of moist skin, and eyes
4) Acute exposure may result in frostbite
5) An experimental teratogen, mutagen, and neoplastic agent

TOXICITY DATA

1) Inhalation TCLo in human producing irritant effects = 12,500 ppm for 10 seconds
2) A 1% solution for 7 seconds is a skin irritant in human
3) Oral LD50 in rat = 72 mg/kg
4) Inhalation LC50 in rat = 1462 ppm/4 hours
5) Inhalation LC50 in mouse = 836 ppm/4 hours
6) Intraveous LDLo in rabbit = 175 mg/kg
7) Oral LD50 in Guinea pig = 270 mg/kg

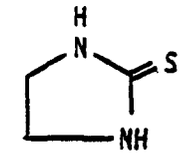
TLV/TWA = 90 mg/m^3

ETHYLENE THIO UREA

SYNONYM

2-Imidazolidinethione
1,3-Ethylene-e-Thio.

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental teratogen

TOXICITY DATA

1) Oral LD50 in rat = 1832 mg/kg

TLV/TWA = N.A.

ETHYL METHANESULFONATE

SYNONYM

methanesulfonic acid, ethyl ester
EMS

STRUCTURE

CH_3SO_2-O-CH_2CH_3

USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Experimental mutagen and teratogen

TOXICITY DATA

1) Intraperitoneal LDLo in mouse = 200 mg/kg

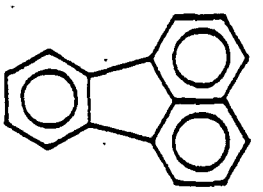
TLV/TWA = N.A.

FLUORANTHENE

SYNONYM

benzo(jk)fluorene

STRUCTURE



USE/OCCURRENCE

See TARS listing;
A polycyclic aromatic hydrocarbon found in air pollution studies;
ubiquitous in the environment

HEALTH EFFECTS

1) A possible animal neoplastic or cocarcinogenic agent
2) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 2000 mg/kg
2) Dermal LD50 in rabbit = 3180 mg/kg

TLV/TWA = N.A.

FLUORINE

SYNONYM	STRUCTURE
none	F_2

USE/OCCURRENCE :

Used in the conversion of uranium tetrafluoride to uranium hexafluoride, in the synthesis of organic and inorganic fluorine compounds, and as an oxidizer in rocket fuel; pesticide use of sodium fluoride restricted by USEPA

HEALTH EFFECTS

1) NONFLAMMABLE GAS (DOT); the DOT label is POISON and OXIDIZER
2) Primary irritant of skin, eyes, mucous membranes, and lungs; thermal or chemical burns may result from contact
3) Nosebleeds and sinus trouble may result from low level exposures in air, higher concentrations may lead to bronchospasms, laryngospasms, pulmonary edema, and possible GI symptoms
4) 25 ppm exposure level has led to sore throat, chest pain, irreparable lung damage and death

TOXICITY DATA

1) Inhalation LC50 in rat = 185 ppm for 1 hour
2) Inhalation LC50 in rabbit = 270 ppm for 30 minutes
3) 25 ppm for 5 minutes is a mild eye irritant in human

TLV/TWA = 2 mg/m^3

2-FLUOROACETAMIDE

SYNONYM

Compound 1081

STRUCTURE

$F-CH_2-CO-NH_2$

USE/OCCURRENCE

Rodenticide; use restricted by USEPA

HEALTH EFFECTS

1) Highly toxic via oral route

TOXICITY DATA

1) Oral LD50 in rat = 5750 µg/kg
2) Dermal LD50 in rat = 80 mg/kg
3) Oral LD50 in mouse = 31 mg/kg
4) LD50 in mammal (unknown route) = 4 mg/kg

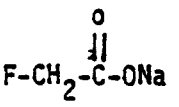
TLV/TWA = N.A.

FLUOROACETIC ACID, SODIUM SALT

SYNONYM

Compound 1080
sodium fluoroacetate

STRUCTURE



USE/OCCURRENCE

Rodenticide

HEALTH EFFECTS

1) A highly toxic poison which causes CNS stimulation (convulsions) and cardiac arrhythmias: dangerous dose for man = 0.5-2 mg/kg
2) Rapidly absorbed via the GI tract, but only slowly through uncut skin
3) Early symptoms of poisoning includes nausea and mental apprehension, followed by convulsions, heart irregularities, and death

TOXICITY DATA

1) Oral LDLo in human = 714 ug/kg
2) Oral LD50 in rat = 220 ug/kg
3) Oral LD50 in mouse = 4 mg/kg

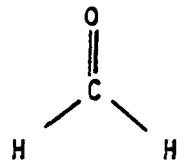
TLV/TWA = 0.05 mg/m^3

FORMALDEHYDE

SYNONYM

formalin
methylene oxide

STRUCTURE



USE/OCCURRENCE

Fungicide, embalming fluid, chemical intermediate, etc.; released from home insulation resins; found in photo chemical smog, in incineration and combustion processes

HEALTH EFFECTS

1) COMBUSTIBLE LIQUID (DOT); no label requirement
2) Readily ab orbed via the lungs and GI tract, may also enter the body via skin and eyes
3) A primary irritant, 4-5 ppm concentrations are intolerable to most people
4) Gas may cause severe irritation of the mucous membranes of the respiratory tract and eyes
5) Inhalation exposures may result in uticaria (hives)
6) Formalin solution exposures may lead to eye burns, and cause severe irritation of the mouth, throat, and stomach after ingestion
7) An experimental carcinogen and mutagen
8) Bioaccumulation unlikely; it is very reactive

TOXICITY DATA

1) Oral LDLo in woman = 36 mg/kg
2) Inahlation TDLo in man producing an irritant effect = 17 mg/m^3 for 30 minutes
3) LDLo in man = 477 mg/kg (unknown route)
4) Oral LD50 in rat = 800 mg/kg
5) Dermal LD50 in rabbit = 270 mg/kg
6) 4 ppm for 5 minutes is an irritating does in human eye
7) 750 ug is a severe eye irritant dose in rabbit
8) 540 mg is a mild skin irritant (open) in rabbit

TLV/TWA = 3 mg/m^3

FORMIC ACID

SYNONYM

methanoic acid
hydrogen carboxylic acid
formylic acid

STRUCTURE

USE/OCCURRENCE

A strong reducing agent, a decalcifier; used in wool dyeing, electroplating, leather operations; a chemical intermediate, etc.; occurs naturally in stinging insects, plants, and in some foods; has been reported to migrate into foods from packaging materials

HEALTH EFFECTS

1) CORROSIVE MATERIAL (DOT); the DOT label is CORROSIVE
2) Absorbed via ingestion, inhalation, and via the skin
3) A severe irritant of the skin, eyes, and mucous membranes: exposure may result in lacrimation, increased nasal discharge, cough, throat discomfort, erythema (skin redness) and blistering
4) Ingestion of formic acid has led to severe poisoning and deaths: symptoms may include salivation, vomiting, burning sensation in the mouth, bloody vomiting, diarrhea, pain, shock, breathing difficulties, kidney failure, circulatory collapse, and secondary ischemic lesions in the liver and heart.
5) Chronic exposures have been reported to result in albuminuria and hematuria

TOXICITY DATA

1) Oral LD50 in rat = 1210 mg/kg
2) Oral LD50 in mouse = 1100 mg/kg
3) Oral LD50 in dog = 4000 mg/kg
4) 122 mg is a severe eye irritant dose in rabbit
5) 610 mg is a mild skin (open) irritant dose in rabbit

TLV/TWA = 9 mg/m^3

GLYCIDYLALDEHYDE

SYNONYM

STRUCTURE

$C_4H_6O_2$

USE/OCCURRENCE

HEALTH EFFECTS

1) A strong irritant of skin, eyes, and mucous membranes
2) Large doses have resulted in convulsions in experimental animals
3) Chronic injections have led to bone marrow depression in experimental studies

TOXICITY DATA

TLV/TWA = N.A.

HALOMETHANE, N.O.S.

SYNONYM

various

STRUCTURE

various

USE/OCCURRENCE

Chlorinated-, brominated-, and flourainated-methans have be used as fumigants, solvents, regrigeiants, and in fire extinguishers

HEALTH EFFECTS

1) See listings for individual halomethanes
2) Acute toxicity results in CNS depression and liver damage with the fluorohalomethanes
3) Several halomethanes have been shown to be mutagenic in the Ames assay.
4) Epidemiologic studies have shown some type of association between trihalomethane levels in drinking water and increased cancer rates

TOXICITY DATA

See individual listings

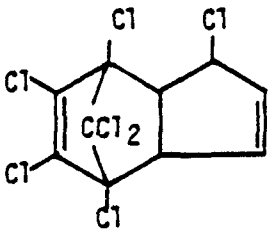
TLV/TWA = See individual listings

HEPTACHLOR

SYNONYM

heptachlorotetrahydro-
4,7-methanoindene

STRUCTURE



USE/OCCURRENCE

A chlorinated hydrocarbon insecticide; persists in the environment; use restricted by USEPA

HEALTH EFFECTS

1) CARCINOGEMC (CAG)
2) Readily absorbed from the GI tract
3) Chlorinated hydrocarbon insecticide act on the CNS causing dizziness, nausea, vomiting, which can progress to severe irritability, convulsive seizures, coma, or death
4) Acute exposure causes liver damage, while chronic doses in exp. animal have also lead to liver damage.
5) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 40 mg/kg
2) Dermal LD50 in rabbit = 2000 mg/kg
3) Dermal LD50 in rat = 119 mg/kg
4) Oral LD50 in mouse = 68 mg/kg

TLV/TWA = 0.5 mg/m^3

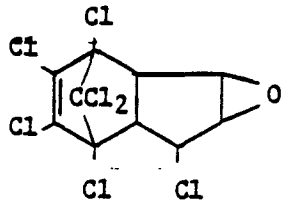
HEPTACHLOR EPOXIDE

SYNONYM

hiptachlor expoxide

STRUCTURE

d-B-, and r-isomers of heptachlor epoxide



USE/OCCURRENCE

The principal metabolite of heptachlor in micro-organisms, soil, plants, animals, and probably man

HEALTH EFFECTS

1) Readily absorbed via the G.I. tract
2) More acutety toxic than heptachlor
3) An experimental mutagen and carcinogen
4) Relatively persistant in the environment and will bioconcentrate
5) See HEPTACHLOR listing

TOXICITY DATA

1) Oral LD50 in rat = 62 mg/kg
2) Oral LDLo in mouse = 40 mg/kg

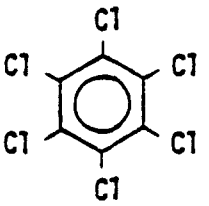
TLV/TWA = 0.5 mg/m^3 (as heptachlor)

HEXACHLOROBENZENE

SYNONYM

perchlorobenzene

STRUCTURE



USE/OCCURRENCE

Fungicide, plasticizer for PCV, flame retardant; a waste by-product of chlorinated hydrocarbon production; released into the atmosphere by various industrial facilities and waste dumps; degraded in the environment very slowly

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Readily absorbed in the presence of lipid material
3) Human poisonings (via ingestion of treated wheat) have resulted in toxic porphyria cutanea tarda (metabolism disturbances) showing skin symptoms of photo sensitivity, deep scarring, bulbae formation, permanent loss of hair, and skin atrophy
4) Chronic exposure can lead to hepatic and spleen damage
5) Experimental teratogen; can pass the palcental barrier and produce toxic or lethal effects on the fetus
6) Stored for long periods of time in adipose tissue

TOXICITY DATA

1) LDLo in man = 220 mg/kg (unknown route of adminstration)
2) Oral LD50 in rat = 10,000 mg/kg

TLV/TWA = N.A.

HEXACHLOROBUTADIENE

SYNONYM

HCBD

STRUCTURE

$Cl_2{=}CClCCl{=}CCl_2$

USE/OCCURRENCE

Organic solvent and chemical interim; a significant by-product in the manufacture of chlorinated hydrocarbons; appears to rapidly absorb to soils

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Toxic via oral and inhalation routes
3) Target organ during chronic exposure is the kidney
4) Experimental teratogen

TOXICITY DATA

1) Oral LD50 in rat = 90 mg/kg
2) Dermal LD50 in rabbit = 1211 mg/kg
3) 162 mg a mild irritating does in rabbit eye
4) 810 mg for 24 hours a moderately irritating dose on rabbit skin

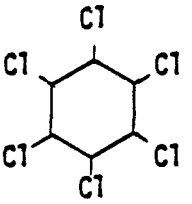
TLV/TWA = N.A.

HEXACHLOROCYCLOHEXANE

SYNONYM

HCH
benzene hexachloride (BHC)
lindane (gamma-isomer)

STRUCTURE



USE/OCCURRENCE

Broad spectrum organochlorine insecticide, a mixture of 5 configurational isomers no longer used in the United States, however, imported lindane (gamma isomer) is used in a wide range of insecticide applications, lindane use in vaporizers has been cancelled by USEPA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Unusually soluble in water, absorbed via oral and dermal routes
3) Lindane is the most acutely toxic isomer of HCH
4) HCH is a convulsant
5) Occupational exposure to technical grade HCH has produced headache, vertigo, and irritation of the skin, eyes, and respiratory tract mucosa, with reported effects on carbohydrate and lipid metabolism
6) Chronic occupational exposure to HCH has been reported to result in toxic hepatitis
7) Lindane exposures have resulted in CNS irritation, nausea, vomiting, spasms, weak respiration with cyanosis and blood dyscrasia

TOXICITY DATA

1) Oral LD50 in rat = 100 mg/kg
2) Dermal LD50 in rat = 900 mg/kg
3) Oral LD50 in rat = 177 mg/kg (alpha-lindane)
4) Oral LD50 in rat = 6000 mg/kg (beta-lindane)
5) Oral LD50 in rat = 1000 mg/kg (delta-lindane)
6) Oral LD50 in rat = 76 mg/kg (lindane)
7) Oral LDLo in child = 180 mg/kg (lindane)

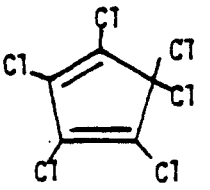
TLV/TWA = 0.5 mg/m^3 (lindane)

HEXACHLOROCYCLOPENTADIENE

SYNONYM

HEX

STRUCTURE



USE/OCCURRENCE

Chemical interim in the production of flame retardants and chlorinated pesticides; polymerizes at low termperatures between 20-200 C

HEALTH EFFECTS

1) Toxic via oral and dermal routes
2) Chronic exposures in animal studies have resulted in damage to liver, kidneys, adrenal glands, brain, and skin
3) Effects of human exposure may include eye and mucous membrance irritation, lacrimation, salivation, skin blistering, pulmonary edema, nausea, diarrhea, etc.

TOXICITY DATA

1) Oral LD50 in rat = 113 mg/kg
2) Dermal LD50 in rabbit = 430 mg/kg
3) 100 mg for 5 minutes is a severe irritant to rabbit eye
4) 500 mg for 4 hours is a severe irritant to rabbit skin
5) 10 mg is a severe irritant to monkey skin

TLV/TWA = 0.1 mg/m^3

HEXACHLOROETHANE

SYNONYM

carbon hexachloride

STRUCTURE

Cl_3CCCl_3

USE/OCCURRENCE

Solvent, cleaning and degreasing agent, chem. interm.

HEALTH EFFECTS

1) A POSITIVE ANIMAL CARCINOGEN (NCI)
2) May see CNS depression as well as liver, kidney, and heart degeneration as a result of exposure
3) A liver toxicant

TOXICITY DATA

1) Oral LD50 in rat = 6000 mg/kg

TLV/TWA = 10 mg/m^3 (skin)

1,2,3,4,10,10-HEXACHLORO-1,4,4A,5,3,8,8A-HEXAHYDRO-1,4:5,3-ENDO,ENDODIMETHANONAPHTHALENE

SYNONYM

Compound 711
Isodrin

STRUCTURE

$C_{12}H_8Cl_6$

USE/OCCURRENCE

An isomer of aldrin no longer manufactured

HEALTH EFFECTS

1) Experimental studies using this class of compounds have resulted in liver injury and acne-like rashes
2) See ALDRIN listing
3) Highly toxic via oral and dermal routes

TOXICITY DATA

1) Oral LD50 in rat = 7 mg/kg
2) Dermal LD50 in rat = 23 mg/kg
3) Oral LD50 in mouse = 8800 µg/kg
4) LD50 in mammal (unknown route) = 7 mg/kg

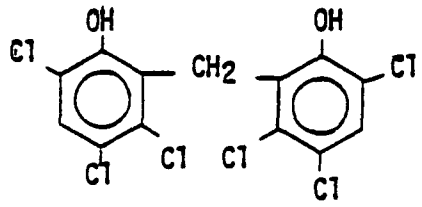
TLV/TWA = N.A.

HEXACHLOROPHENE

SYNONYM

2,2'-emthylenebis 3,4,6-trichlorophenol)
Phisohex

STRUCTURE



USE/OCCURRENCE

Topical anti-infective agent for humans, disinfectant for hospital equipment, broad-spectrum soil fumigant, veterinary anti-helminthic, ingredient in germicidal soaps.

HEALTH EFFECTS

1) Absorbed via dermal and oral routes
2) Chronic exposures in humans have resulted in CNS effects including diplopia (double vision), irritability, weakness of lower extremeties and convulsions
3) In experimental studies has been shown to induce reproductive changes
4) An experimental teratogen: the compound crosses the placenta

TOXICITY DATA

1) Oral LD50 in rat = 60 mg/kg
2) Oral LDLo in child = 250 mg/kg
3) Oral TDLo in woman resulting in CNS effects = 600 mg/kg
4) 50 mg for 24 hours is a mild skin irritant in rabbit
5) 3 mg for 3 days (intermittant dosing) is a mild skin irritant in human
6) 1250 mg for 24 hours is a mild skin irritant in rabbit

TLV/TWA = N.A.

HEXACHLOROPROPENE

SYNONYM

hexachloropropylene

STRUCTURE

C_3Cl_6

USE/OCCURRENCE

HEALTH EFFECTS

1) A powerful irritant
2) High toxicity via inhalation route

TOXICITY DATA

1) Inhalation LC50 in rat = 425 ppm for 30 minutes
2) Intraperitoneal LD50 in rat = 400 mg/kg
3) Inhalation LC50 in mouse = 300 ppm for 30 minutes
4) Inhalation LCLo in rabbit = 85 ppm for 30 minutes

TLV/TWA = N.A.

HEXAETHYL TETRAPHOSPHATE

SYNONYM

Ethyl tetraphosphate
HETP

STRUCTURE

$(C_2H_5O)_6P_4O_7$

USE/OCCURRENCE

Pesticide mixture of ethyl polyphosphates containing 12-20% tetraethyl pyrophosphate which is the active ingredient; see TETRAETHYL PYROPHOSPHATE listing

HEALTH EFFECTS

1) POISON B(DOT); the DOT label is POISON
2) Absorbed rapidly through the skin of warm blooded animals.

TOXICITY DATA

1) Oral LD50 in rat = 7 mg/kg
2) Dermal LDLo in rat = 2500 ug/kg
3) Oral LD50 in rabbit = 21 mg/kg
4) Intravenous LD50 in rabbit = 690 ug/kg

TLV/TWA = N.A.

HYDRAZINE

SYNONYM

Hydrazine anhydrous

STRUCTURE

H_2NHH_2

USE/OCCURRENCE

Use as liquid rocket fuels, and reducing agent.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) May see absorption via inhalation and percutaneous routes
3) Highly irritating to the eyes, skin and upper respiratory tract.
4) May see a caustic action on skin and mucous membranes
5) Exposures may result in liver and blood effects.

TOXICITY DATA

1) Inhalation LC50 in rat = 570 ppm/4 hours
2) Intraperitoneal LD50 in rat = 76 mg/kg
3) Dermal LD50 in rabbit = 91 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (suspected human carcinogen)

HYDROCYANIC ACID

See CYANIDE (HYDROGEN) listing

HYDROFLUORIC ACID

SYNONYM	STRUCTURE
hydrogen fluoride	HF

USE/OCCURRENCE

Starting material for production of fluorine compounds, a catalyst, pesticide, fluorination process component; a solution of hydrogen fluoride gas in water; a common air contaminant

HEALTH EFFECTS

1) CORROSIVE MATERIAL (DOT); the DOT label is CORROSIVE
2) A primary irritant of the skin, eyes, mucous membranes, and lungs: exposure may result in slow healing chemical burns, nosebleeds, sinus trouble, and systemic effects of fluoride poisoning after fluoride absorption via the skin
3) Acute inhalation exposure may produce bronchospasm, laryngospasm, and pulmonary edema: brief exposure to 25 ppm has been reported to cause sore throat, chest pain, irreparable lung damage, and death
4) Ingestion of toxic quantities may result in nausea, vomiting, diffuse abdominal cramps, diarrhea, CNS effects, muscle twitching, convulsions, and coma
5) Prolonged (chronic) absorption will result in deposition of fluorine in bone (osteosclerosis) which can be visualized by x-ray
6) When heated, emits highly corrosive fumes of fluorides; will react with water or steam to produce toxic and corrosive fumes

TOXICITY DATA

1) Inhalation TDLo in man producing an irritant effect = 110 ppm for 1 minute
2) Inhalation LCLo in human = 50 ppm for 30 minutes
3) Inhalation LC50 in rat = 1276 ppm for 1 hour
4) Inhalation LC50 in monkey = 1774 ppm for 1 hour
5) Inhalation LC50 in mouse = 456 ppm for 1 hour
6) Intraperitoneal LDLo in rat = 25 mg/kg

TLV/TWA = 2.5 mg/m^3 (hydrogen fluoride, as F)

HYDROGEN SULFIDE

SYNONYM

Hydrosulfuric Acid
Sulfuretted hydrogen
Stink damp

STRUCTURE

H_2S

USE/OCCURRENCE

Used in sulfuric acid and chemical production; occurs in most petroleum and natural gas deposits; liberated in coking operations or in the production of manufactured gases from coal.

HEALTH EFFECTS

1) FLAMMABLE GAS (DOT); the DOT label is FLAMMABLE GAS AND POISON.

2) Route of entry: Inhalation.

3) Very toxic; can cause death at concentration of 800–1,000 ppm in 30 minutes.

4) Low concentrations (50-200 ppm) result in local tissue irritation, especially inthe eye ("gas eye")

5) Greater exposures may result in cough, dyspnea, and possible pulmonary edema.

6) Chronic poisoning results in headache, inflammation of the conjunctiva and eyes, loss of weight and digestive disturbances.

7) At concentrations of 150 ppm, the olfactory nerve is paralyzed and the presence of the gas is no longer sensed.

8) Recovery from acute poisoning may show irreversible damage to certain cells of the body due to prolonged oxygen starvation.

TOXICITY DATA

1) Inhalation LCLo in human = 600 ppm/30 minutes

2) Inhalation LC50 in rat = 444 ppm

TLV/TWA = 14 mg/m^3

HYDROQUINONE

SYNONYM

quinol
1,4-benzenediol
hydroquinol

STRUCTURE

USE/OCCURRENCE

Reducing agent, photographic developer, antioxidant, stabilizer, etc.; cocklebur weed contains high concentrations of hydroquinone

HEALTH EFFECTS

1) A liver toxicant
2) Oxidation of hydroquinone may produce quinone vapor which is highly irritating
3) The dust is a mild primary irritant which may cause dermatitis, may also lead to eye staining, corneal opacity, and loss of visual acuity after prolonged exposures to concentrations not high enough to produce systemic effects
4) Oral ingestion of 1 gram may result in blurred speech, tinnitus (ringing in the ears), tremors, a sense of suffocation, vomiting, muscular twitching, headache, convulsions, dyspnea, cyanosis (methemoglobinemia), dark-colored urine, coma, and collapse from respiratory failure: death has been reported to have resulted after ingestion of 5 grams of hydroquinone
5) An active allergen
6) No systemic symptoms have been reported following inhalation of hydroquinone dust
7) More toxic than phenol, inhalation of vapor, especially at high temperature, must be avoided

TOXICITY DATA

1) Oral LDLo in human = 29 mg/kg
2) Oral LD50 in rat = 320 mg/kg
3) Oral LD50 in mouse = 400 mg/kg
4) Oral LD50 in dog = 200 mg/kg
5) Intravenous LD50 in rat = 115 mg/kg

TLV/TWA = 2 mg/m^3

INDENO(1,2,3-CD)PYRENE

SYNONYM

2,3-phenylenepyrene

STRUCTURE

USE/OCCURRENCE

A PAH formed from incomplete combustion of organic material; ubiquitious in the environment

HEALTH EFFECTS

1) CARCINOGOGENIC (CAG)
2) A weak carcinogen, but a positive animal carcinogen and experimental mutagen
3) Little likelihood of bioaccumulation due to chronic exposures

TOXICITY DATA

TLV/THA = N.A.

IODOMETHANE

SYNONYM	STRUCTURE
methyl iodide	CH_3I

USE/OCCURRENCE

As imbedding material for examining diatoms, and in testing for pyridine; used in methylations

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) May cause severe narcosis and lung irritation following acute exposures
3) An experimental mutagen
4) Vesicant (blistering) burns may result following extended skin contact

TOXICITY DATA

1) Oral LDLo in rat = 150 ug/kg
2) Inhalation LCLo in rat = 3790 ppm for 15 minutes
3) Dermal LDLo in rat = 800 mg/kg
4) Subcutaneous LD50 in mouse = 110 mg/kg
5) 1 gram for 10 minutes is a mild skin irritant in human
6) 1 gram for 30 minutes is a mild skin irritant in rat

TLV/TWA = 28 mg/m^3 (skin)

IRON DEXTRAN (COMPLEX)

SYNONYM

Imferon

STRUCTURE

the approximate
MW = 180,000

USE/OCCURRENCE

Parenteral iron preparation

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental carcinogen and neoplastic agent

TOXICITY DATA

1) Intraperitoneal LDLo in rat = 2500 mg(Fe)/kg
2) Intravenous LD50 in mouse = 1000 mg(Fe)/kg

TLV/TWA = N.A.

ISOBUTANOL

SYNONYM

isobutylalcohol

STRUCTURE

$(CH_3)_2CHCH_2OH$

USE/OCCURRENCE

Solvent, chemical interim

HEALTH EFFECTS

1) An experimental carcinogen
2) Acute human exposure can result in narcotic effects, eye and throat irritation, and loss of appetite.

TOXICITY DATA

1) Oral LD50 in rat = 2460 mg/kg
2) Dermal LD50 in rabbit = 4240 mg/kg
3) 2 mg is a severe ittitant in rabbit
4) 500 mg for 24 hours is a moderate dermal irritant in rabbit

TLV/TWA = 150 mg/m^3

ISOCYANIC ACID, METHYL ESTER

SYNONYM

Methyl Isocyanate

STRUCTURE

CH_3NCO

USE/OCCURRENCE

HEALTH EFFECTS

1) Highly irritating to skin, eyes, and mucous membranes: absorbed via the skin
2) Exposure may result in pulmonary edema

TOXICITY DATA

1) Inhalation TCLo in human producing an irritant effect = 2ppm
2) Oral LD50 in rat = 71mg/kg
3) Inhalation LC50 in rat = 5ppm/4 hours
4) Dermal LD50 in rabbit = 220 mg/kg

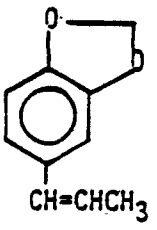
TLV/TWA = 0.05 mg/m^3(skin)

ISOSAFROLE

SYNONYM

1,2-(methylenedioxy)-4-propenylbenzene

STRUCTURE



USE/OCCURRENCE

Manuf. heliotropin, to modify oriental perfumes, to strengthen soap perfume

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

1) Oral LD50 in rat = 1340 mg/kg
2) Oral LD50 in mouse=2470 mg/kg
3) 500 mg for 24 hours is a moderate skin (closed) irritant in rabbit

TLV/TWA = N.A.

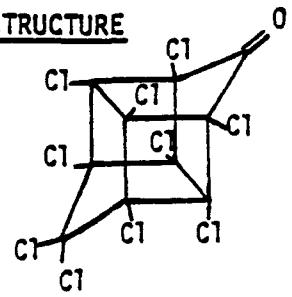
KEPONE

SYNONYM

decachloroctahydro-1,3,4-methano-2,4-cyclobuta(cd) pentalen-2-one

chlordecone

STRUCTURE



USE/OCCURRENCE

Organochlorine insecticide, 2000 times more soluble in water than mirex; environmentally persistant; all registered products containing kepone were effectively cancelled by May 1, 1978 (USEPA)

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (NCI)
2) Highly toxic to a variety of organisms
3) Bioconcentrates; stored in liver and fat tissues in humans and has been found in mother's milk
4) Toxic effects in humans may include weight loss, neurologic impairment, abnormal liver function, skin rash, reproductive failure, nervousness, tremor, opsoclonia, hepatomegaly, and abnormal sperm morphology

TOXICITY DATA

1) Oral LD50 in rat = 95 mg/kg
2) Dermal LD50 in rabbit = 345 mg/kg
3) Oral LD50 in rabbit = 65 mg/kg
4) Oral LD50 in dog = 250 mg/kg
5) LD50 in mammal = 126 mg/kg (Unkown route of administration)

TLV/TWA = N.A.

LASIOCARPINE

SYNONYM

Heliotridine ester with Lasiocarpum and Angelic acid

STRUCTURE

$C_{21}H_{33}NO_7$

USE/OCCURRENCE

An alkaloid isolated form *H. lasiocarpum*

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)

TOXICITY DATA

1) Oral LD50 in rat = 150 mg/kg

TLV/TWA = N.A.

LEAD, N.O.S.

See individual listings

LEAD ACETATE

SYNONYM

Lead (2+)salt
Acetic acid

STRUCTURE

$Pb(C_2H_3O_2)_2 \cdot 3H_2O$

USE/OCCURRENCE

Topical astringent, was used as a treatment of diarrhea and catorrhal inflammations; all due to the possibility of lead poisoning

HEALTH EFFECTS

1) Absorption may cause lead poisoning
2) An experimental mutagen and teratogen
3) See LEAD listing
4) Lead acetate produces less of an irritant effect than other metate salts

TOXICITY DATA

1) Intraperitonal LD50 in rat = 204 mg/kg
2) Intraperitonal LD50 in mouse = 120 mg/kg
3) Intravenous LDLo in rabbit = 50 mg/kg
4) Oral LDLo in dog = 300 mg/kg

TLV/TWA = N.A.

LEAD, INORGANIC

SYNONYM

STRUCTURE

Pb

USE/OCCURRENCE

Electroplating, metallurgy, construction materials, radiation protection devices, paints, etc.; stable in the environment due to its elemental nature

HEALTH EFFECTS

1) A suspected carcinogen of the lungs and kidney
2) Absorption via inhalation and ingestion
3) Once absorbed, lead tends to accumulate in the bone (90% of body builder), although lead concentrations have been found to be higher in aorta, liver, lidney, pancreas and lungs
4) Symptoms of acute lead poisoning may include thirst, a marked astringent effect, a metallic taste, nausea, milky vomiting (lead chloride), black stools (lead sulfide), and circulatory collapse, which is then followed days later by muscular weakness, acute hemolytic crisis, and kidney damage
5) Chronic lead poisoning is manifested by CNS effects (enciphalopathy, tremor, convulsions, intellectual deterioration, etc.), GI symptoms (especially colic and constipation), blood system changes (including decreased hemoglobin and red cell production), kidney damage, weakness of extensor nuscles (wrist or foot drop), skin pallor, loss of weight, and a gum lead line
6) Exposure has lead to miscarriages and still births among female workers in the lead industry and to sperm damage among male workers
7) An experimental teratogen

TOXICITY DATA

1) Oral LDLo in human producing CNS effects = 450 mg/kg for 6 years

TLV/TWA = 0.15 mg/m^3 (inorganic lead, fumes and dusts, as Pb)
0.15 mg/m^3 (lead arsenate, as Pb)
0.05 mg/m^3 (lead chromate, as Cr; suspected human carcinogen)

LEAD PHOSPHATE

SYNONYM

Lead (2+) salt(2,3) phosphoic acid

STRUCTURE

$Pb_3(PO_4)_2$

USE/OCCURRENCE

Stabililizer for plastics

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Poisonous
3) See LEAD listing

TOXICITY DATA

TLV/TWA = N.A.

LEAD SUBACETATE

SYNONYM

Bis(acetato)tetrahydoxytri
Lead

STRUCTURE

$Pb(C_2H_3O_2)_2$

USE/OCCURRENCE

In sugar analysis to remove coloring matters and decolorizing other solution of organic substances

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) See LEAD listing

TOXICITY DATA

TLV/TWA = N.A.

LEAD, TETRAETHYL

SYNONYM

TEL

STRUCTURE

$Pb\ (C_2H_5)_4$

USE/OCCURRENCE

Anti-knock additive in gasoline, a common air pollutant

HEALTH EFFECTS

1) POISON B(DOT); the DOT label is POISON
2) Alkyl lead can penetrate the skin without producing appreciable local injury
3) May be irritating to eyes, skin, and upper respiratory tract; mild intoxication causes headache, anxiety, insommia, and minor GI symptoms with a metallic taste in the mouth
4) The absorption of a sufficient quantity of TEL may cause acute intoxication of the CNS leading to encephalopathy (brain disease)
5) Decomposition via exposure to sunlight forms triethyl lead which also is poisonious
6) An experimental carcinogen

TOXICITY DATA

1) LDLo in man = 1470 ug/kg (unknown route)
2) Oral LDLo in rat = 17 mg/kg
3) Parenteral LD50 in rat = 15 mg/kg
4) Inhalation LC50 in rat = 850 mg/m^3 for 1 hour
5) Dermal LDLo in rabbit = 830 mg/kg

TLV/TWA = 0.100 mg/m^3 (skin)' (as Pb)

LEAD, TETRAMETHYL

SYNONYM

TML

STRUCTURE

$Pb(CH_3)_4$

USE/OCCURRENCE

Anti-knock additive in gasoline; an alkyl lead compound

HEALTH EFFECTS

1) An experimental carcinogen
2) Toxic via oral, dermal, and inhalation routes
3) Alkyl lead intoxication effects mainly the CNS resulting in anorexia (loss of appetite), vomiting, and diarrhea; acute poisoning may result in delirium, hallucinations, convulsions and coma
4) TML exposure in experimental animals has resulted in lethargy and coma
5) No cases of TML poisoning have been reported in humans

TOXICITY DATA

1) Oral LD50 in rat = 109 mg/kg
2) Dermal LDLo in rabbit = 3391 mg/kg

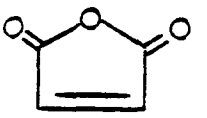
TLV/TWA = 0.150 mg/m^3 (skin) (as Pb)

MALEIC ANHYDRIDE

SYNONYM

2,5- furandione

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in production of certain resins, fumaric acid, and pesticides; a by-product of phthalic anhydride manufacture

HEALTH EFFECTS

1) A possible animal carcinogen
2) Highly irritating to skin, eyes, and mucous membranes
3) Exposures may result in burns to the eyes and skin, and an allergic reaction
4) Inhalation of vapors may cause pulmonary edema
5) Chronic exposure may lead to bronchitis and dermatitis
6) Not expected to bioconcentrate
7) Emits toxic fumes when heated

TOXICITY DATA

1) Oral LD50 in rat = 481 mg/kg
2) Dermal LD50 in rabbit = 2620 mg/kg
3) 1% solution is a severe eye irritant in rabbit

TLV/TWA = 1 mg/m^3

MALONONITRILE

SYNONYM

Cyanacetonitrile

methylene dicyanide

STRUCTURE

$CH_2(CN)_2$

USE/OCCURRENCE

As a lubricating oil additive, for thiamine synthesis, for pteridine-type anti-cancer agent synthesis; use in the treatment of various form of mental illness to stimulate protein and nucleic acid production in brain cells

HEALTH EFFECTS

1) Route of Entry: Inhalation (readily), and skin absorption
2) May cause headaches, vomiting, muscle spasms, could hands and feet, facial redness, numbness and tachycardia
3) Metabolic source of cyanide ion
4) When heated to decomposition, nitriles emit toxic fumes containing cyanides
5) See CYANIDE listing

TOXICITY DATA

1) Oral LD50 in rat = 61 mg/kg
2) Subcantaneous in rabbit LDLo = 6 mg/kg
3) 5 mg for 24 hours is a severe eye irritant in rabbit

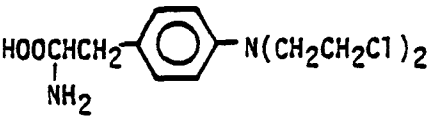
TLV/TWA = N.A.

MELPHALAN

SYNONYM

1) 3-(P-(Bis(2-chloroethyl) amino)phenyl) L-Alanine
2) Sarcolysine

STRUCTURE



USE/OCCURRENCE

Alkylating antineoplastic agent

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) POSITIVE ANIMAL CARCINOGEN (NCI)
3) May cause, nausea, vomiting and bone marrow depression
4) An experimental mutagen

TOXICITY DATA

1) Oral TDLo in man producing a carcinogenic effect = 67 mg/kg for 4.3 years (intermittant dosing)
2) Intraperitoneal LD50 in rat = 4484 ug/kg
3) Intraperitoneal LD50 in mouse = 4mg/kg

TLV/TWA = N.A.

MERCURY, N.O.S.

See MERCURY, ALKYL, AND MERCURY, NON-ALKYL, listings

MERCURY, ALKYL

SYNONYM

compounds of methylmercury, ethyl mercury, and methyl ethyl mercury

STRUCTURE

Various

USE/OCCURRENCE

Former uses as a seed treatment, wood preservative; disinfectant; all pesticide uses for mercury have been cancelled by USEPA for specific fumgicide applications; short chain alkyl mercury compounds can be formed from mercury in the environment by sediment bacteria

HEALTH EFFECTS

1) Very efficient absorption via oral and inhalation routes, possible dermal absorption as well; after absorption found in kidney, brain and blood
2) Alkyl similar to infantile cerebral palsy has been reported in infants born to methyl mercury poisoned mothers (Minamata episode)
3) Primary skin irritants, exposures may result in skin burns, dermatitis, and sensitazation
4) Principal target tissue is the CNS including the brain; chronic poisoning leads to progressive signs of degeneration with possible constriction of visual fields as well
5) Experimental teratogen and mutagen
6) Results from experimental studies have indicated that increased dietary selenium may decrease the toxicity of methyl mercury in birds and rats
7) When heated to decomposition; emits highly toxic fumes of mercury

TOXICITY DATA

TLV/TWA = 0.01 mg/m^3 (skin) (alkyl compounds, as Hg)

MERCURY, NON-ALKYL

SYNONYM

quicksilver
cinneban
etc.

STRUCTURE

Hg, HgS, $HgCl_2$, etc.

USE/OCCURRENCE

Catalyst, paint ingredient, in electrolytic cells, in the chlorine/alkali industry, etc.; released during possible fuel use; all pesticide uses for mercury have been cancelled by USEPA except for specific fungicide applications

HEALTH EFFECTS

1) Inorganic mercury salts and metallic mercury are not well absorbed from the GI tract
2) Efficient absorption via inhalation; exposure to 1.2-8.5 mg Hg/m^3 has resulted in acute poisoning in man
3) Acute exposure in experimental studies have resulted in severe hemorrhage of the kidneys, brain, heart colon, and lungs
4) Chronic exposures can produce a variety of CNS symptoms including sialorrhea (flow of salvia), increased irritability, muscular tumors, with possible gingivitis, kidney and GI tract disturbances
5) Acute or chronic exposures may lead to permanent damage of affected tissue
6) Absorbed mercury and ionic mercury concentrates in the kidneys which may lead to kidney dysfunction
7) A primary irritant of skin and mucous membranes: Ingestion of mercuric chloride leads to an ashen-grey appearance of the mouth
8) Acrodynia (pink disease) has resulted in children due to ingestion of mercury compounds in teething powders or paint
9) Mercury can be transferred to the fetus from an exposed mother: mercury chloride is an experimental teratogen
10) Bioconcentrates
11) Elemental mercury can be metabolized within the body to an oxidized form which is more reactive toward tissue ligands
12) When heated, emits highly toxic fumes

TOXICITY DATA

1) Inhalation TDLo in woman producing CNS effects= 150 mg/m^3 for 46 days
2) Inhalation LCLo in rabbit = 29 mg/m^3 for 30 hours

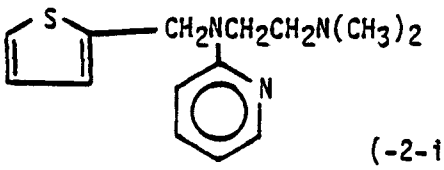
TLV/TWA = 0.05 mg/m^3 (all forms of mercury except alkyl, as Hg)

METHAPYRILENE

SYNONYM

Histadyl (-2-isomer)
Thenfadil (-3-isomer)

STRUCTURE



(-2-isomer)

USE/OCCURRENCE

antihistaminic drug with hypnotic side effects; a common ingredient in several nonprescription sleeping tablets, including Sleep-eze and Sominex (Histadyl)

HEALTH EFFECTS

1) Symptoms of sedation may include dizziness, dry mouth, fever, flushing, GI irritation, fixed dilated pupils, nervousness, increased heart rate, coma, tremors, and convulsions (Histadyl)

TOXICITY DATA

1) Subcutaneous LD50 in rat = 150 mg/kg (-2-isomer)
2) Oral LD50 in mouse = 182 mg/kg (-2-isomer)
3) Intraperitoneal LD50 in mouse = 77 mg/kg (-2-isomer)
4) Oral TDLo in human producing CNS effects = 50 mg/kg (-3-isomer)
5) Oral LD50 in rat = 525 mg/kg (-3-isomer)

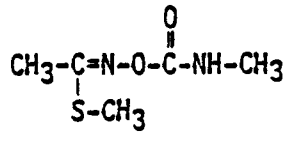
TLV/TWA = N.A.

METHOMYL

SYNONYM

S-methyl N-(methylcarbamoyloxy) thioacetimidate
Lannate
Nudrin

STRUCTURE



USE/OCCURRENCE

Carbamate insecticide - nematocide

HEALTH EFFECTS

1) Readily absorbed via inhalation or dermal exposure: almost completely eliminated from the body within 24 hours
2) Carbamate pesticides, such as methonyl, have chomergic properties similar to those of organic phosphates, but of shorter duration; inhibits RBC and plasma cholinestease activity for approximately 1-2 hours with recovery usually in 24-48 hours
3) Reported cases of human poisoning have listed symptoms of respiratory failure, miosis, myofbrillary twitching, increasein air way secretions, loss of consciousness, and reduced serum cholinesterase activity with complications of pulmonary edema, hepatitis, and polyneuritis
4) Chronic exposures during experimental studies have resulted in kidney, spleen, testis, and liver changes
5) A potential product of the reaction of methomyl with certain nitrogen compounds in the environment or in mammalian systems is nitrosomethomyl, which is a potent mutagen, carcinogen, and teratogen

TOXICITY DATA

1) Oral LD50 in rat = 17 mg/kg
2) Inhalation LC50 in rat = 77 ppm
3) Subcantaneous LDLo in rat = 9 mg/kg
4) Oral LD50 in mouse = 10 mg/kg

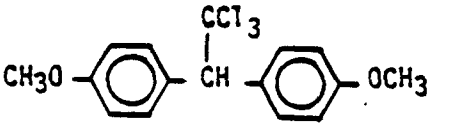
TLV/TWA = 2500 ug/m^3(skin)

METHOXYCHLOR

SYNONYM

2,2-bis(p-methoxyphenol)-1,1,1-trichloroethane

STRUCTURE



USE/OCCURRENCE

Ogano-chlorine insecticide

HEALTH EFFECTS

1) Slightly irritating
2) Not readily absorbed through the skin
3) May cause kidney damage if ingested over long period
4) An experimental teratogen
5) Much less acutely toxic than DDT and presents less of a hazard with respect to biomagnification and persistance in the environment
6) An estimated fatal oral dose (human) = 7.5 g/kg
7) See DDT listing

TOXICITY DATA

1) Oral LDLo in human = 6430 mg/kg
2) Dermal TDLo in human producing unspecified effects = 2414 mg/kg
3) Oral LD50 in rat = 5000 mg/kg
4) Oral LD50 in mouse = 1850 mg/kg

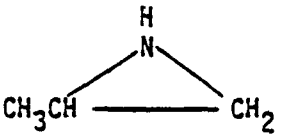
TLV/TWA = 10 mg m^3

2-METHYLAZIRIDINE

SYNONYM

Propylene imine,
1,2-Propylenimine

STRUCTURE



USE/OCCURRENCE

Chemical intermediate (base)

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) FLAMMABLE LIQUID (DOT); same label.
3) An experimental mutagen
4) High toxicity via dermal, inhalation, and oral routes
5) When heated to decomposition, emits toxic fumes of NOx

TOXICITY DATA

1) Oral LD 50 in rat = 19 mg/kg
2) Inhalation LCLo in rat = 500 ppm/4Hours
3) 250 ug is a severe eye irritant in rabbit

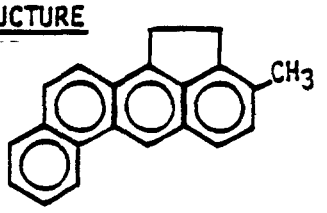
TLV/TWA = 5gm/m^3(skin)

3-METHYLCHLOANTHRENE

SYNONYM

1,2-Dihdro-3-methyl benz(j)acenanthrylene

STRUCTURE



USE/OCCURRENCE

A PAH: see Tars listing

HEALTH EFFECTS

1) A potent experimental carcinogen
2) Experimental mutagen and teratogen

TOXICITY DATA

1) Intraperitoneal LDLo in mouse = 100 mg/kh

TLV/TWA = N.A.

METHYL CHLORIDE

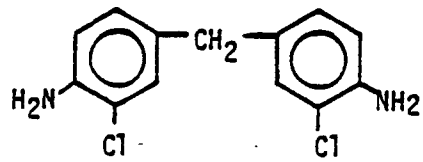
See CHLOROMETHANE listing

4,4'-METHYLENE-BIS-(2-CHLOROANILINE)

SYNONYM

1) Di(-4 amino-3-cholorphonyl)methane
2) 3,3'-Dichloro-4,4'-Diaminediphony methane

STRUCTURE



USE/OCCURRENCE

Used in the production of solid elastomeric parts, curing agent for epoxy resins. and cross-linked urethane forms in auto seats

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Route & Entry: Inhalation and percutaneous absorption
3) Experiment feeding and rat produced liver and lung cancer; no tumors were found in dogs
4) No tumors or other illness has been reported from acute exposure in man
5) An experimental mutagen

TOXICITY DATA

TLV/TWA = 0.02 ppm(skin) (Suspected Human Carcinogen)

METHYLENE CHLORIDE

See DICHLOROMETHANE listing

METHYL ETHYL KETONE

SYNONYM

butanone
MEK

STRUCTURE

$CH_3\overset{O}{\overset{\|}{C}}CH_2CH_3$

USE/OCCURRENCE

Solvent, chemical intermediate, paint remover, etc.

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same label
2) May see a dermatitis after repeated exposure
3) High vapor concentration may irritate the conjunctiva and mucous membranes of the eyes, nose and throat
4) At higher doses can see narcosis with nausea, light headness, and unconsciousness
5) Limited reports of loss of feeling in fingers and arms of exposed workers
6) Experimental teratogen

TOXICITY DATA

1) Oral LD50 in rat = 3400 mg/kg
2) Dermal LD50 in rabbit = 13 gm/kg
3) Inhalation TCLo in human causing irritant effects = 100 ppm for 5 minutes
4) 350 ppm is an irritant does to human eye
5) 80 mg is an irritant dose to human eye
6) 500 mg for 24 hours is a moderate irritant on rabbit skin

TLV/TWA = 590 mg/m^3

METHYL HYDRAZINE

SYNONYM

1) Hydrazomethane
2) Tmethyl Hydrazine

STRUCTURE

CH_3NHNH_2

USE/OCCURRENCE

Fuel base

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQUID and POISON
2) An experimental teratogen, mutagen, neoplastic agent, and carcinogen

TOXICITY DATA

1) Inhalation LC50 in rat = 74 ppm/4 hours
2) Dermal LD50 in rat = 183 mg/kg
3) Oral LD50 in rat = 33 mg/kg
4) Dermal LD50 in rabbit = 95 mg/kg

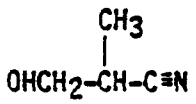
TLV/TWA = 0.35 mg/m^3(skin)

2-METHYLLACTIONITRILE

SYNONYM

Acetone cyanohydrin
α-Hydroxymisobutyronitrile

STRUCTURE



USE/OCCURRENCE

In preparative organic chemistry for transcyanohydrination

HEALTH EFFECTS

1) POISON B(DOT); the DOT label is POISON.

2) May be slightly irritating to the skin and mucous membranes.

3) Decomposes readily to form hydrogen cyanide, which is highly toxic.

4) See CYANIDE listing.

TOXICITY DATA

1) Oral LD50 in rat = 17 mg/kg

2) Oral LD50 in mouse = 14 mg/kg

3) Oral LD50 in rabbit = 13500 ug/kg

4) Dermal LD50 in rabbit = 17 mg/kg

5) Inhalation LCLo in mouse = 2050 mg/m^3 for 2 hours

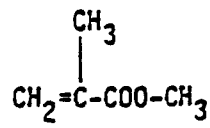
TLV/TWA = N.A.

METHYL METHACRYLATE

SYNONYM

Methacrylic Acid, methyl ester

STRUCTURE



USE/OCCURRENCE

Used in manufacture of methacrylate resins and plastics, ion exchange resins, dentures, etc.

HEALTH EFFECTS

1) FLAMMABLE LIQUID(DOT); same label
2) Route of entry: inhalation, ingestion, and skin absorption
3) May act as strong irritant
4) Has narcotic effects
5) Mutagenic changes have been reported in workers exposed to mixture of methyl methacrylate and chloroprene
6) Chronic exposures in workers havebeen reported to result in headache, pain in the extremeties, fatigue, sleep disturbances, loss of memory and irritability (0.5-50 ppm exposures for several years)
7) An experimental teratogen
8) Chronic exposures in experimental studies have resulted in liver and kidney damage

TOXICITY DATA

1) Inhalation TCLo in human producing irritant effects = 125 ppm
2) Inhalation TCLo in human producing CNS effects = 150 mg/m^3
3) Oral LDLo in rat = 8000 mg/kg
4) Inhalation LC50 in rat = 3750 ppm
5) Oral LDLo in rabbit = 6550 mg/kg
6) Inhalation LCLo in rabbit = 17500 mg/m^3 for 4 hours

TLV/TWA = 410 mg/m^3

METHYL METHANE SULFONATE

SYNONYM

methanesulfonic acid
methyl Ester

STRUCTURE

$CH_3SO_2OCH_3$

USE/OCCURRENCE

Catalyst in polymerization, alkylation and esterification reaction, and as a solvent

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Strong irritant
3) An experimental mutagen

TOXICITY DATA

1) Subcutaneous LD50 in rat = 125 mg/kg
2) Intravenous LD50 in rat = 175 mg/kg
3) Intravenous TDLo in rat = 96 mg/kg

TLV/TWA = N.A.

2-METHYL-2-(METHYLTHIO) PROPIONALDEHYDE-O-(METHYL CARBONYL) OXIME

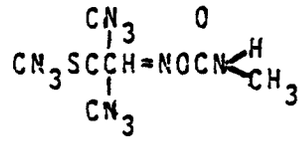
SYNONYM

2-methy-2(mthylthio) propomal,
O-(methylamino)carbonyl)oxime

aldicarb

temik

STRUCTURE



USE/OCCURRENCE

Carbamate insecticide, acariade, and nematocide for soil use.

HEALTH EFFECTS

1) Extremely toxic via oral and dermal routes of exposure
2) A cholinesterase inhibitor
3) See METHOMYL Listing for health effects of carbonate pesticides

TOXICITY DATA

1) Oral LD50 in rat = 1 mg/kg
2) Dermal LD50 in rat = 2500 ug/kg
3) Oral LD in mouse = 300 ug/kg
4) Dermal LD50 in rabbit = 1400 mg/kg

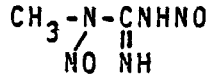
TLV/TWA = N.A.

N-METHYL-N'-NITRO-N-NITROSOGUANIDINE

SYNONYM

1-methyl-3-nitro-1-nitrosoguanidine

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen and teratogen

TOXICITY DATA

1) Oral LD50 in rat = 90 mg/kg
2) Subcantaneous LD50 in rat = 420 mg/kg
3) Oral TDLo in mouse = 100 mg/kg

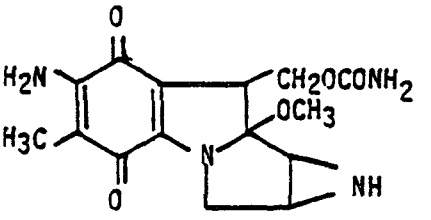
TLV/TWA = N.A.

MITOMYCIN C

SYNONYM

MMC
ametycin
mitomycin C

STRUCTURE



USE/OCCURRENCE

Antineoplastic agent in medicinal usage; isolated from Strep. c.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC and NCI)

TOXICITY DATA

1) Oral LD50 in rat = 14 mg/kg
2) Oral LD50 in mouse = 17 mg/kg
3) 750 ug in human (unknown route of administration) resulted in blood effects

TLV/TWA = N.A.

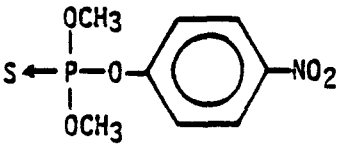
METHYL PARATHION

SYNONYM

phosphorothioic acid 0,0 -
dimethyl 0-p-nitro phenyl Ester

Metron

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide

HEALTH EFFECTS

1) Very toxic via oral route
2) An experimental mutagen and teratogen
3) See PARATHION listing

TOXICITY DATA

1) Oral LD50 in Rat = 6 mg/kg
2) Inhalation LC50 in Rat = 120 mg/m^3 for 4 hours
3) Dermal LD50 in rabbit = 300 mg/kg
4) Orae LD 50 in mouse = 23 mg/kg
5) Dermal LD50 in rat = 63 mg/kg

TLV/TWA = 0.2 mg/m^3 (skin)

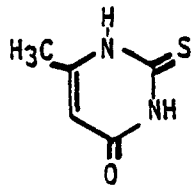
METHYLTHIOURACIL

SYNONYM

6-methyl-2-thiouracil

Muracil

STRUCTURE



USE/OCCURRENCE

Antithyroid agent.

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Reported to be a human teratogen
3) Side effects may include drug fever, skin reaction, and granulocytopenia

TOXICITY DATA

1) Oral TDLo in woman producing a teratogenic effect = 1120 mg/kg (dosing during 20-39th weeks of pregnancy)
2) Oral LDLo in Rabbit = 2500 mg/kg
3) Intraperitoneal LD50 in mouse = 200 mg/kg

TLV/TWA = N.A.

MONOCHLOROBENZENE

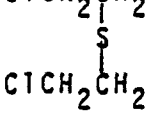
See CHLOROBENZENE listing

MUSTARD GAS

SYNONYM

Bis(2-chloroethyl) sulfide
Yperite

STRUCTURE



USE/OCCURRENCE

War gas

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC).
2) A primary lung irritant.
3) May cause edema, ulcerations, necrosis of respiratory tract and exposed skin, conjunctiuitis, and blindness.
4) Ingestion can cause nausea, and vomiting
5) An experimental mutagen

TOXICITY DATA

1) Inhalation LC50 in human = 1500 mg/m^3 for 1 minute
2) Inhalation LCLo in human = 23 ppm for 10 minutes
3) Dermal LDLo in humans = 64 mg/kg
4) Inhalation LC50 in Rat = 420 mg/m^3 for 2 minutes
5) Dermal LD50 in Rat = 9 mg/kg
6) Dermal LD50 in Rabbit = 100 mg/kg

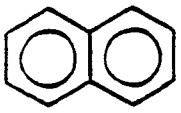
TLV/TWA = N.A.

NAPHTHALENE

SYNONYM

tar camphor
moth flake

STRUCTURE



USE/OCCURRENCE

Chemical intermediate, moth repellant, fumigant

HEALTH EFFECTS

1) Inhaling large conc. of vapor or ingesting may cause intravascular hemolysis with eye irritation, headache, nausea, abdominal pain, jaundice, renal damage, coma
2) A suspected, experimental neoplastic agent
3) The dust and vapor can form explosive mixtures with air
4) Toxicity due to the formation of highly reactive metabolites
5) Effects of chronic exposure include cataracts, hemolytic anemia, and renal disease.
6) Can cross the placenta

TOXICITY DATA

1) Oral rat LD50 = 1780 mg/kg
2) Oral LDLo in child = 100 mg/kg
3) 100 mg is a mild irritant in rabbit eye
4) 495 mg is a mild irritant on rabbit skin (open)

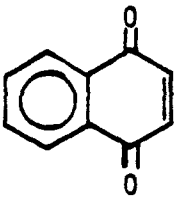
TLV/TWA = 50 mg/m^3

1,4-NAPHTHOQUINONE

SYNONYM

1,4-naphthalenedione

STRUCTURE



USE/OCCURRENCE

Polymerization regulator, chemical intermediate, fungicide, algicide; oegredation product of certain nap derivatives

HEALTH EFFECTS

1) An experimental neoplastic agent.
2) Serious acute effects via oral route
3) Can see hematological changes, irritant and allergenic effects, and decreased activity of selected biochemical oxidation reactions.
4) Would be expected to bioaccumulate to some extent based on low water solubility

TOXICITY DATA

1) Oral LD50 in rat = 190 mg/kg
2) Intraperitoneal LD50 in mouse = 10 mg/kg

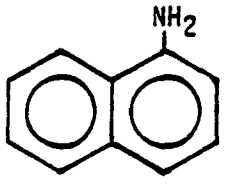
TLV/TWA = N.A.

1-NAPHTHYLAMINE

SYNONYM

2-naphthylamine
naphthalidam

STRUCTURE



USE/OCCURRENCE

Used in dye, condensation and rubber production, and in many other chemical syntheses.

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC).
2) Absorption via dermal and inhalation routes.
3) Workers exposed to 1-naphthylamine have developed bladder tumors (mean latent period = 22 years), but, this effect is possibly due to contamination by 2-naphthylamine, a known human carcinogen.
4) An experiment mutagen.

TOXICITY DATA

1) Oral LD50 in rat = 779 mg/kg
2) Oral Ldls in mammal = 4000 mg/kg
3) Subcutaneous LdLo in rabbit = 300 mg/kg

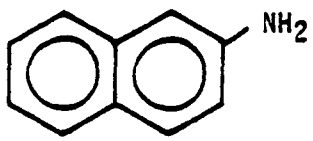
TLV/TWA = N.A.

2-NAPHTHYLAMINE

SYNONYM

beta-naphthylamine
2-aminonaphthalene

STRUCTURE



USE/OCCURRENCE

Presently used only for research purposes; present as an impurity in 1-naphthylamine; was widely used in the past in the manufacture of dye stuffs, as an antioxidant for rubber, and in rubber coated cables.

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC) of the bladder
2) Can be absorbed via inhalation and skin routes.
3) Mildly irritating to the skin, has produced contact dermatitis
4) Latent period for bladder tumor production has been reported to be about 16 years: Symptoms include frequent urination, dysuria (impaired and/or painful urination), and hematuria (blood in urine).
5) Acute poisoning has lead to met-hemoglobinemia or aucute hemorrhagic cystitis (bloody inflamation of the urinary bladder)
6) An experiment mutagen and carcinogen

TOXICITY DATA

1) LDLo in dog = 500 mg/kg (unknown route)

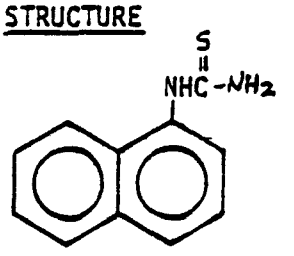
TLV/TWA = N.A. (human carcinogen)

1-NAPHTHYL-2-THIOUREA

SYNONYM

alpha-naphthylthiourea
alpha-naphthylthiocarbamide
antu

STRUCTURE



USE/OCCURRENCE

Rodenticide

HEALTH EFFECTS

1) Poisoning may result in death due to pulmonary edema.
2) Chronic exposure has been reported to lead to drug rashes and a decrease in the white blood cells.
3) Reported to be an experimental neoplastic agent
4) On decomposition, emits toxic fumes

TOXICITY DATA

1) LDLo in man = 588 mg/kg (unknown route of administration)
2) Oral LD50 in Rat = 6 mg/kg
3) Oral LD50 in Monkey = 4250 mg/kg

TLV/TWA = N.A.

NICKEL CARBONYL

SYNONYM

Raney nickel
nickel tetracarbonyl

STRUCTURE

$Ni(CO)_4$

USE/OCCURRENCE

Nickel production, gas plating, catalyst; formed by nickel or its compounds in the presence of carbon monoxide; a commom air contaminant; found in significant quantities in cigarette smoke

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE LIQUID (DOT); the DOT label is FLAMMABLE LIQUID AND POISON
3) A highly volatile liquid which decomposes above room temperature releasing CO and finely divided nickel
4) Absorbed via inhalation and dermal routes
5) Epidemiological studies have linked nickel carbonyl to cancer of the lungs and nose
6) Inhalation of vapor and subsequent release of carbon monoxide (CO) in the lungs initially may lead to headache, nausea, chest tightness, vomiting, and shortness of breath: very severe symptoms may develop hours or days later and these include rapid respiration, shortness of breath, cyanosis, extreme weakness, with possible convulsions, acute chemical pneumonitis, and death
7) An experimental teratogen

TOXICITY DATA

1) Inhalation LCLo in human = 30 ppm for 30 minutes
2) Inhalation TCLo in human producing CNS effects = 7 mg/m^3
3) Inhalation LC50 in rat = 35 ppm for 30 minutes
4) Inhalation LC50 in rat = 580 mg/m^3 for 15 minutes

TLV/TWA = 0.35 mg/m^3 (as Ni)

NICKEL, N.O.S.

SYNONYM

various compounds

STRUCTURE

Ni

USE/OCCURRENCE

Alloy metal, catalyst, intermediate, in stainless steel, coins, batteries, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) FLAMMABLE SOLID (DOT); same label
3) A skin sensitizer often leading to chronic eczema development ("Nickel itch")
4) Irritants of the eye conjunctiva and mucous membranes of the upper respiratory tract
5) Chronic exposure can result in upper and lower respiratory tract damage in man
6) May synergistically affect the carcinogenicity of polycyclic hydrocarbons, asbestos, and viruses
7) Doses of nickel sulfate have induced myocardial and liver damage
8) Serum nickel is increased in humans after myocardial infarction
9) High dose of the soluble salts induce giddiness and nausea

TOXICITY DATA

1) Intravenous LDLo in mouse = 50 mg/kg
2) Intratracheal LDLo in rat = 12 mg/kg
3) Intravaneous LDLo in dog = 10 mg/kg
4) Oral LD50 in rat = 350 mg/kg (nickel (II) acetate)
5) Oral LD50 in rat = 105 mg/kg (nickel (II) chloride)
6) Oral LD50 in rat = 490 mg/kg (nickel biscyclopentadrine)

TLV/TWA = 0.1-1 mg/m^3 (nickel metal, soluble compounds)

NICKEL CYANIDE

SYNONYM

STRUCTURE

$Ni(CN)_2 \cdot 4H_2O$

USE/OCCURRENCE

Nickel-plating

HEALTH EFFECTS

1) POISON B(DOT); the DOT label is POISON
2) See CYAMDE and NICKEL listings

TOXICITY DATA

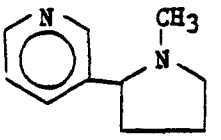
TLV/TWA = 5 mg/m^3 (skin) (cyanides, as CN)
0.1 mg/m^3 (soluble nickel compounds, as Ni)

NICOTINE AND SALTS

SYNONYM

3-(-1-Methyl-2-Pyrrolidyl) Pyridine
Black leaf 40

STRUCTURE



USE/OCCURRENCE

A plant alkaloid found in tobacco leaves (Nicotiana tabacum); an insectide and fumigant whose use has large been replaced by organophosphate incecticides; little or no nicotine is now produced in the United States with respect to pesticides usage

HEALTH EFFECTS

1) POISON B (DOT); DOT label is POISON; 40 mg orally has been fatal in man
2) Toxic effects may result following ingestion, inhalation, or absorption through the skin
3) An extremely toxic alkloid capable of producing nervous system stimulation followed by severe nervous system depression *
4) Green-tobacco sickness(weakness, nausea, vomiting) seen in persons pulling tobacco leaves during cropping is believed to result as a consequence of dermal absorption of nicotine in green tobacco gum.
5) An experimental teratogen
6) When heated emits highly toxic fumes

*May see mental disturbances, convulsions, twitching, evacuation of bladder and bowel, cessation of respiration

TOXICITY DATA

1) LDLo in man =882 ug/kg (unknown route)
2) Rectal TDLo in man producing blood pressure effects =1430 ug/kg
3) Oral LD50 in rat = 53 mg/kg
4) Dermal LD50 in rat = 140 mg/kg
5) Dermal LD50 in rabbit = 50 mg/kg
6) Intraperitoneal LD50 in rabbit = 14 mg/kg

TLV/TWA = 0.5 mg/m^3 (skin)

NITRIC OXIDE

SYNONYM

mononitrogren monoxide
nitrogen monoxide

STRUCTURE

NO

USE/OCCURRENCE

Manufacture of nitric acid, also in bleaching of rayon; as a stabilizer

HEALTH EFFECTS

1) POISON A(DOT); the DOT label is POISON GAS.
2) Entry Route: Inhalation of gas, mist or vapor.
3) Can cause irritation to the eyes and mucous membranes.
4) May produce yellowish or brownish staining to the skin and teeth.
5) May cause burn, ulcers, and necrosis of the skin, mucous membranes and eye tissues.
6) In high concentration may cause severe pulmonary irritation and methemoglobinemia.

TOXICITY DATA

1) Inhalation LCLo in mouse = 320 ppm
2) Inhalation LC50 in rabbit = 315 ppm for 15 minutes

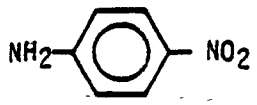
TLV/TWA = 30 mg/m^3

P-NITROANILINE

SYNONYM

1-amino-4-nitrobenzene

STRUCTURE



USE/OCCURRENCE

Dyestuff intermediate

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Acute exposure may cause methemoglobinemia, cyanosis, stupor, weakness, vomiting, nausea, and headache
3) Chronic exposure may cause liver damage
4) Also see ANILINE listing

TOXICITY DATA

1) Oral LD50 in rat = 750 mg/kg
2) Oral LD50 in mouse = 812 mg/kg
3) Intravenous LDLo in mammal = 40 mg/kg

TLV/TWA = 6 mg/m^3 (skin)

NITROBENZENE

SYNONYM

nitrobenzol

STRUCTURE

NO_2

USE/OCCURRENCE

Chemical intermediate in explosives, dyes, a solvent; a common air contaminant

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Absorption can occur via all possible routes; will pass directly through the skin
3) May cause eye irritation
4) One to four hours post exposure may see CNS effects of headache, vomiting, weakness and coma
5) Chronic exposures may lead to spleen and liver damage cyanosis (methemoglobin formation), jaundice, anemia, and dark colored urine
6) A suspected experimental carcinogen, mutagen, and teratogen
7) Menstrual disturbances have been reported in chronically exposed workers
8) Once in the body, remains for prolonged periods of time
9) Nitrobenzene belongs to a group of compounds which can influence ferric hemoglobin levels and thus contribute to asphyxiation
10) Produce Heinz Bodies (dark granules) in red blood cells

TOXICITY DATA

1) Oral TDLo in woman producing blood effects = 200 mg/kg
2) LDLo in man = 35 mg/kg (unknown route)
3) Oral LD50 in rat = 640 mg/kg
4) Dermal LD50 in rabbit = 600 mg/kg
5) Dermal LD50 in rat = 2100 mg/kg
6) 500 mg f r 24 hours is a moderate skin irritant in rabbit
7) 500 mg for 24 hours is a mild eye irritant in rabbit

TLV/TWA = 5 mg/m^3 (skin)

NITROGEN DIOXIDE

SYNONYM

NO_x
nitrogen tetroxide

STRUCTURE

NO_2

USE/OCCURRENCE

Intermediate in nitric and sulfuric acid production, and in the nitration of organic compounds and explosives; an air pollutant; cigarette smoke contains appreciable quantities of nitrogen dioxide

HEALTH EFFECTS

1) Liquid nitrogen dioxide is designated a POISON A (DOT); DOT label requirement is OXIDIZER and POISON GAS
2) Low concentrations may cause inflammation of the lungs with only slight irritation which will pass unnoticed: acute pulmonary edema may result several hours later
3) Acute exposures may produce immediate malaise, cyanosis, cough, dyspnea, chills, fever, headache, nausea, vomiting, pulmonary edema, collapse, and death
4) Exposures to low concentrations can produce tolerance to subsequent higher exposures so that acute symptoms are not experienced: chronic damage will ensue from such repeated low dosings
5) Exposures at high concentrations have resulted in methemoglobinemia in experimental studies
6) Chronic effects include lung damage resembling emphysema
7) Experimental studies have indicated that nitrogen dioxide causes configurational changes in lung, collagen and elastin, causes lipid peroxidation in lung and increases susceptibility to respiratory infection by bacterial pneumonia or influenza virus

TOXICITY DATA

1) Inhalation LCLo in human = 200 ppm for 1 minute
2) Inhalation TCLo in man producing pulmonary effects = 90 ppm for 40 minutes
3) Inhalation LC50 in rat = 88 ppm for 4 hours
4) Inhalation LC50 in rabbit = 315 ppm for 15 minutes

TLV/C = 9 mg/m^3

NITROGEN MUSTARD AND HYDROCHLORIDE SALT

SYNONYM

2,2-dichloro-n-methyldiethylamine

Caryolysin
Chloramine (hydrochloride salt)
Caryolysine (hydrochloride salt)

STRUCTURE

$CH_3N(CH_2CH_2CL)_2$
$CH_3N(CH_2CH_2CL)_2 \cdot HCL$

USE/OCCURRENCE

Alkylating agent used as a cancer chemotherapeutic drug; nitrogen mustards are analogs of lewisite (World War I poison gas)

HEALTH EFFECTS

1) The hydrochloride salt is a POSITIVE ANIMAL CARCINOGEN (IARC)
2) Nitrogen mustard and its hydrochloride salt are experimental mutagens and teratogens
3) A vesicant which may cause severe eye and skin burns on contact in very low concentrations
4) Exposure may result in nausea, vomiting, and leukopenia

TOXICITY DATA

1) Inhalation LDLo in rat = 440 mg/m^3 for 10 minutes
2) Dermal LD50 in rat = 14 mg/kg
3) Dermal LDLo in rabbit = 15 mg/kg
4) Intravenous LD50 in rat = 1.1 mg/kg
5) Intravenous TDLo in human producing CNS effects = 400 ug/kg (hydrochloride salt)
6) Oral LD50 in rat = 10 mg/kg (Hydrochloride salt)
7) Oral LD50 in mouse = 20 mg/kg (hydrochloride salt)
8) Intravenous DL50 in rat = 1600 µg/kg (hydrochloride salt)
9) 400 µg is severe eye irritant in rabbit

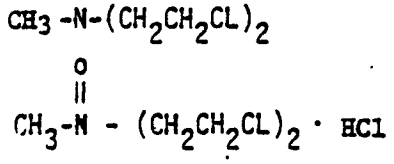
TLV/TWA = N.A.

NITROGEN MUSTARD N-OXIDE AND HYDROCHLORIDE SALTS

SYNONYM

2,2'-dichloro-n-methyldiethylamine-n-oxide

STRUCTURE



USE/OCCURRENCE

See NITROGEN MUSTARD listing

HEALTH EFFECTS

1) The hydrochloride salt is a POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen and carcinogen
3) See NITROGEN MUSTARD listing

TOXICITY DATA

1) Oral LD50 in rat = 80 mg/kg
2) Intravenous LD50 in rat = 45 mg/kg
3) Intravenous LDLo in monkey = 8 mg/kg (hydrchloride salt)
4) Intravenous LDLo in dog = 4 mg/kg (hydrochloride salt)

TLV/TWA = N.A.

NITROGEN PEROXIDE

See NITROGEN DIOXIDE listing

NITROGEN TETROXIDE

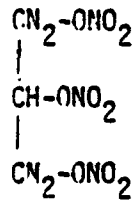
See NITROGEN DIOXIDE listing

NITROGLYCERINE

SYNONYM

Angina
Nitroglycerol
Wasting gelatin
Trinitroglycerol

STRUCTURE



USE/OCCURRENCE

Dynamite manufacture; medicinal use in heart disease patients (coronary vasodilator)

HEALTH EFFECTS

1) CLASS A EXPLOSIVE(DOT); DOT label is EXPLOSIVE A
2) Absorbed via ingestion, inhalation, skin, and mucous membranes
3) Subacute exposures may cause severe throbbing headaches, while larger exposures may result in nausea, vomiting, cyanosis, palpitations of the heart, coma, cessation of breathing and death
4) Symptoms of chronic poisoning may include headache, hallucinations, and skin rashes
5) Alcohol aggravates nitroglycerin toxicity

TOXICITY DATA

1) LDLo in human = 28 mg/kg (unknown route)
2) Intravenous LDLo in rabbit = 40 mg/kg
3) Subcutaneous LDLO in rabbit = 400 mg/kg

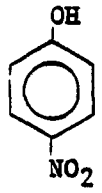
TLV/C = 2 mg/m^3 (skin)

4-NITROPHENOL

SYNONYM

P-nitrophenol
4-hydroxynitrobenzene

STRUCTURE



USE/OCCURRENCE

Dyestuffs synthesis chemical intermediate in production of pigments, pharimaceuticals, rubber chemicals, lumber presentatives, pesticides, etc.; itrophenols may be formed as a result of microbial degredation, photo degredation, or metabolism of parathion; a chemical indicator (at PH5.6=colorless, at PH7.6= yellow)

HEALTH EFFECTS

1) May be absorbed via ingestion, inhalation, and through the skin
2) Animal studies have indicated that symptoms of exposure may include central and peripheral vagus nerve stimulation, CNS depression, methemoglobinemia, dyspnea, hepatitis, spleen changes and hyperthermia
3) The p-isoner is the most toxic nitrophenol
4) A weak experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 350 mg/kg
2) Oral LD50 in mouse = 467 mg/kg

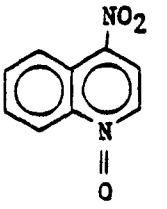
TLV/TWA = N.A.

4-NITROQUINOLINE-1-OXIDE

SYNONYM

4-nitroquinoline-n-oxide

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) An experimental mutagen, carcinogen, and tumor-forming agent

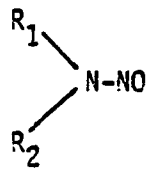
TOXICITY DATA

TLV/TWA =

NITROSAMINE, N.O.S.

SYNONYM

STRUCTURE



(R_1, R_2=various groups)

USE/OCCURRENCE

Research chemicals; N-nitrosodiphenylamine is used in rubber processing; widespread in the environment (air, diet, smoking); also see DIMETHYLNITROSAMINE listing.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Metabolites of nitrosamines are thought to be active teratogens, mutagens, and carcinogens
3) The water concentration of DMN corresponding to a lifetime cancer risk for humans of 10^{-5} is 0.026 mg/l
4) In rodents, nitrosamines have been shown to cause cancer in liver, kidney, lung, esophagus, bladder, nasal sinuses, trachea, tongue
5) Chronic exposures in experimental studies have resulted in pathological liver changes
6) Ferric oxide, cigarette smoke, volatile acids, aldehydes, methyl nitrite, and benzo(a) pyrene have been theorized to act in concert with dimethylnitrosamine to produce a carcinogenic response

TOXICITY DATA

See individual listings

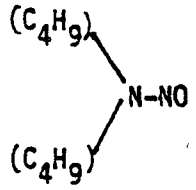
TLV/TWA = N.A.

N-NITROSODI-N-BUTYLAMINE

SYNONYM

N-butyl-n-nitroso-1-butanamine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) See NITROSAMINE listing
3) An experimental mutagen and carcinogen

TOXICITY DATA

1) Oral LD50 in rat = 1200 mg/kg
2) Subcutaneous LD50 in rat = 1200 mg/kg

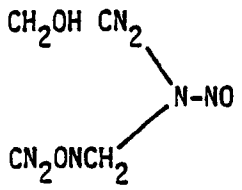
TLV/TWA = N.A.

N-NITROSODIETHANOLAMINE

SYNONYM

2,2'-Dihydroxy-n-nitroso
Diethylamine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 7500 mg/kg
2) Subcutaneous LD50 in hamster = 11gm/kg

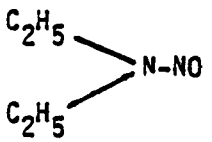
TLV/TWA = N.A.

N-NITROSODIETHYLAMINE

SYNONYM

Diethylnitrosamine
DEN

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) POSITIVE ANIMAL CARCINOGEN (NCI)
3) An experimental mutagen and teratogen
4) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 280 mg/kg
2) Intravenous LD50 in rat =280 mg/kg

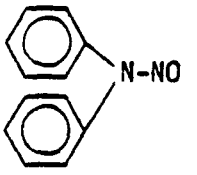
TLV/TWA = N.A.

N-NITROSODIPHENYLAMINE

SYNONYM

Diphenylnitrosamine
NDPhA

STRUCTURE



USE/OCCURRENCE

Vulcanization retarder in the rubber industry

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (NCI)
2) An experimental mutagen
3) When heated to decomposition; emits highly toxic fumes of NO_x
4) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 1650 mg/kg
2) Oral LD50 in mouse = 3850 mg/kg
3) 500 mg for 24 hours is a severe eye irritant in rabbit

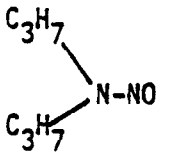
TLV/TWA = N.A.

N-NITROSODI-N-PROPYLAMINE

SYNONYM

NDPA
Di-n-propylnitrosamine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing; NDPA has been detected in food, alcholic bevages, pesticides, and in the waste-water from several chemical plants

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Should be regarded as a human carcinogen (IARC)
3) An experimental mutagen and carcinogen
4) Animal studies have shown NDPA exposure results in cancers or tumors of the liver, esophagus, tongue, nasal cavity, lung, kidney, etc.
5) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 480 mg/kg
2) Subcutaneous LD50 in rat 487 mg/kg
3) Subcutaneous LD50 in mouse = 689 mg/kg

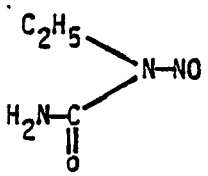
TLV/TWA = N.A.

N-NITROSO-N-ETHYLUREA

SYNONYM

1) Ethylnitorsourea
2) Nitrosoethylurea

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental teratogen and mutagen
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 300 mg/kg
2) Subcut neous LD50 in rat = 240 mg/kg
3) Intravenous LD50 in rat = 240 mg/kg

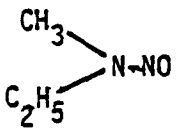
TLV/TWA = N.A.

N-NITROSOMETHYLETHYLAMINE

SYNONYM

Ethylmethyl Nitrosamine
N,N-Methyl Ethyl Nitrosamine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) See NITROSAMINE listing

TOXICITY DATA

1) Oral DL50 in rat = 90 mg/kg

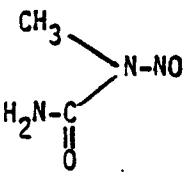
TLV/TWA = N.A.

N-NITROSO-N-METHYLUREA

SYNONYM

1-Methyl -1 Nitrosourea

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental teratogen and mutagen
3) Has been known to cause a contact dermatitis of the poison-ivy type
4) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 180 mg/kg
2) Intraperitoneal LD50 in rat = 110 mg/kg
3) Intravenous LD50 in rat = 108 mg/kg
4) Intraperitoneal LD50 in mouse = 144 mg/kg

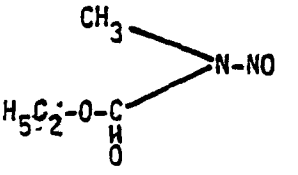
TLV/TWA = N.A.

N-NITROSO-N-METHYLURETHANE

SYNONYM

N-Methyl-N-Nitroso Carbamic Acid, Ethyl Ester

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental teratogen and mutagen
3) See NITROSAMINE listing
4) When heated to decomposition, emits highly toxic fumes of NO_x

TOXICITY DATA

1) Oral LD50 in rat = 180 mg/kg
2) Intravenous LD50 in rat = 4 mg/kg
3) Intraperitoneal LD50 in mouse = 37 mg/kg

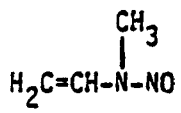
TLV/TWA = N.A.

N-NITROSOMETHYLVINYLAMINE

SYNONYM

N-Methyl-N-Nitroso-Ethenylamine

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)

TOXICITY DATA

1) Oral DL50 in rat = 24 mg/kg
2) Inhalation LD50 in rat = 22 mg/kg

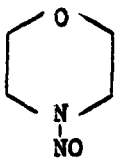
TLV/TWA = N.A.

N-NITROSOMORPHOLINE

SYNONYM

4-Nitrosomorpholine
NMOR

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental mutagen, carcinogen, and neoplastic agent
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 282 mg/kg
2) Intraperitoneal LD50 in rat = 282 mg/kg
3) Subcutaneous LD50 in rat = 170 mg/kg
4) Intravenous LD50 in rat = 98 mg/kg

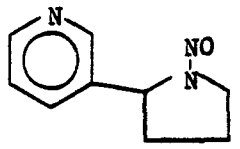
TLV/TWA = N.A.

N-NITROSONOENICOTINE

SYNONYM

1) 3-(1-Nitroso-2-Pyrrolidynyl) Pyridine
2) 1-Nitroso-1-Demethyl-Nicotine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental mutagen, carcinogen, and tumor-forming agent

TOXICITY DATA

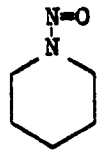
TLV/TWA = N.A.

N-NITROSOPIPERIDINE

SYNONYM

NPIP
1-Nitrosopiperidine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental mutagen, carcinogen, and neoplastic agent
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 200 mg/kg
2) Subcutaneous LD50 in rat = 100 mg/kg
3) Intravenous LD50 in rat = 60 mg/kg

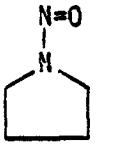
TLV/TWA = N.A.

N-NITROSOPYRROLIDINE

SYNONYM

NPYR
1-Nitroso-Pyrrolidine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental mutagen, carcinogen, and tumor-forming agent
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 900 mg/kg
2) Oral LD50 in mouse = 125 mg/kg
3) Subcutaneous LD50 in mouse = 125 mg/kg

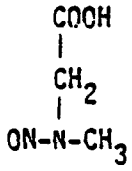
TLV/TWA = N.A.

N-NITROSOSARCOSINE

SYNONYM

N- Methyl - N - Nitroso - Glycine

STRUCTURE



USE/OCCURRENCE

See NITROSAMINE listing

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) An experimental carcinogen
3) See NITROSAMINE listing

TOXICITY DATA

1) Oral LD50 in rat = 5000 mg/kg

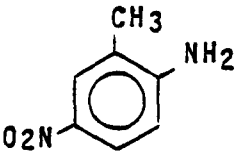
TLV/TWA = N.A.

5-NITRO-O-TOLUIDINE

SYNONYM

4 - Nitro - 2 - Aminotoluene

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) Positive Animal Carcinogen (NCI)

TOXICITY DATA

1) Oral LD50 in rat = 574 mg/kg

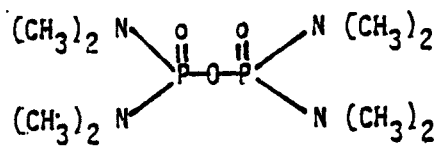
TLV/TWA = N.A.

OCTAMETHYLPYROPHOSPHORAMIDE

SYNONYM

OMPA
Schradan
Pestox III

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide; all products containing OMPA have been cancelled (voluntary) by USEPA

HEALTH EFFECTS

1) See PARATHION listing; a cholinesterase inhibitor
2) High toxicity via oral, dermal, intraperitoneal, and intravenous routes

TOXICITY DATA

1) Oral LD50 in rat = 5 mg/kg
2) Intraperitoneal LD50 in rat = 8 mg/kg
3) Subc taneous LD50 in rat = 9 mg/kg
4) Oral LD50 in mouse = 2 mg/kg
5) Intraperitoneal LD50 in mouse = 10 mg/kg
6) Intravenous LD50 in mouse = 9400 ug/kg
7) Oral LD50 in rabbit = 25 mg/kg

TLV/TWA = N.A.

OSMIUM TETROXIDE

SYNONYM

Osmic acid

STRUCTURE

$O_s\ O_4$

USE/OCCURRENCE

Oxidizing agent (especially in the conversion of alefins to glycols; a fixative for tissues in electron microscopy; osmium tetroxide can be formed by heating osmium metal

HEALTH EFFECTS

1) Vapors are poisonous and extremely irritating to the eyes: exposure to low vapor concentrations may result in weeping and persistant conjunctivitis, while longer exposures may result in corneal damages with halo vision, and blindness
2) Skin exposures may result in green or black discoloration, dermatitis, and ulceration
3) Inhalation of fumes results in severe irritation of the respiratory system which may result in bronchitis, bronchial spasm, tracheitis (inflammation of the trachea), difficulty in breathing which may persist for several hours, and possible serious inflammation of the lungs with bronchopneumonia and gangrene
4) A case of human poisoning was found to result in bronchopneumonia, kidney damage, and death
5) When heated to decomposition, emits toxic fumes

TOXICITY DATA

1) Inhalation TCLo in man producing eye effects = 133 ug/m^3
2) Inhalation TCLo in human producing irritant effects = 100 ug/m^3
3) Oral LD50 in rat = 14 mg/kg
4) Oral LD50 in mouse = 162 mg/kg
5) Inhalation LDLo in rat = 40 ppm for 4 hours
6) Inhalation LDLo in mouse = 40 ppm for 4 hours
7) Intraperitoneal LD50 in mouse = 14 mg/kg

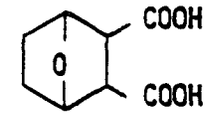
TLV/TWA = 0.002 mg/m^3 (as O_s)

7-OXABICYCLO (2,2,1) HEPTANE-2,3-DICARBOXYLIC ACID

SYNONYM

Endothall

STRUCTURE



USE/OCCURRENCE

Herbicide, defoliant, desiccant, growth regulator

HEALTH EFFECTS

1) Very irritating to eyes, skin, and mucous membranes
2) Highly toxic via oral and dermal routes
3) Ingestion may result in vomiting and diarrhea

TOXICITY DATA

1) Oral LD50 in rat = 38 mg/kg
2) Oral LD50 in rat = 51 mg/kg (disoduim salt of endothall)
3) Dermal LD50 in rabbit = 100 mg/kg (disoduim salt of endothall)

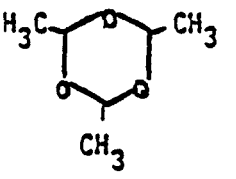
TLV/TWA = N.A.

PARALDEHYDE

SYNONYM

paracetaldehyde
trimethyl trioxane

STRUCTURE



USE/OCCURRENCE

Hypnotic and analgesic drug; used in the manufacture of organic compounds

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label
2) Rapidly absorbed via ingestion and parenteral administration
3) Therapeutic doses to induce sleep range from 4-8 ml; overdose may include very rapid, labored breathing, marked depression of blood pressure, and degenerative changes in the kidney and liver, with possible prolonged coma, and death due to respiratory failure
4) Effects of chronic poisoning may include acidosis, bleeding gastvitis, muscular irritability, azotemia (uremia), oliguria (decreased urine flow), albuminuria, leukocytosis, liver and kidney damage, pulmonary hemorrhage, and dilation of the right heart
5) Chronic use may induce tolerance and addiction
6) Readily crosses the placenta and has been reported to cause toxic effects on neonates following administration to the mother during labor
7) Decomposes to the toxic compounds acetic acid and acetaldehyde
8) No reported cases of industrial poisoning
9) Exposure may result in skin eruptions similar to those caused by chloral hydrate
10) Bioaccumulation is unlikely due to metabolism of this compound in the body
11) Emits toxic fumes when heated
12) A suspected experimental neoplastic agent

TOXICITY DATA

1) Oral TDLo in human producing psychlogical effects = 14 mg/kg
2) Intravenous TDLo in human producing psychlogical effects = 14 mg/kg
3) Intramuscular TDLo in human producing psychological effects = 71 mg/kg
4) Rectal TDLo in human producing psychological effects = 14 mg/kg
5) Oral LD50 in rat = 1530 mg/kg
6) Dermal LD50 in rabbit = 14 grams/kg

TLV/TWA = N.A.

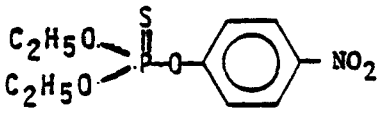
PARATHION

SYNONYM

0,0-diethyl 0-p-nitrophenyl hosphrothioate

Thiophos

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide; use of ethyl parathion restricted by USEPA

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Organophosphates are irreversible inhibitors of the enzyme cholinesterase, and are rapidly absorbed via ingestion, through intact or broken skin and the eye, and via inhalation
3) Symptoms of mild poisoning may include headache, fatigue, dizziness, blurred vision, excessive sweating, nausea, vomiting, stomach cramps, diarrhea, and salivation
4) Symptoms of more severe poisoning may also include difficulty in walking, chest tightness, miosis (pupil constriction), muscle twitching
5) Severe poisoning may result in rapid onset of unconsciousness, seizures, and possible death as a result of respiratory failure
6) Organophosphates effect nerve tissue, skeletal muscle, smooth muscle, the heart, exocrine galnds, the CNS, and the respiratory system.

(CONT'D. on page 2)

TOXICITY DATA

1) Oral LDLo in human = 240 ug/kg
2) Oral TDLo in woman producing CNS effects = 5670 ug/kg
3) LDLo in man = 1471 ug/kg (unknown route)
4) Oral LD50 in rat = 2 mg/kg
5) Oral LD50 in mouse = 6 mg/kg
6) Oral LD50 in rabbit = 10 mg/kg
7) Dermal LD50 in rabbit = 40 mg/kg
8) Dermal LD50 in rat = 6800 ug/kg
9) Dermal LD50 in mouse = 32400 ug/kg
10) Inhalation LCLo in rat = 10 mg/m^3 for 2 hours

TLV/TWA = 0.1 mg/m^3 (skin)

HEALTH EFFECTS - CONT'D.

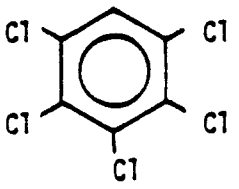
7) Onset of symptoms after exposure is usually rapid
8) Other sumptoms of organophosphate poisoning may include involuntary defacation and urination, bradycardia and possible heart block, easy fatigue, pallor, elevation of blood pressure, hyperglycemia, slurred speech, anxiety, insomnia, etc.
9) Local effects may be seen at the sites of exposure before generalized symptoms become apparent: vapor exposures may produce eye and lung effects (inhalation, skin sweating (dermal absorption); oral ingestion may result in GI symptoms first
10) Effects of parathion exposure are comulative
11) An experimental mutagen and teratogen
12) When heated to decomposition, emits highly toxic fumes of NO_x, PO_x, SO_x

PENTACHLOROBENZENE

SYNONYM

QCB

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in fungicide production, flame retardant; a by-product of chlorobenzene synthesis

HEALTH EFFECTS

1) Experimental teratogen
2) A possible, experimental carcinogen
3) See TETRACHLOROBENZENE listing for health effects of chlorinated benzenes

TOXICITY DATA

TLV/TWA

N.A.

PENTACHLOROETHANE

SYNONYM

Ethane pentachloride
Pentalin

STRUCTURE

$Cl_3C\text{-}CHCl_2$

USE/OCCURRENCE

HEALTH EFFECTS

1) May act as a CNS depressant and Narcotic; liver damage a possible result of over exposure
2) Moderately toxic via oral route
3) When heated to decomposition, emits highly toxic fumes of chlorides

TOXICITY DATA

1) Inhalation LCLo in rat = 4238 ppm for 2 hours
2) Inhalation LCLo in mouse = 35 mg/m^3 for 2 hours
3) Oral LDLo in dog = 500 mg/kg
4) Intravenous LDLo in dog = 100 mg/kg

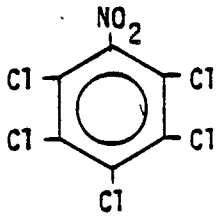
TLV/TWA = N.A.

PENTACHLORONITROBENZENE (PCNB)

SYNONYM

PCNB
Terrachlor
Quintozene

STRUCTURE



USE/OCCURRENCE

Fungicide; commercial PCNB fungicides contain toxic impurities such as hexachlorobenzene, penta-chlorobenzene, and tetrachloronitrobenzene

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) An experimental teratogen
3) Very little accumulation in the body, due to rapid metabolism and elimination
4) When heated to decomposition, emits highly toxic fumes of chlorides on NO_x
5) The chloro-mono-nitrobenzenes are similar in their toxic effects to nitrobenzene: see NITROBENZENE listing

TOXICITY DATA

1) Oral LD50 in rat = 1650 mg/kg
2) Mammal LD50 = 1650 mg/kg (unknown route)

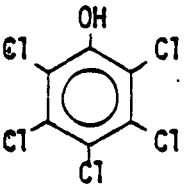
TLV/TWA = N.A.

PENTACHLOROPHENOL

SYNONYM

PCP
Dowicide 7

STRUCTURE



USE/OCCURRENCE

Herbicide, molluscicide, algacide, wood preservative, etc.; widely dispersed in the environment

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON (human fatalities have been reported)
2) Readily absorbed through the skin
3) Acute poisoning is marked by weakness and respiratory tract irritation, blood pressure and urinary output changes, also causes dermatitis, convulsions and collapse
4) Chronic exposure can cause liver and kidney injury
5) An experimental neoplastic and teratogenic agent
6) Does not significantly accumulate in body tissues
7) Uncoupler of oxidative phosphorylation
8) Dangerous when heated to decomposition, emits highly toxic fumes of chlorides

TOXICITY DATA

1) Oral LDLo in human = 29 mg/kg
2) Oral TDLo in human = 196 mg/kg (CNS effects)
3) Oral LD50 in rat = 50 mg/kg
4) Dermal LDLo in rabbit = 40 mg/kg
5) 10 mg for 24 hours is a mild skin irritant (open) in rabbit

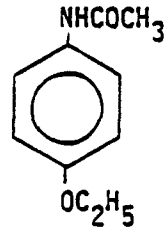
TLV/TWA = 0.5 mg/m^3 (skin)

PHENACETIN

SYNONYM

acetophenetidine
p-acetophenetidide

STRUCTURE



USE/OCCURRENCE

Analgesic drug (pain reliever) and anti-pyretic (anti-fever)

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) Symptoms of misuse include weakness, dizziness, depression, collapse, cyanosis and possible death
3) It is believed that phenacetin can directly damage kidney cells
4) Chronic effects include weight loss, insomnia, shortness of breath, weakness, and possible aplastic anemia: can be habit-forming
5) An experimental mutagen
6) When heated to decomposition; emits toxic fumes

TOXICITY DATA

1) Oral TDLo in human producing a carcinogenic effect = 57 mg/kg for 47 years (intermittant dosing)
2) Oral TDLo in human producing CNS effects = 1000 mg/kg
3) LDLo in man = 74 mg/kg (unknown route)
4) Oral LD50 in rat = 1650 mg/kg
5) Intraperitoneal LD50 in rat = 1020 mg/kg

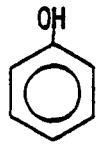
TLV/TWA = N.A.

PHENOL

SYNONYM

carbolic acid

STRUCTURE



USE/OCCURRENCE

Chemical intermdiate, disinfectant, etc.; a common air contaminant

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Corrosive on any tissue
3) Absorbed via all routes of administration
4) Can cause severe eye damage and blindness
5) Systemic poisoning can lead to CNS depression, weakness, ear ringing, shock, frothing of the nose and mouth, kidney damage, and death
6) Chronic poisoning following prolonged exposures to low concentrations of vapor or mist results in digestive disturbances, nervous disorders, skin eruptions, and liver damage
7) Reported to be carcinogenic and teratogenic in animal studies
8) Emits toxic fumes when heated

TOXICITY DATA

1) Oral LDLo in human = 140 mg/kg
2) Oral LD50 in rat = 414 mg/kg
3) Dermal LD50 in rabbit = 850 mg/kg
4) 5 mg is a severe eye irritant in rabbit
5) 535 mg is a severe irritant on rabbit skin (open)

TLV/TWA = 19 mg/m^3 (skin)

PHENOLIC COMPOUNDS

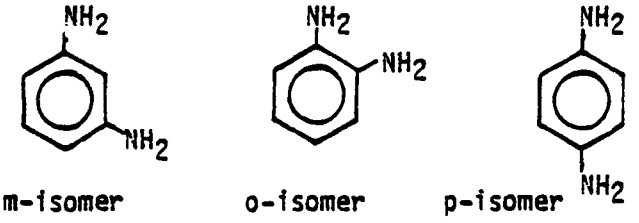
See the following lsitings: CRESOL
CREOSOTE
HYDROQUINONE
QUINONE

PHENYLENE DIAMINE

SYNONYM

o-,m-,p-phenylenediamines
o-,m-,p-aminoanilines

STRUCTURE



m-isomer o-isomer p-isomer

USE/OCCURRENCE

Used in dye manufacturing, rubber curing agent (m-isomer), hair dye (p-isomer), etc.

HEALTH EFFECTS

1) p- and m- isomers are experimental mutagens and neoplastic agents
2) p-isomer is a powerful skin and eye, conjunctive irritant, asthmatic agent, respiratory tract toxicant, and liver toxicant
3) When the p-isomer is heated, it burns and emits highly toxic fumes of nitrogen compounds

TOXICITY DATA

1) Oral LD50 in rat = 550 mg/kg (m-isomer)
2) Oral LD50 in rat = 1070 mg/kg (o-isomer)
3) Oral LD50 in rat = 80 mg/kg (p-isomer)
4) 250 mg for 24 hours is a mild skin irritant in human (p-isomer)
5) 250 for 24 hours is a moderate skin irritant in rabbit (p-isomer)

TLV/TWA = 0.1 mg/m^3 (skin) (p-isomer)

PHENYL DICHLOROARSINE

SYNONYM

dichlorophenylarsine

STRUCTURE

$C_6H_5A_sCl_2$

USE/OCCURRENCE

A lacrymator type of military poison gas

HEALTH EFFECTS

1) POISON B (DOT) ; the DOT label is POISON
2) High toxicity via oral, inhalation and dermal routes
3) When heated to decomposition; emits highly toxic fumes of arsenic
4) Reacts with water or steam to produce corrosive fumes
5) See ARSENIC listing

TOXICITY DATA

1) Dermal LD50 in rabbit = 500 ug/kg
2) Dermal LD50 in rat = 16 mg/kg
3) Inhalation LCLo in mouse = 370 mg/m^3

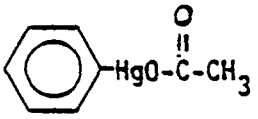
TLV/TWA = 0.2 mg/m^3 (as arsine or for arsenic and soluble arsenic compounds, as As)

PHENYLMERCURY ACETATE

SYNONYM

PMA
Agrosan

STRUCTURE



USE/OCCURRENCE

Fungicide, herbicide; no longer cleared for use in the U.S.; organic mercury compounds are common air contaminants

HEALTH EFFECTS

1) High toxicity via oral and intraperitoneal routes
2) An experimental mutagen and teratogen
3) Aryl (phenyl) mercury compounds may cause skin burns and be absorbed through the skin
4) Organic mercury compounds have an affinity for lipoid-containing organs resulting in CNS disturbances
5) Mercury is a general protoplasmic poison and once within the body is stored in liver, kidneys, spleen, and bone
6) When heated to decomposition; emits highly toxic fumes of mercury
7) See MERCURY listing

TOXICITY DATA

1) 100 g for 24 hours is a severe skin irritant in humba
2) 50 ug for 24 hours is a sever eye irritant in rabbit
3) Oral LD50 in rat = 30 mg/kg
4) Oral LD50 in mouse = 26 mg/kg
5) Intraperitoneal LD50 in mouse = mg/kg

TLV/TWA = 0.05 mg/m^3 (all forms of H_g except alkyl)

N-PHENYLTHIOUREA

SYNONYM

1-phenyl-2-thiourea
phenylthiocarbamide

STRUCTURE

$C_6H_5NHCSNH_2$

USE/OCCURRENCE

Rodenticide; also used in medical genetics

HEALTH EFFECTS

1) High toxicity via oral and intraperitoneal routes
2) When heated to decomposition; or on contact with acid or acid fumes, emits highly toxic fumes of SO_x and NO_x

TOXICITY DATA

1) Oral rat LD50 = 3 mg/kg
2) Intraperitoneal LD50 in rat = 5 mg/kg
3) Oral mouse LD50 = 10 mg/kg
4) Intraperitoneal LD50 in mouse = 25 mg/kg
5) Oral LD50 in rabbit = 40 mg/kg

TLV/TWA = N.A.

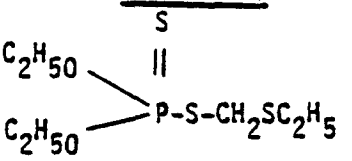
PHORATE

SYNONYM

Thimet

O,O-diethyl S-[(ethylthio)methyl] phosphorodithioate

STRUCTURE



USE/OCCURRENCE

Organophosphate insecticide

HEALTH EFFECTS

1) Highly toxic via skin, inhalation, and oral contact
2) A cholinesterase inhibitor, see PARATHION listing
3) Cases of industrial poisoning have been reported to result in confusion, dizziness, nausea, vomiting, pupil constriction, respiratory distress, cardiac arrhythmia, and unconsciousness: death may result from respiratory failure
4) Commercial grades may contain formaldehyde as a contaminant

TOXICITY DATA

1) Oral LD50 in rat = 1100 ug/kg
2) Inhalation LC50 in rat = 11 mg/m^3 for 1 hour
3) Dermal LD50 in rat = 2500 ug/kg
4) Oral LD50 in mouse = 11 mg/kg

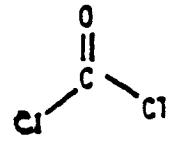
TLV/TWA = 0.05 mg/m^3 (skin)

PHOSGENE

SYNONYM

carbonyl chloride
carbon oxychloride
chloroformyl chloride

STRUCTURE



USE/OCCURRENCE

Dyestuffs manufacture based on triphenylmethane, coal tar, and urea; component in synthesis of isocyanates, carbonic acid esters, and acid chlorides; a common air contaminant

HEALTH EFFECTS

1) POISON A (DOT); DOT label is POISON GAS
2) The gas is an irritant of the eyes (may cause lacrimation), conjunctiva, and upper respiratory tract, the liquid may cause skin burns (3 - 5 ppm in air cause eye and throat irritation with coughing)
3) Once within the body, phosgene combines with moisture to produce hydrochloric acid and carbon monoxide
4) Acute exposures may result in pulmonary edema after a latent period of 5 - 12 hours; symptoms include dizziness, chills, discomfort, thirst, increasingly tormenting cough, viscous sputum which thins out later, dyspnea, tracheal rhonci (wheezing), grey-blue cyanosis, with possible death as a result of respiratory or cardiac failure
5) Phosgene exposure at low levels (205 mg/m^3) may produce no warning symptoms (50 ppm is rapidly fatal after short exposures)
6) Chronic exposure may produce irreversible pulmonary changes of emphysema and fibrosis
7) When heated to decomposition or on contact with water or steam, will react to produce toxic and corrosive fumes

TOXICITY DATA

1) Inhalation LC50 in human = 3200 mg/m^3
2) Inhalation TCLo in human producing irritant effects = 25 ppm for 30 minutes
3) Inhalation LCLo in rat = 50 ppm for 30 minutes
4) Inhalation LCLo in dog = 80 ppm for 30 minutes
5) Inhalation LCLo in mammal = 50 ppm for 5 minutes

TLV/TWA = 0.4 mg/m^3 (carbonyl chloride)

PHOSPHINE

SYNONYM

Celphos
hydrogen phosphide
Phostoxin
Phosphoretted hydrogen

STRUCTURE

PH_3

USE/OCCURRENCE

Insecticidal fumigant: Phostoxin is a commercial preparation, composed of aluminum phosphide formulated with ammonium carbamate and hard pharmaceutical paraffin, which releases phosphine gas with moisture upon contact;

Phosphine may be evolved during the generation of acetylene from impure calcium carbide, as well as during metal shaving, sulfuric acid tank cleaning, rust proofing, and ferrosilicon, phosphoric acid and yellow phosphorous explosives handling

HEALTH EFFECTS

1) POISON A (DOT); DOT label is FLAMMABLE GAS and POISON GAS
2) A colorless gas with an nausating odor of decaying fish
3) Systemic effects due to acute inhalation exposure include: CNS depression, irritation of lungs, and damage to liver and other organs; symptoms may include weakness, fatigue, headache, vertigo, anorexia, nausea, vomiting, abdominal pain, diarrhea, tenesmus (painful urination or defecation), thirst, dryness of the throat, difficulty in swallowing, sensation of chest pressure.
4) Severe poisoning may result in staggering gait, convulsions, coma, and death as a result of cardiac arrest and pulmonary edema (which may be latent)
5) Chronic poisoning has been suggested as possible with symptoms of anemia, bronchitis, GI disturbances, visual, speech and motor disturbances, however, there is a lack of human data on the subject
6) When heated to decomposition, emits highly toxic fumes of PO_x

TOXICITY DATA

1) Inhalation LCLo in human = 1000 ppm
2) Inhalation LC50 in rat = 11 ppm for 4 hours
3) Inhalation LCLo in rabbit = 2500 ppm for 20 minutes
4) Inhalation LCLo in mammal = 1000 ppm for 5 minutes

TLV/TWA = 0.4 mg/m^3

PHOSPHORODITHIOTIC AND PHOSPHOROTHIOTIC ACID ESTERS

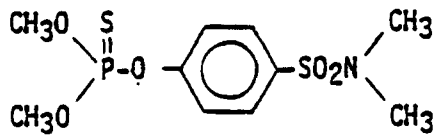
See individual listings

PHOSPHOROTHIOTIC ACID, O,O-DIMETHYL ESTER, O-ESTER WITH N,N-DIMETHYL BENZENE SULFONAMIDE

SYNONYM

Famphur
Famfos

STRUCTURE



USE/OCCURRENCE

Organophosphate pesticide (for use against cattle lice and grubs)

HEALTH EFFECTS

1) Highly toxic via oral route
2) A cholinesterase inhibitor
3) See PARATHION listing

TOXICITY DATA

1) Oral LD50 in rat = 35 mg/kg
2) Oral LD50 in mouse = 27 mg/kg
3) Dermal LD50 in rabbit = 1460 mg/kg

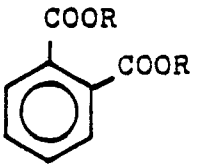
TLV/TWA = N.A.

PHTHALIC ACID ESTERS, N.O.S.

SYNONYM

various

STRUCTURE



(R = various groups)

USE/OCCURRENCE

Platicizers, components of cosmetics, munitions, insect repellents, etc.

HEALTH EFFECTS

1) Several members of this group have been reported to be experimental teratogens and to cause other reproductive damage in experimental studies
2) Phthalic acid esters are readily absorbed from the intestinal tract, peritoneal cavity, and lungs
3) Toxic polyneuritis and neurological symptoms have been reported in exposed workers
4) Experimental animals exposed to large doses of butylbenzyl phthalate have shown CNS degeneration and encephalopathy
5) Chronic dosing has caused liver damage and kidney effects in experimental animals

TOXICITY DATA

1) Oral TDLo in man producing gastrointestinal effects = 143 mg/kg (phthalic acid, bis 2-ethylhexyl ester)
2) Oral LD50 in rat = 31 grams/kg (" ")
3) Oral LDLo in human producing eye effects = 140 mg/kg
4) Inhalation TCLo in human producing an irritant effect = 1000 mg/m^3
5) Oral LD50 in rat = 6900 mg/kg (phthalic acid, dimethyl ester)

TLV/TWA = 5 mg/m^3 (dibutyl-, diethyl-, and dimethyl phthalate)

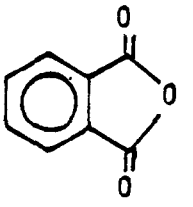
PHTHALIC ANHYDRIDE

SYNONYM

phthalandione

1,3-isobenzofurandione

STRUCTURE



USE/OCCURRENCE

Chemical intermediate; a common air contaminant

HEALTH EFFECTS

1) Dust, fume, and vapor are potent irritants of the eye, skin, and respiratory tract; skin burns may develop
2) Hypersensitivity can develop
3) Inhalation of dust or vapors may cause coughing, sneezing, and bloody nasal discharge
4) Repeated exposure may result in bronchitis, emphysema, allergic asthma, uticaria (hives), chronic eye irritation, and lung fibrosis

TOXICITY DATA

1) Oral LD50 in rat = 4020 mg/kg
2) 100 mg is a severe eye irritant in rabbit

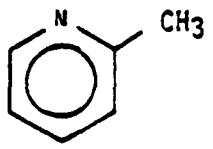
TLV/TWA = 6 mg/m^3

2-PICOLINE

SYNONYM

alpha-methylpyridine

STRUCTURE



USE/OCCURRENCE

Organic solvent, chemical intermediate; present in cigarette smoke and near operating coke ovens

HEALTH EFFECTS

1) A respiratory irritant
2) Chronic exposure can lead to changes in liver, spleen, bone marrow, and lymph nodes

TOXICITY DATA

1) Oral LD50 in rat = 790 mg/kg
2) Dermal LD50 in rabbit = 410 mg/kg
3) 750 mg is a severe eye irritant in rabbit
4) 470 mg a mild dermal irritant in rabbit

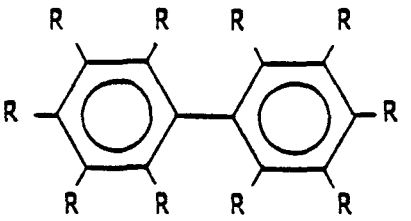
TLV/TWA = N.A.

POLYCHLORINATED BIPHENYL, N.O.S.

SYNONYM

PCB
Arochlor
chlorinated diphenyl

STRUCTURE



(R = H or Cl)

USE/OCCURRENCE

Due to their high heat capacity and low electrical conductivity, PCBs have been used as fluids in electrical transformers, capacitors, heat transfer systems, and hydraulic systems; they have also been used in paints, plasticizers, inks, carbonless paper, and as dust control agents

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) Various mixtures of PCBs have been reported to be carcinogenic, neoplastic, or teratogenic in experimental studies
3) PCBs biomagnify and are very persistent in the environment
4) Toxic effects generally increase as the level of chlorine substitution increases
5) Absorption via inhalation, dermal, and oral routes
6) Prolonged skin contact may result in chloracne (comedones, sebaceous cysts, and pustules) as well as in eye, nose, and throat irritation
7) Acute and chronic exposure can cause liver damage with edema, jaundice, vomiting, anorexia, nausea, abdominal pain, and fatigue; may also result in impotence
8) Accidental oral poisoning has resulted in stillbirth, grey-brown color of the skin, and increased eye discharge in infants born to women exposed during pregnancy
9) When heated to decomposition, emit highly toxic fumes

TOXICITY DATA

1) Oral LD50 in rat = 3980 mg/kg (Arochlor 1221; 21% Cl)
2) Oral LD50 in rat = 4470 mg/kg (Arochlor 1232; 32% Cl)
3) Oral LD50 in rat = 1295 mg/kg (Arochlor 1254; 54% Cl)

POLYCHLORINATED BIPHENYL (CONT.)

4) Oral LD50 in rat = 16000 mg/kg (Arochlor 4465)
5) Inhalation TCLo in human producing an irritant effect = 10 mg/m^3 (Arochlor 1242)
6) Oral TDLo in human producing skin effects = 28 mg/kg

<u>TLV/TWA</u> = 0.5-1.0 mg/m^3 (skin) (42-54% Cl)

POTASSIUM CYANIDE

See CYANIDE listing

POTASSIUM SILVER CYANIDE

SYNONYM	STRUCTURE
potassium dicyanoargentate(I)	$KAg(CN)_2$

USE/OCCURRENCE

Silver plating, bactericide

HEALTH EFFECTS

1) High toxicity via oral and inhalation routes of exposure
2) Ingestion may cause corrosion of gastric mucosa
3) See CYANIDE listing

TOXICITY DATA

1) Oral LD50 in rat = 21 mg/kg
2) 250 μg for 24 hours is a severe eye irritant in rabbit
3) 50 mg for 24 hours is a severe skin irritant dose in rabbit

TLV/TWA = 5 mg/m^3 (skin) (as CN)
0.01 mg/m^3 (soluble compounds, as Ag)

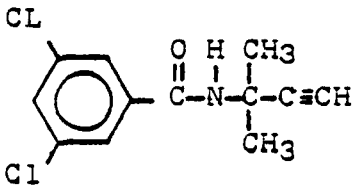
PRONAMIDE

SYNONYM

Promamide
Propyzamide
Kerb

3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide

STRUCTURE



USE/OCCURRENCE

Herbicide

HEALTH EFFECTS

TOXICITY DATA

1) Oral LD50 in rat = 5620 mg/kg

TLV/TWA = N.A.

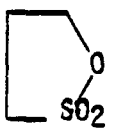
1,3-PROPANE SULTONE

SYNONYM

2,2-dioxide-1,2-oxathiolane

3-hydroxy-1-propanesulphonic acid sulfone

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen

TOXICITY DATA

1) Subcutaneous LD50 in rat = 135 mg/kg
2) Dermal LDLo in mouse = 1000 mg/kg

TLV/TWA = N.A.

PROPIONITRILE

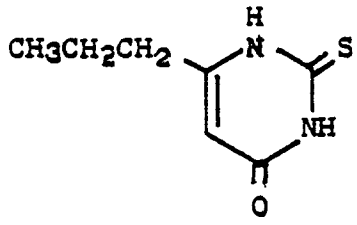
see ETHYL CYANIDE listing

PROPYLTHIOURACIL

SYNONYM

6-propyl-2-thiouracil

STRUCTURE



USE/OCCURRENCE

Thyroid depressant drug; has been used as a veterinary metabolic depressant

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Reported to be teratogenic in humans
3) An experimental neoplastic agent
4) Side effects as a result of exposure have been reported to include agranulocytosis (low white blood cell count), leukopenia, dermatitis, drug fever, and possible liver injury

TOXICITY DATA

1) Oral TDLo in woman producing a teratogenic effect = 1680 mg/kg (exposure during weeks 1-40 of pregnancy)

TLV/TWA = N.A.

2-PROPYN-1-OL

SYNONYM

propargyl alcohol
ethynyl-methanol

STRUCTURE

$HC \equiv CCH_2OH$

USE/OCCURRENCE

Solvent, chemical intermediate, pesticide

HEALTH EFFECTS

1) Extremely toxic via oral and dermal routes of exposure
2) Irritating to skin and mucous membranes
3) A CNS depressant

TOXICITY DATA

1) Oral LD50 in rat = 70 ug/kg
2) Inhalation LC50 in rat = 2000 mg/m^3 for 2 hours
3) Dermal LD50 in rabbit = 88 mg/kg
4) Inhalation LC50 in mouse = 2000 mg/m^3 for 2 hours
5) Oral LD50 in mouse =50 mg/kg

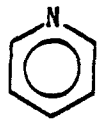
TLV/TWA = 2 mg/m^3 (skin)

PYRIDINE

SYNONYM

azine

STRUCTURE



USE/OCCURRENCE

Solvent, chemical intermediate, denaturant for ethyl alcohol; by-product of coke and cigarette combustion

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same label
2) Absorbed via GI tract and inhalation
3) An irritant of conjunctiva of eye and cornea, and of mucous membranes of the upper respiratory tract and skin
4) High concentration exposure may cuase narcosis and death
5) Repeated, intermittant, or continous low level exposure may lead to transient effects on the CNS and GI tract, including headache, dizziness, anore ia, vomiting, low back pain, urinary frequency
6) Exposure can result in a photo-sensitized skin eruption
7) Other effect include hepatic and renal damage, fewer, and possible stimulation of platelet production in bone marrow
8) Flammable and explosive when exposed to a flame and decomposes on heating to release cyanide fumes: salts penetrate rubber and plastic gloves

TOXICITY DATA

1) Oral LD50 in rat = 891 mg/kg
2) Dermal LD50 in rabbit = 1121 mg/kg
3) 2 mg is a severe eye irritant in rabbit
4) 10 mg for 24 hours is a mild irritant on rabbit skin

TLV/TWA = 15 mg/m^3

QUINONE

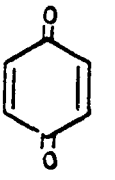
SYNONYM

1,4-benzoquinone

1,4-cyclohexadienedione

p-quinone

STRUCTURE



USE/OCCURRENCE

Oxidizing agent, chemical intermediate; used in dye, textile, tanning industries: reacts with nitrogen compounds to form colored substances

HEALTH EFFECTS

1) Readily absorbed via ingestion; inhalation, and the skin route
2) Quinone vapor is highly irritating to the eyes and only brief exposure may result in corneal ulceration; chronic exposures may lead to corneal stains, opacity, and structural damage to the cornea
3) Solid, liquid, and vapor may cause severe irritation of the skin, nose, and throat resulting in discoloration, swelling, and papule/vesicle formation: prolonged contact may lead to local necrosis (tissue death)
4) Experimental studies have shown that acute oral or dermal poisoning may result in chronic convulsions, respiratory difficulties, drop in blood pressure, and death via paralysis of the medullary centers
5) Chronic exposure to vapors in industrial settings has not been reported to result in systemic effects
6) An experimental tumor-forming agent

TOXICITY DATA

1) Oral LD50 in rat = 130 mg/kg
2) Intravenous LD50 in rat = 25 mg/kg
3) Intraperitoneal LD50 in mouse = 8500 ug/kg

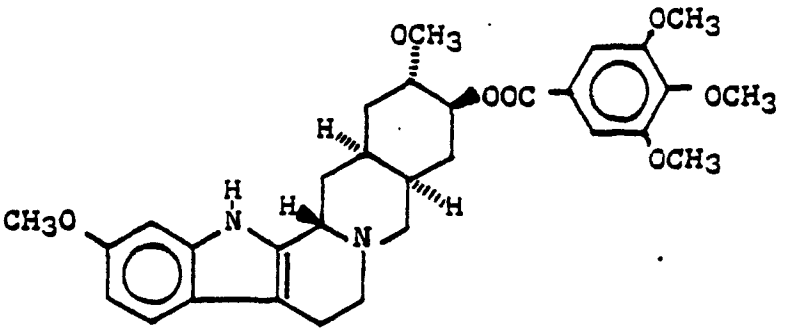
TLV/TWA = 0.4 mg/m^3

RESERPINE

SYNONYM

3,4,5-trimethoxybenzoyl methyl reserpate

STRUCTURE



USE/OCCURRENCE

Hypotensive drug, tranquilizer, sedative; isolated from the roots of Rawolfia s.

HEALTH EFFECTS

1) An experimental teratogen and carcinogen which has also been reported to be teratogenic in humans
2) Reserpine crosses the placenta and has produced side effects in delivered infants (nasal congestion, lethargy, extreme sedation, and depression)
3) In humans, a dose of 0.014 mg/kg has produced psychotropic effects
4) Side effects of use may include nasal stuffiness, weight gain, diarrhea, lowered heart rate, fatigue, and drowsiness

TOXICITY DATA

1) Oral TDLo in woman producing teratogenic (birth defect) effects = 80 ug/kg per day (exposure during 32-36th week of pregnancy)
2) Oral TDLo in human producing possible tumorigenic effects = 9100 ug/kg for 5 years (intermittant dosing)
3) Oral LD50 in mouse = 390 mg/kg
4) Intravenous LD50 in mouse = 21 mg/kg
5) Intravenous LD50 in rat = 15 mg/kg
6) Intravenous LD50 in dog = 500 ug/kg

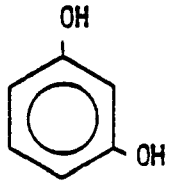
TLV/TWA = N.A.

RESORCINOL

SYNONYM

m-dihydroxybenzene
1,3-benenediol
3-dihyroxyphenol
resorcin

STRUCTURE



USE/OCCURRENCE

A weak antiseptic, fungicide; used in tire and rubber products, wood adhesive resins, UV absorber in plastics, dye intermediate (especially hair dyes), explosives, specialty adhesives synthetic tanning agents; by-product of coal conversion; a component of cigarette smoke

HEALTH EFFECTS

1) A primary skin irritant; may cause eye injury and dermatitis in sensitive individuals
2) Resorcinol can act as an acute systemic poison once it is absorbed through the skin (in a solvent) or ingested: may result in local hyperemia, itching, dermatitis, edema, corrosion associated with enlargement of regional lymph glands, methemoglobinemia, cyanosis, convulsions, tachycardia (rapid heart rate), dyspnea, and possible death

TOXICITY DATA

1) Oral LDLo in human = 29 mg/kg
2) Oral LD50 in rat = 301 mg/kg
3) Dermal LD50 in rabbit = 3360 mg/kg
4) 100 mg is a severe eye irritant dose in rabbit
5) 500 mg is a skin irritant dose in rabbit

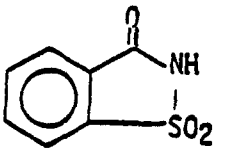
TLV/TWA = 45 mg/m^3

SACCHARIN

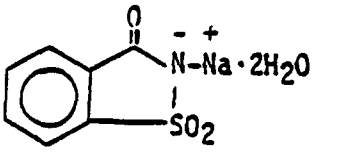
SYNONYM

anhydro-o-sulfamine-benzoic acid.

STRUCTURE



(saccharin)



(sodium saccharin, soluble)

USE/OCCURRENCE

Non-nutritive artificial sweetener used primarily in diet soft drinks; used in formulations for electroplating bath brighteners

HEALTH EFFECTS

1) Experimental feeding studies (1948-1977) have shown that saccharin is a weak carcinogen of the urinary bladder and female reproductive organs, and has caused lymphomas or leukemias (Epstein, 1978)
2) Has been reported to retard growth at very high doses when given to experimental animals
3) When heated to decomposition, emits highly toxic fumes of SO_x and NO_x

TOXICITY DATA

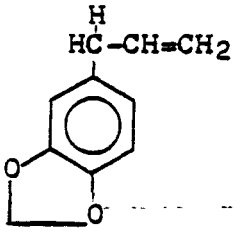
TLV/TWA = N.A.

SAFROLE

SYNONYM

4,-allyl-1,2-methylene-dioxybenzene

STRUCTURE



USE/OCCURRENCE

A natural component of sassafras oil formerly used in root beer flavorings; a pesticide whose use has been cancelled by the USEPA (voluntary); used in denaturing fats in soaps manufacture and also in the manufacture of heliotropin

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 1950 mg/kg
2) Oral LD50 in mouse = 2350 mg/kg
3) Intraperitoneal LDLo in mouse = 64 mg/kg
4) 500 mg for 24 hours is a moderate skin irritant in rabbit

TLV/TWA = N.A.

SELENIOUS ACID

SYNONYM

STRUCTURE

H_2SeO_3

USE/OCCURRENCE

An alkaloid reagent; see SELENIUM listing ;
an oxidizing agent

HEALTH EFFECTS

1) High toxicity via oral and intraperitoneal routes
2) Selenious acid, disodium salt, is an experimental mutagen
3) See SELENIUM listing

TOXICITY DATA

1) Oral LDLo in rat = 25 mg/kg
2) Intraperitoneal LDLo in rat = 10 mg/kg
3) Intravenous LD50 in mouse = 11 mg/kg
4) Oral LD50 in rat = 7 mg/kg (selenious acid, disodium salt)
5) Intraperitoneal LD50 in rat = 3 mg/kg (selenious acid, disodium salt)

TLV/TWA = 0.2 mg/m^3 (as Se)

SELENIUM AND COMPOUNDS, N.O.S.

SYNONYM

STRUCTURE

Se(-2), Se(+2)
Se(+4), Se(+6)

USE/OCCURRENCE

Manufacture of glass, electronic devices, pigments, dyes, insecticides, veterinary medicine, photocopying, anti-dandruff shampoos; found in the sludges and sediments from electrolytic copper refining, may be recovered in flue dust from burning pyrites in sulfuric acid manufacture

HEALTH EFFECTS

1) Elemental selenium is relatively non-irritating and poorly absorbed by the body, although soluble salts (sodium selenite) appear to be efficiently absorbed from the GI tract and intact skin (anti-dandruff shampoo use)
2) Selenium dioxide and selenium oxychloride are strong vesicants (blister-forming agents) which may cause skin destruction upon exposure; these compounds are also strong irritants of the upper respiratory tract, eyes, and mucous membranes of the stomach
3) Selenium dioxide exposure may result in an allergic uticarial, generalized skin rash and in a pink discoloration of the eye lids ("rose-eye")
4) Selenium oxide may cause extremely painful nail beds of the fingers after exposure
5) Hydrogen selenide is an irritant gas
6) Acute selenium poisoning results in central nervous system effects including nervousness, drowsiness, and possibly convulsions; acute selenium dioxide inhalation exposure may produce pulmonary edema
7) Chronic selenium ingestion may produce lassitude, loss of hair, discoloration and loss of fingernails, skin eruptions, GI distress, and tooth damage
8) Chronic selenium inhalation symptoms may include pallor, coated tongue, GI disorders, nervousness, "garlic breath" (dimethyl selenide), liver and spleen damage, anemia, mucosal irritation, and lumbar pain
9) Selenium is an essential trace element and at nutritional levels in incorporated into specific functional proteins; at higher levels it may replace sulfur in certain tissues

SELENIUM (CONT.)

10) Selenium has not been shown to be carcinogenic or teratogenic in man

TOXICITY DATA

1) Inhalation LDLo in rat = 33 mg/kg for 8 hours
2) Intravenous LD50 in rat = 6 mg/kg

TLV/TWA = 0.2 mg/m^3 (selenium compounds, as Se)

SELENIUM SULFIDE

SYNONYM

selenium monosulfide

STRUCTURE

SSe

USE/OCCURRENCE

Ingredient in anti-dandruff shampoos

HEALTH EFFECTS

See SELENIUM listing

TOXICITY DATA

1) Oral LD50 in mouse = 370 mg/kg
2) Oral LDLo in rat = 180 mg/kg
3) Oral LDLo in rabbit = 55 mg/kg

TLV/TWA = 0.2 mg/m^3 (as Se)

SELENOUREA

SYNONYM

STRUCTURE

$SeCNH_4$

USE/OCCURRENCE

HEALTH EFFECTS

See SELENIUM listing

TOXICITY DATA

1) Oral LD50 in rat = 50 mg/kg
2) Intravenous LD50 in mouse = 56 mg/kg

TLV/TWA = 0.2 mg/m^3 (as Se)

SILVER AND COMPOUNDS, N.O.S.

SYNONYM

STRUCTURE

Ag(+1), Ag(+2)

USE/OCCURRENCE

Photographic materials, electroplating, dental alloys, solder and brazing alloys, paints, jewelry, silverware, coinage, mirror production, treatment of gonorrheal inflammation in newborns, germicide, antiseptic, etc.

HEALTH EFFECTS

1) All forms of silver are extremely cumulative once they enter the body tissues and very little is excreted
2) May be absorbed via inhalation, ingestion, mucous menbranes, or broken skin: efficiency by any route is poor
3) Silver(I) nitrate is an OXIDIZER (DOT)
4) Chronic occupational exposures have resulted in the production of a greyish pigmentation of the skin and mucous membranes (argyria); generalized argyria involves widespread pigmentation of the skin surfaces with possible skin blackening with a metallic luster, as well as silver depostion in blood vessel walls, kidneys, testis, pituitary, etc., once deposited, silver pigmentation is permanent; the onset of
5) visible argyria begins at a total dose of 0.9 grams of silver
5) Silver nitrate dust and solutions are highly corrosive to the skin, intestinal tract, and eyes, (blindness may result)
6) Industrial and medicinal exposures have been implicated as causative factors in kidney and lung lesions, and possibly arteriosclerosis
7) Medicinal use of colloidal silver has been reported to result in bronchitis
8) Effects of acute dosing with colloidal silver in experimental studies have included hemolysis, pulmonary edema, congestion, and death
9) Silver is an experimental carcinogen via implantation (solid state)
10) Silver exhibits nutritional antagonism to selenium, vitamin E, and copper

TOXICITY DATA

1) Inhalation TCLo in human producing skin effects = 1 mg/m^3
2) 1 mg is a severe eye irritant dose in rabbit (silver ammonium nitrate)

3) 1500 ug is a severe eye irritant in rabbit (silver ammonium lactate)
4) Oral LD50 in mouse = 100 mg/kg (colloidal silver)
5) Oral LD50 in mouse = 50 mg/kg (silver(I) nitrate)
6) LDLo in man = 29 mg/kg (silver(I) nitrate, unknown route)
7) 1 mg is a severe eye irritant in rabbit (silver(I) nitrate)
8) Also see SILVER CYANIDE listing

TLV/TWA = 0.1 mg/m^3 (silver metal)
0.01 mg/m^3 (soluble compounds, as Ag)

SILVER CYANIDE

SYNONYM

STRUCTURE

AgCN

USE/OCCURRENCE

Silver plating

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) See CYANIDE listing
3) See SILVER listing

TOXICITY DATA

1) Oral LD50 in rat = 123 mg/kg
2) 20 mg for 24 hours in a severe eye irritant in rabbit
3) 500 mg for 24 hours is a mild skin irritant in rabbit

TLV/TWA = 0.01 mg/m^3 (soluble compounds, as Ag)
5 mg/m^3 (cyanides, as CN/skin)

SODIUM CYANIDE

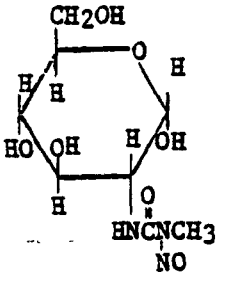
SEE CYANIDE LISTING

STREPTOZOTOCIN

SYNONYM

N-D-glucosyl-(2)-N'-nitrosomethylinea
STR

STRUCTURE



USE/OCCURRENCE

Antibiotic drug used in cancer chemotherapy; isolated from S. achromogenes fermentation broth

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) POSITIVE ANIMAL CARCINOGEN (NCI)
3) An experimental mutagen and neoplastic agent
4) Streptozotoan has the structure on an N-methyl-nitrosamine, a class of powerful carcinogens
5) Produces diabetes mellitus in rats and dogs when administered at a dose level of 50 mg/kg

TOXICITY DATA

1) Oral TDLo in human producing gastrointestinal effects = 1044 mg/kg for 5 days
2) Intravenous TDLo in woman producing systemic effects = 170 mg/kg for 3 weeks
3) Intravenous LDlo in woman = 440 mg/kg for 65 weeks (intermittant dosing)
4) Oral LD50 in mouse = 264 mg/kg
5) Intravenous LD50 in rat = 138 mg/kg
6) Intravenous LDLo in dog = 25 mg/kg

TLV/TWA = N.A.

STRONTIUM SULFIDE

SYNONYM

Strontium nosulfide

STRUCTURE

SrS

USE/OCCURRENCE

HEALTH EFFECTS

1) Chemical toxicity of stable strontium is very low (^{90}Sr, an isotope of strontium, is toxic due to its radioactivity)
2) Strontium maybe essential for normal mammalian growth (i.e., calcification of bone and teeth)
3) Resembles calcium in its action and function; absorbed from the GI tract in limited amounts depending somewhat on dietary calcium levels
4) Excess strontium in the body tends to be stored in the teeth and bones
5) Experimental studies have indicated that massive intravenous does of trontium result in EKG changes, increased salivation, nausea, diarrhea and sudden death due to respiratory paralysis

TOXICITY DATA

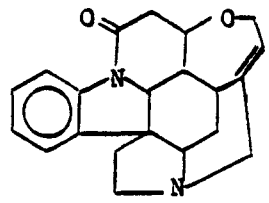
TLV/TWA = N.A.

STRYCHNINE AND SALTS

SYNONYM

various compounds

STRUCTURE



USE/OCCURRENCE

A rodenticide whose use has been restricted by the USEPA; alkaloid extracted from seeds of Strychnos nux-vomica, etc.; use in mammalian predator control cancelled and suspended by USEPA

HEALTH EFFECTS

1) A very poisonous alkaloid via oral, intra-venous, intraperitoneal, and subcutaneous routes
2) Dimethoxy strychnine and strychnine salt, solid, have POISON B (DOT) designations
3) Strychnine poisoning is characterized by irritability, muscular twitching, a sense of impending suffocation, severe convulsions without loss of consciousness, increasingly violent spasms, with death resulting from asphyxia or involvement of vital brain centers
4) When heated, emits highly toxic fumes

TOXICITY DATA

1) Oral LDLo in human = 30 mg/kg
2) LDLo in man = 1103 ug/kg (unknown route)
3) Oral LD50 in rat = 16 mg/kg
4) Oral LD50 in rat = 5 mg/kg (strychnine sulfate)
5) Oral LD50 in rat = 1 mg/kg (dimethoxy strychnine, Brucine)
6) Oral LDLo in dog = 1100 ug/kg
7) Oral LDLo in rabbit = 600 ug/kg
8) Intravenous LD50 in mouse = 410 ug/kg
9) Intravenous LDLo in mouse = 600 ug/kg (strychnine nitrate)
10) Intravenous LD50 in mouse = 475 ug/kg (strychnine sulfate)

TLV/TWA = 0.15 mg/m^3 (strychnine)

TARS

SYNONYM

polynuclear aromatic hydrocarbons
PAH

STRUCTURE

see individual listings

USE/OCCURRENCE

Sources of PAH include incomplete burning of organic materials (C-H free radicals are formed which then polymerize), soot, coal tar, coal gas, coke oven emissions, tobacco smoke, petroleum, cutting oils, etc.; examples of PAH include benz(a) anthracene, benzo(a)pyrene, 3-methyl cholanthrene, DMBA, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Experimental studies have shown that PAH are readily absorbed across all epithelia
3) As a class, PAH contain some of the most extensively studied chemical carcinogens: the first compounds shown to be involved in chemical carcinogenosis
4) Carcinogenic PAH have been shown to induce tumors both at the site of application and in organs distant to the site of absorption, and these effects have been demonstrated in almost all tissues and species tested, regardless of the route of administration
5) Epidemiological studies of workers in industrial settings exposed to PAH-containing materials have linked such exposures to lung cancer
6) Cytotoxic effects of exposure seem to be centered in rapidly proliferating tissues such as bone marrow, lymphoid tissue, etc.
7) Acute and chronic effects may include selective destruction of hematopoietic and lymphoid elements, ovotoxicity, anti-spermatogenic effects, adrenal necrosis, and changes in the intestinal and respiratory epithelia: however, even above no-effect levels, the threat of carcinoma would predominate

TOXICITY DATA

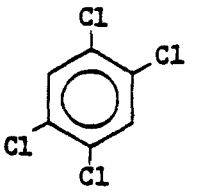
TLV/TWA = 0.2 mg/m^3 (coal tar pitch volatiles, as benzene solubles)
(Human Carcinogen)

1,2,4,5-TETRACHLOROBENZENE

SYNONYM

benzene tetrachloride

STRUCTURE



USE/OCCURRENCE

Chemical intermediate in 2,4,5-T production, etc.

HEALTH EFFECTS

1) Chlorinated benzenes liquid can be absorbed via inhalation and through the skin
2) Chlorinated benzenes are skin, conjunctiva, and upper respiratory mucous membrane irritants
3) Toxicity of chlorinated benzenes generally decreases as the number of substituted chlorine atoms increases.
4) Acute exposure to chlorinated benzenes may result in drowsiness, incoordination, unconsciousness, and possible liver damage
5) Chronic exposure to chlorinated benzenes may result in liver, kidney and lung damage as reported in experimental studies
6) When heated to decomposition, emits highly toxic fumes of chlorides

TOXICITY DATA

1) Oral LD50 in rat = 1500 mg/kg
2) Oral LD50 in mouse = 1035 mg/kg

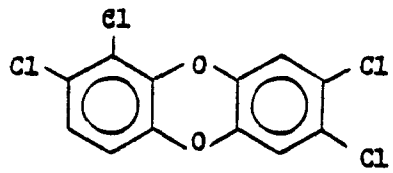
TLV/TWA = N.A.

2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN (TCDD)

SYNONYM

TCDD

STRUCTURE



USE/OCCURRENCE

A contaminant of the chlorophenoxy herbicide 2,4,5-T; also formed as a contaminant during the production of 2,4,5-trichlorophenol from 1,2,4,5-tetrachlorobenzene

HEALTH EFFECTS

1) Extremely high toxicity via oral and dermal routes
2) Workers exposed to TCDD during 2,4,5-T manufacture have developed chloraene, muscular weakness, loss of appetite and weight, sleep disturbances, orthostatic hypotension, abdominal pain, liver impairment, hyperpigmentation of the skin, hirsutism (excessive hair growth), and psychopathological changes
3) An experimental teratogen, carcinogen, and mutagen
4) Experimental studies have indicated that chronic exposure results in liver and thymus damage
5) TCDD is a potent inducer of hepatic and renal microsomal drug metabolizing enzymes

TOXICITY DATA

1) Oral LD50 in rat (male and female) = 22-45 ug/kg
2) Oral LD50 in mouse = 114 ug/kg
3) Oral LDLo in monkey = 70 ug/kg
4) Oral LDLo in rabbit = 10 ug/kg
5) Oral LDLo in dog = 3 mg/kg
6) Dermal LD50 in rabbit = 275 ug/kg
7) Dermal LDLo in mouse = 80 ug/kg
8) Oral LD50 in guinea pig = 600 ng/kg
9) 2 mg is a moderate eye irritant in rabbit

TLV/TWA = N.A.

TETRACHLOROETHANE, N.O.S.

See 1,1,2,2-TETRACHLOROETHANE listing

SYNONYM **STRUCTURE**

USE/OCCURRENCE

HEALTH EFFECTS

TOXICITY DATA

1) Oral LD50 in rat = 200 mg/kg
2) Inhalation LCLo in rat = 1000 ppm for 4 hours
3) Dermal LD50 in rabbit = 3990 mg/kg

TLV/TWA = 35 mg/m3 (skin) (1,1,2,2-tetrachloroethane)

1,1,1,2, - TETRACHLOROETHANE

SYNONYM

STRUCTURE

Cl_3CCH_2Cl

USE/OCCURRENCE

Solvent, chemical intermediate

HEALTH EFFECTS

1) Chronic exposure may produce liver damage
2) Chloroethanes are absorbed rapidly via oral and inhalation routes

TOXICITY DATA

1) 100 mg is a severe eye irritant in rabbit
2) 500 mg for 24 hours is dermal irritant in rabbit

TLV/TWA = N.A.

1,1,2,2,-TETRACHLOROETHANE

SYNONYM

STRUCTURE

$Cl_2CHCHCl_2$

USE/OCCURRENCE

Dry cleaning agent, chemical intermediate, solvent, etc.

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) RApidly absorbed via oral and inhalation routes
3) Some evidence indicates absorption via the skin affects the CNS only
4) Exposure can induce narcotic effects, paralysis of certain muscles, (including the heart) blood changes headache, constipation, nausea, liver dysfunction, pulmonary edema, renal damage
5) Repeated or prolonged contact can produce dermatitis
6) Experimental mutagen
7) Oxidative decomposition by UV radiation or by contact with hot metal results in the formation of small quantities of phosgene, HCl,CO,CO_2 or dichloroacetylchloride

TOXICITY DATA

1) Oral TDLo in human = 30mg/kg (CNS effects)
2) Inhalation TCLo in human = 1000 mg/m^3 for 30 minutes (CNS effects)
3) Inhalation LCLo in rat = 1000 ppm for 4 hours
4) Oral LD50 in dog = 300 mg/kg

TLV/TWA = 35 mg/m^3 (skin)

TETRACHLOROETHYLENE

SYNONYM

Perchloroethylene
PCE
carbon dichloride

STRUCTURE

$Cl_2C{=}CCl_2$

USE/OCCURRENCE

Solvent, degreaser, formerly used as a fumigant; a common air contaminant, widespread in the environment

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Exposures may result in dermatitis; eye and nose irritation, liver and kidney effects, and possible anesthetic death at lethal concentrations
3) Chronic exposures have been reported to result in impaired liver function
4) PCE tends to accumulate in body fat; biological half-life = 65 hours
5) An experimental mutagen
6) When decomposed, highly toxic fumes of chloride are emitted

TOXICITY DATA

1) Inhalation TCLo in human producing systemic effects = 96 ppm for 7 hours
2) Inhalation TCLo in man producing eye effects = 280 ppm for 2 hours
3) Inhalation TCLo in man producing CNS effects = 600 ppm for 10 minutes
4) Inhalation LCLo in rat = 4000 ppm for 4 hours
5) Oral LD50 in mouse = 8100 mg/kg
6) 162 mg is a mild eye irritant in rabbit
7) 810 for 24 hours is a severe skin irritant in rabbit

TLV/TWA = 670 mg/m^3 (skin)

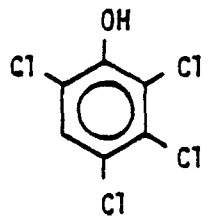
TETRACHLOROMETHANE

SEE CHLOROFORM LISTING

TETRACHLOROPHENOLS

SYNONYM

STRUCTURE



(2,3,4,6-TCP)

USE/OCCURRENCE

Chlorinated phenols are chemical intermediates, pesticides, disinfectants, antigumming agents; tetra chlorophenols have been isolated from flue gas condensates of municipal incinerators

HEALTH EFFECTS

1) 2,3,4,6-tetrachlorophenol is a strong uncoupler of oxidative phosphorylation and also affects other enzyme systems
2) Emit highly toxic fumes when heated to decomposition

TOXICITY DATA

1) Oral LD50 in rat = 140 mg/kg
2) Subcutaneous LD50 in rat = 210 mg/kg
3) Oral LD50 in mouse = 400 mg/kg (2,3,4,5-TCP)
4) Oral LD50 in rat = 140 mg/kg (2,3,4,6-TCP)
5) dermal LD50 in rabbit = 250 mg/kg (2,3,4,6-TCP)
6) Oral LD50 in mouse = 109 mg/kg (2,3,5,6-TCP)

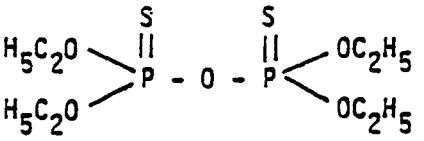
TLV/TWA = *N.A.*

O,O,O,O-TETRAETHYL DITHIOPYROPHOSPHATE

SYNONYM

Sulfotepp
Bladafume
Dithione
TEDP

STRUCTURE



USE/OCCURRENCE

Organophosphate Insecticide, acaricide

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON

TOXICITY DATA

1) Oral rat LD50 = 5 mg/kg
2) Dermal LD50 in rabbit = 20 mg/kg
3) Intramuscular LD50 in rat = 55 ug/kg

TLV/TWA = 0.2 mg/m^3 (skin)

TETRAETHYL LEAD

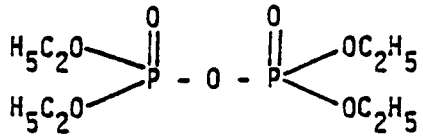
See LEAD, TETRAETHYL listing

TETRAETHYL PYROPHOSPHATE

SYNONYM

TEPP
Tetron

STRUCTURE



USE/OCCURRENCE

Organophosphorous insecticide: related compounds have been used as nerve gas chemical warfare agents ; see PARATHION listing

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) TEPP exposure results in irreversible inhibition of cholinesterase with a subsequent accumulation of acetylcholine in the body
3) Oraganophosphorous insecticide poisoning effects smooth muscles, the heart, exocrine glands, skeletal muscles, and the central nervous system: a wide variety of symptoms have been reported
4) In cases of lethal poisoning, the immediate cause of death is asphy ia due to respiratory failure
5) Exposure may result in local, systemic, and/or delayed neurot xic effects
6) Small doses at frequent time intervals are largely additive
7) When heated, emits highly toxic fumes
8) See PARATHION listing

TOXICITY DATA

1) Oral LDLo in human = 2 mg/kg
2) Oral TDLo in human producing CNS effects = 432 ug/kg
3) Oral LD50 in rat = 500 ug/kg
4) Oral LD50 in mouse = 7 mg/kg
5) Intramuscular LDLo in human = 500 ug/kg
6) Intramuscular LD50 in rat = 1800 ug/kg
7) Parenteral TDLo in human producing CNS effects = 100 ug/kg
8) Dermal LD50 in rabbit = 5 mg/kg
9) Ocular LD50 in rabbit = 1 mg/kg

TLV/TWA = 0.05 mg/m^3 (skin)

TETRAMETHYL LEAD

See LEAD, TETRAMETHYL listing

THALLIC OXIDE

SYNONYM

thallium peroxide
thallium sesqinoxide

STRUCTURE

Tl_2O_3

USE/OCCURRENCE

See THALLIUM listing

HEALTH EFFECTS

1) See THALLIUM listing
2) Experimental studies have suggested that thallium oxide is more toxic orally than by intravenous or intraperitoneal adminstration

TOXICITY DATA

1) Oral LD50 in rat = 22 mg/kg
2) Oral LDLo in dog = 34 mg/kg
3) Oral LDLo in rabbit = 34 mg/kg
4) Intraperitoneal LDLo in rat = 80 mg/kg
5) Intraperitoneal LDLo in rabbit = 67 mg/kg
6) Intravenous LDLo in rabbit = 44 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (soluble compounds/as Tl)

THALLIUM AND COMPOUNDS, N.O.S.

SYNONYM

See individual listings

STRUCTURE

Tl^{+1} (thallous ion)
Tl^{+3} (thallic ion)

USE/OCCURRENCE

Thallium and its compounds are used as pesticides, catalysts, phosphor activators, in the manufacture of optical equipment, in alloys, special glass manufacture, etc. its medical use for epilation (hair removal) has been almost discontinued; the thallous ion is the more stable and common form

HEALTH EFFECTS

1) An extremely toxic and cumulative poison
2) May be absorbed via inhalation, ingestion, and percutaneous routes
3) Acute poisoning (ingestion) results in gastrointestinal symptoms, abdominal colic, vomiting, insomnia, loss of kidney function, peripheral neuritis, strabismus (mis-alignment of the eyes), disorientation, convulsions, joint pain, hair loss; death may result due to CNS damage
4) Moderate or long term exposures may result in fatigue, limb pain, metallic taste in the mouth, loss of hair, peripheral neuritis, proteinuria, and joint pain
5) Chronic exposure may produce optic atrophy, paraesthesias (skin numbness, etc.), changes in eye response, loss of vision has been related to industrial exposures, adrenal gland damage, nervous system degeneration, pulmonary edema. and liver and kidney effects
6) Estimated lethal dose in humans is 8-12mg/kg
7) Thallium compounds emit highly toxic fumes when heated
8) Thallium freely crosses the placenta
9) Also see individual THALLIUM compound listings

TOXICITY DATA

1) LDLo in man = 4412 mg/kg (unknown route)
2) Also see individual listings of thallium compounds

TLV/TWA = 0.1 mg/kg (skin) (soluble compounds/as Tl)

THALLIUM (I) ACETATE

SYNONYM

thallous acetate

STRUCTURE

$TlC_2H_3O_2$

USE/OCCURRENCE

See THALLIUM listing

HEALTH EFFECTS

1) See THALLIUM listing
2) Children have been reported to tolerate a dose of 8 mg/kg

TOXICITY DATA

1) Human LDLo = 26 mg/kg (unknown route of administration)
2) Child LDLo = 8 mg/kg (unknown route)
3) Oral LDLo in rat = 25 mg/kg
4) Oral LD50 in mouse = 35 mg/kg
5) Oral LDLo in dog = 13 mg/kg
6) Oral LDLo in rabbit = 25 mg/kg
7) Subcutaneous LDLo in mouse = 500 mg/kg
8) Subcutaneous LDLo in rabbit = 5 mg/kg

TLV/TWA = 0.1 mg/m^3 (soluble compounds, as Tl)

THALLIUM (I) CARBONATE

SYNONYM

thallous carbonate

STRUCTURE

Tl_2CO_3

USE/OCCURRENCE

Used in the manufacture of imitation diamonds; see THALLIUM listing

HEALTH EFFECTS

See THALLIUM listing

TOXICITY DATA

1) Oral LDLo in rat = 23 mg/kg
2) Oral LD50 in mouse = 21 mg/kg
3) Subcutaneous LDLo in rat = 18 mg/kg
4) Subcutaneous LD50 in mouse=27 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (soluble compounds/as Tl)

THALLIUM (I) CHLORIDE

SYNONYM

thallous chloride
thallium monochloride

STRUCTURE

Tl Cl

USE/OCCURRENCE

See THALLIUM listing ; catalyst in chlorinations

HEALTH EFFECTS

See THALLIUM listing

TOXICITY DATA

1) Oral LD50 in mouse = 24 mg/kg
2) Intraperitoneal LD50 in mouse = 24 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (soluble compounds/as Tl)

THALLIUM (I) NITRATE

SYNONYM

thallous nitrate

STRUCTURE

$Tl\ NO_3$

USE/OCCURRENCE

See THALLIUM listing; analytical chemistry reagent

HEALTH EFFECTS

See THALLIUM listing

TOXICITY DATA

1) Oral TDLo in man producing CNS effects = 73 mg/kg
2) Oral LD50 in mouse = 33 mg/kg
3) Oral LDLo in dog = 45 mg/kg
4) Subcutaneous LDLo in rat = 20 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (soluble compounds/as Tl)

THALLIUM SELENITE

SYNONYM

Thallous selenite

STRUCTURE

Tl_2Se

USE/OCCURRENCE

See THALLIUM listing

HEALTH EFFECTS

1) See THALLIUM listing
2) See SELENIUM listing

TOXICITY DATA

1) Oral LDLo in rat = 50 mg/kg

TLV/TWA = 0.1 mg/m^3 (skin) (soluble compounds) as Tl)

THALLIUM (I) SULFATE

SYNONYM

thallous sulfate

STRUCTURE

Tl_2SO_4

USE/OCCURRENCE

The sulfate salts of thallium had been used as insecticides and rodenticides: all pesticide products have been suspended and cancelled by USEPA

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) Thallous ion (1t) is readily absorbed through the skin or gastrointestinal tract
3) Toxic effects of exposure may include gastrointestinal disturbances, hair loss, polyneuritis of the legs and feet, leg weakness or paralysis, psychic disturbances, neuritis of the optic nerve, and possible, cataracts
4) Thallous sulfate is a chronic poison and cummulates in liver, brain, and skeletal muscle; a cellular toxicant like arsenic
5) The fatal human dose is about 500 mg (Tl); many reported fatalities
6) Also see THALLIUM listing

TOXICITY DATA

1) Oral LDLo in human = 3 mg/kg
2) Oral LD50 in mouse = 29 mg/kg
3) Subcutaneous LDLo in rat = 13 mg/kg

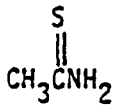
TLV/TWA = 0.1 mg/m^3 (skin) (as Tl)

THIOACETAMIDE

SYNONYM

acetothioamide
ethanethioamide

STRUCTURE



USE/OCCURRENCE

Analytical reagent, H_2S substitute

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental mutagen and neoplastic agent
3) Acute exposures may result in liver cell necrosis
4) The target organ of the thioamides is the thyroid gland with respect to carcinogenic action although in some cases the liver has been involved

TOXICITY DATA

1) Oral LD50 in rat = 200 mg/kg
2) Intraperitoneal LD50 in mouse = 300 mg/kg

TLV/TWA = N.A.

THIOSEMICARBAZIDE

SYNONYM

N-aminothionrea

STRUCTURE

NH_2 $CSNHNH_2$

USE/OCCURRENCE

Reagent for metal detection

HEALTH EFFECTS

1) Extremely toxic via the oral route

TOXICITY DATA

1) Oral LD50 in rat = 9160 µg/kg
2) Oral LD50 in dog = 10 mg/kg
3) Oral LD50 in cat = 20 mg/kg

TLV/THA = N.A.

THIOUREA

SYNONYM

2-thiourea
thiocarbamide
THU

STRUCTURE

H_2NCSNH_2

USE/OCCURRENCE

Photographic fixing agent, vulcanization accelerator, component in resins manufacturing, etc.; formerly used as an antithyroid drug

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Reported to cause bone marrow depression, anemia, leukopenia, thrombocytopenia, allergic skin eruptions, and goiter formation
3) Experimental mutagen
4) When heated to decomposition, emits highly toxic fumes of SO_x

TOXICITY DATA

1) Oral TDLo in human producing blood effects = 1660 mg/kg for 5 weeks
2) LDLo in man = 147 mg/kg (unkown route)
3) Oral LD50 in rat = 125 mg/kg
4) Oral LD50 in mouse = 8500 mg/kg

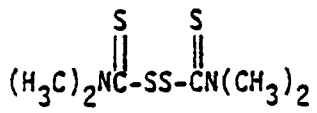
TLV/TWA = N.A.

THIURAM

SYNONYM

thiram
tetramethylthiuram disulfide
bis (dimethylthiocarbamoyl) disulfide
disulfiram

STRUCTURE



USE/OCCURRENCE

Rubber accelerator, vulcanizer, disinfectant, component in antiseptic sprays and soaps, carbamate pesticide, etc.

HEALTH EFFECTS

1) Excessive exposures may result in rhinitis, sneezing, mucous membrane conjunctivitis, skin irritation with erythema (acute redness) and uticaria (eruptive skin rash), allergic contact dermatitis, vomiting, lassitude, salivation and profuse sweating
2) Exposure with concurrent ingestion of alcohol results in violent nausea, vomiting, palpitation, rapid pulse, dizziness, and hypotension: thiram is tructurallly related to the anti-alcohol medication "Antabuse"
3) An experimental teratogen and mutagen
4) Acute toxicity studies in animals have resulted in liver, kidney, and brain damage
5) A reversible cholinesterase inhibitor

TOXICITY DATA

1) Inhalation TCLo in human producing pulmonary effects = 30 ug/m^3 for 5 years (intermittant exposure)
2) Oral LD50 in rat = 560 mg/kg
3) Oral LD50 in mouse = 1350 mg/kg

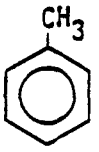
TLV/TWA = 5 mg/m^3

TOLUENE

SYNONYM

toluol
methylbenzene

STRUCTURE



USE/OCCURRENCE

Chemical intermediate, solvent, fuel component

HEALTH EFFECTS

1) FLAMMABLE LIQUID (DOT); same DOT label
2) May cause irritation of the eyes, respiratory tract, and skin
3) May cause dermatitis
4) Acute exposure results in CNS depression, insomnia., collapse, coma
5) In rare cases of high exposure, anemia, leucopenia and enlarged liver may be found
6) Toluene can be contaminated with benzene (a suspected etiologic agent in human leukemia)
7) Teratogenic in mice
8) Reports of menstrual disturbances in female workers exposed to several solvents including toluene
9) Toluene can decrease the body's metabolism of other administered chemicals

TOXICITY DATA

1) 300 ppm is an eye irritant in human
2) Inhalation TCLo in human = 100 ppm (psychotropic effects)
3) Inhalation TCLo in human producing CNS effects = 200 ppm
4) Oral LD50 in rat = 5000 mg/kg
5) Dermal LD50 in rabbit = 14 g/kg
6) 2 mg for 24 hours is a severe eye irritant in rabbit
7) 870 ug is a mild eye irritant in rabbit

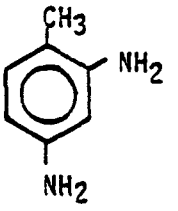
TLV/TWA = 375 mg/m^3 (skin)

TOLUENE-2,4-DIAMINE

SYNONYM

3-amino-p-toluidine
2,4-tolamine

STRUCTURE



USE/OCCURRENCE

Chemical intermediate

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) Has a marked toxic effect on the liver
3) Can cause irritation and blistering of skin
4) Emits toxic fumes when heated
5) An experimental mutagen

TOXICITY DATA

1) Oral LD50 in rat = 260 mg/kg
2) 100 mg for 24 hours is a severe eye irritant in rabbit
3) 500 mg for 24 hours is a mild skin irritant

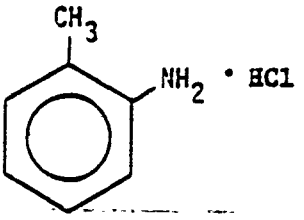
TLV/TWA = N.A.

o-TOLUIDINE HYDROCHLORIDE

SYNONYM

2-toluidine hydrochloride
1-amino-2-methylbenzene hydrochloride

STRUCTURE



USE/OCCURRENCE

HEALTH EFFECTS

1) SUSPECTED HUMAN CARCINOGEN (IARC)
2) POSITIVE ANIMAL CARCINOGEN (NCI)
3) Main route of absorption is via inhalation
4) Symptoms of exposure include headache, weakness, difficulty in breathing, air hunger, psychic disturbances, marked initation of the kidneys and b dder
5) Toluidine has been reported to influence ferric hemoglobin levels in the body which can contribute to asphyxiation
6) When heated, emits highly toxic fumes
7) Also see ANILINE listing

TOXICITY DATA

1) Oral LD50 in rat = 2957 mg/kg
2) Intraperitoneal LD50 in rat = 150 mg/kg

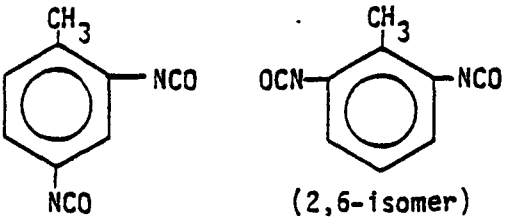
TLV/TWA = 22 mg/m^3 (o-toluidine)

TOLYLENE DIISOCYANATE

SYNONYM

toluene 2,4-diisocyanate (TDI)
toluene 2,6-diisocyanate

STRUCTURE



(2,4-isomer, TDI) (2,6-isomer)

USE/OCCURRENCE

Intermediate in the production of poly-urethane foams, coatings, elastomers, and spande fibers (TDI); a common air contaminant

HEALTH EFFECTS - (all data refers to the 2,4-isomer)

1) POISON B (DOT); the DOT label is POISON
2) A severe irritant of the eyes (permanent damage may result), respiratory tract, and skin (blistering can result)
3) Symptoms of exposure may include bronchitis, nausea, vomiting, abdominal pain, wheezing, pulmonary edema, and possible death at lethal concentrations
4) Ingestion may result in burns of the mouth and stomach
5) Asthmatic sensitization has been reported among workers
6) Chronic exposures may result in decreased lung function
7) When heated to decomposition, emits highly toxic fumes

TOXICITY DATA - (all data refers to the 2,4-isomer unless otherwise stated)

1) Inhalation TCLo in human producing pulmonary effects = 0.02 ppm for 2 years
2) Inhalation TCLo in human producing an irritant effect = 0.5 ppm
3) Inhalation LD50 in rat = 600 ppm for 4 hours
4) Oral LD50 in rat = 5800 mg/kg
5) 100 mg is a severe eye irritant in rabbit
6) Inahlation TCLo in human producing an irritant effect = 80 ppb (2,6-isomer)

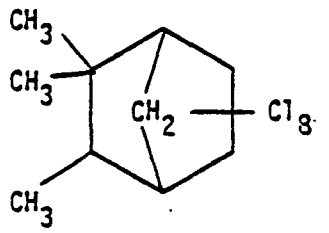
TLV/C = o.14 mg/m^3 (2,4-isomer)

TOXAPHENE

SYNONYM

octachlorocamphene
chlorinated camphene
Strobane-T

STRUCTURE



USE/OCCURRENCE

Chlorinated hydrocarbon insecticide; use restricted by USEPA

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Toxic and lethal amounts can enter the body orally, dermally, and via inhalation
3) Systemic absorption is increased by the liquid preparation and the presence of digestible oils
4) A moderate skin irritant
5) Toxic exposure can result in generalized convulsions and possible death from respiratory failure
6) Lethal dose for man is estimated to be 2 - 7 grams, a toxicity of about 4 times that of DDT
7) An experimental mutagen
8) Bioaccumulates
9) When heated to decomposition, emits highly toxic fumes of chloride

TOXICITY DATA

1) Oral LDLo in human = 40 mg/kg
2) LDLo in man = 44 mg/kg (unknown route)
3) Oral LD50 in rat = 40 mg/kg
4) Dermal LD50 in rabbit = 1025 mg/kg
5) Dermal LD50 in rat = 600 mg/kg
6) Oral LD50 in dog = 15 mg/kg

TLV/TWA = 0.5 mg/m^3 (skin)

TRIBROMOMETHANE

SYNONYM

bromoform
methenyl tribromide

STRUCTURE

$CHBr_3$

USE/OCCURRENCE

Chemical intermediate, solvent, component in fire-resistant chemicals and gauge fluids; may be formed during water chlorination; produced by natural sources (esp. red alage)

HEALTH EFFECTS

1) Absorbed via inhalation, GI tract, and the skin
2) Metabolites of bromoform may include carbon monoxide, and the brominated analog of phosgene
3) A respiratory tract irritant, narcotic, and metabolic poison: symptoms of low dose exposures may include headache, listlessness, and vertigo while more acute poisoning may result in unconsciousness, loss of reflexes, convulsions, and possible death due to respiratory failure; liver damage also has been reported
4) Experimental studies have shown liver and kidney damage
5) An experimental neoplastic agent (tumor causing) and mutagen
6) When heated to decomposition emits highly toxic fumes

TOXICITY DATA

1) Oral LD50 in mouse = 1400 mg/kg
2) Subcutaneous LD50 in mouse = 1820 mg/kg
3) Subcutaneous LDLo in rabbit = 410 mg/kg

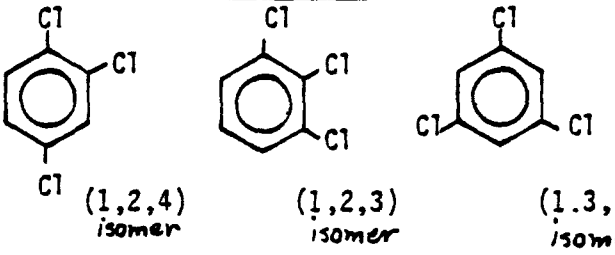
TLV/TWA = 5 mg/m^3 (skin)

TRICHLOROBENZENES

SYNONYM

1, 2, 3 - 1, 2, 4 - and 1, 3, 5 - trichlorobenzene
TCB

STRUCTURE



USE/OCCURRENCE

Herbicide, termite control agent

HEALTH EFFECTS

1) The 1,3,5- and 1,2,3- isomers have induced experimental loss of hair (alopoecia) and are moderate skin, eye, and mucous membrane irritants
2) Liver injury has been reported after 1,2,3- isomer exposure
3) See TETRACHLOROBENZENE listing for health effects of chlorinated benzenes

TOXICITY DATA

1) Oral LD50 in rat = 756 mg/kg (1, 2, 4 - TCB)
2) Oral LD50 in mouse = 766 mg/kg (1, 2, 4 - TCB)
3) 1950 mg for 13 weeks (intermittant dosing) is a moderate skin irritant in rabbit (1, 2, 4 - TCB)

TLV/TWA = 40 mg/m^3 (1,2,4-trichlorobenzene)

1,2,4-TRICHLOROBENZENE

See TRICHLOROBENZENES listing

1,1,1-TRICHLOROETHANE

SYNONYM

methyl chloroform

STRUCTURE

Cl_3CCH_3

USE/OCCURRENCE

Solvent, degreaser, carbon tetrachloride substitute; highly stable in the troposphere; formerly used as a fumigant (pesticide uses cancelled)

HEALTH EFFECTS

1) Readily abosrbed via oral and inhalation routes
2) The liquid and vapor are eye irritants
3) Repeated contact can cause dermatitis
4) Acts systemically as a narcotic and CNS depressant with acute exposure symptoms of dizziness, incoordination, drowsiness, unconsciousness, possible death
5) Cardia arrhythmia possible consequence of exposure
6) Exposure to high concentrations may induce a type of liver pathology
7) Upon contact with hot metal or exposure to UV radiation, it will decompose to form the irritant gases HCl, phosgene, and dichloroacetylene
8) At ambient temps. hydrolyzes to acetic and hydrochloric acids.
9) Attacks natural rubber

TOXICITY DATA

1) Inhalation LCLo in man = 27 grams/m^3 for 10 minutes
2) Inhalation TCLo in man producing psychotropic effects = 350 ppm
3) Oral TCLo in human producing gastrointestinal effects = 670 mg/kg
4) Inhalation TCLo in human producing CNS effects = 920 ppm for 70 minutes
5) Oral LD50 in rat = 10300 mg/kg
6) Inhalation LCLo in rat = 1000 ppm
7) Oral LD50 in dog = 750 mg/kg

TLV/TWA = 1900 mg/m^3

1,1,2-TRICHLOROETHANE

SYNONYM

vinyl trichloride

STRUCTURE

Cl_2CHCH_2Cl

USE/OCCURRENCE

Chemical intermediate, solvent

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Comparable to carbon tetrachloride
3) Rapid oral and inhalation absorption; dermal absorption could be significant
4) Has narcotic properties and acts as a local irritant to eyes, nose and lungs
5) Chronic exposures may be injurious to liver and kidneys

TOXICITY DATA

1) Oral LD50 in rat = 1140 mg/kg
2) 162 mg is a mild eye irritant in rabbit
3) 810 mg for 24 hours is a severe dermal irritant in rabbit

TLV/TWA = 45 mg/m^3 (skin)

TRICHLOROETHYLENE

SYNONYM

ethylene trichloride

STRUCTURE

$Cl_2C=CHCl$

USE/OCCURRENCE

Solvent, chemical intermediate, dry cleaning agent, used in chemical extraction of caffeine from coffee, degreaser

HEALTH EFFECTS

1) CARCINOGENIC (CAG)
2) Readily absorbed by all routes of exposure
3) Has been shown to cross the placenta
4) May cause eye, nose, throat irritation, possible dermatitis
5) Acute exposure depresses the CNS leading to headache, dizziness, irregular heart beat, intoxication, and possible death
6) Addiction and peripheral neuropathy
7) Chronic exposure can lead to CNS and PNS disturbances, and to liver damage
8) Experimental mutagen
9) Carcinogenicity and mutagenicity in experimental studies has been questioned due to presence of toxic contaminants

TOXICITY DATA

1) 5 ppm is a human eye irritant
2) Oral LDLo in human = 7 gm/kg
3) Inhalation TCLo in human producing CNS effects = 160 ppm for 83 minutes
4) Inhalation TCLo in human producing irritant effects = 110 ppm for 8 hours
5) Oral LD50 in rat = 4920 mg/kg
6) 20 mg for 24 hours is a severe eye irritant in rabbit
7) 500 mg for 24 hours is a severe skin irritant in rabbit

TLV/TWA = 535 mg/m^3

TRICHLOROFLUOROMETHANE

SYNONYM

Freon II
fluorotrichloromethane

STRUCTURE

$FCCl_3$

USE/OCCURRENCE

Refrigerant, aerosol propellant (current government regulations should be consulted as most aerosol propellant uses were banned in the United States as of 3/17/79)

HEALTH EFFECTS

1) See CHLORINATED FLUOROCARBONS listing
2) May be absorbed via ingestion, skin route, and inhalation
3) Elimination of fluorocarbons from the body is via expired air
4) Exposure to high concentrations may result in narcosis and anesthesia
5) High concentrations have been shown to induce cardiovascular and pulmonary effects in experimental studies
6) When heated to decomposition, emits highly toxic fumes of fluorides and chlorides

TOXICITY DATA

1) Inhalation TC50 in human producing eye effects = 50000 ppm for 30 minutes
2) Inhalation TCLo in human producing peripheral nervous system effects = 50000 ppm for 30 minutes
3) Inhalation LC50 in mouse = 10 pph for 30 mintues
4) Inhalation LC50 in rabbit = 25 pph for 30 mintues
5) Inhalation LCLo in rat = 10 pph for 20 minutes

TLV/TWA = 5600 mg/m^3

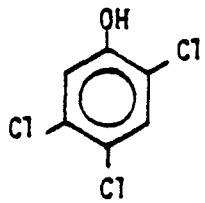
TRICHLOROMETHANETHIOL

TRICHLOROPHENOLS

SYNONYM

TCP

STRUCTURE



(2.4,5-TCP)

USE/OCCURRENCE

Chemical intermediates, germicide (2, 4, 5 - TCP); trichlorophenols can form as a result of metabolic degredation of chlorophenoxy herbicides; they are also found in flue gas condensates from municipal incinerators

HEALTH EFFECTS

1) Chlorinated phenols have a strong irritant effect via oral, dermal, and inhalation routes
2) Most available trichlorophenols contain contaminating amounts of highly toxic TCDD
3) 2, 4, 5 - TCP has been reported to be an experimental neoplastic agent
4) Powerful uncouplers of oxidative phosphorylation
5) When heated to decomposition, they emit highly toxic fumes

TOXICITY DATA

1) (2, 3, 6 - TCP) intraperitoneal LD50 in rat = 308 mg/kg
2) (2, 4, 5 - TCP) intraperitoneal LD50 in rat = 355 mg/kg
3) (2, 4, 5 - TCP) oral LD50 in rat = 820 mg/kg
4) (3, 4, 5 - TCP) intraperitoneal LD50 in rat = 372 mg/kg

TLV/TWA = N.A.

2,4,5-TRICHLOROPHENOL

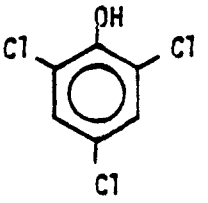
See TRICHLOROPHENOLS listing

2,4,6-TRICHLOROPHENOL

SYNONYM

phenachlor
2, 4, 6 - TCP

STRUCTURE



USE/OCCURRENCE

Wood preservative, bactericide, antimildew treatment
See TRICHLOROPHENOLS listing

HEALTH EFFECTS

1) A POSITIVE ANIMAL CARCINOGEN (NCI)
2) A convulsant
3) SEE: TRICHLOROPHENOLS LISTING

TOXICITY DATA

1) Intraperitoneal LD50 in rat = 276 mg/kg
2) Oral LD50 in rat = 820 mg/kg
3) 250 ug for 24 hours is a severe eye irritant in rabbit

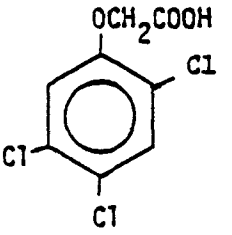
TLV/TWA = N.A.

2,4,5-TRICHLOROPHENOXYACETIC ACID (2,4,5-T)

SYNONYM

2,4,5-T

STRUCTURE



USE/OCCURRENCE

Chlorophenoxy herbicide; use restricted by USEPA; chlorodioxin contaminants not allowed

HEALTH EFFECTS

1) SUSPECTED ANIMAL CARCINOGEN (IARC)
2) An experimental teratogen and mutagen
3) Readily absorbed orally and via inhalation
4) Symptoms of exposure may include weakness, lethargy, anorexia, diarrhea, ventricular fibrilation and/or cardiac arrest and death
5) Chlorophenoxy herbicides have produced contact dermatitis in man, and chloracne in workers involved in 2,4,5-T manufacture
6) The toxicity of the chlorophenoxy herbicides has been attributed at least in part to contaminants such as TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin
7) See also 2,4-D listing

TOXICITY DATA

1) Oral LD50 in rat = 300 mg/kg
2) Oral LD50 in mouse = 389 mg/kg
3) Oral LD50 in dog = 100 mg/kg
4) Oral LD50 in mammal = 500 mg/kg

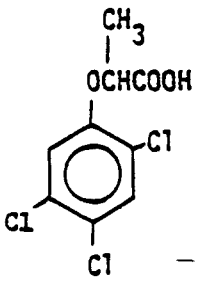
TLV/TWA = 10 mg/m^3

2,4,5-TRICHLOROPHENOXYPROPRIONIC ACID (2,4,5-TP) (SILVEX)

SYNONYM

Silvex
2,4,5-TP
Fenoprop

STRUCTURE



USE/OCCURRENCE

Chlorinated phenoxy herbicide; use of Silvex has been restricted by USEPA, chlorodioxin contaminants not allowed

HEALTH EFFECTS

1) An experimental teratogen
2) Experimental studies have indicated liver and kidney damage as a result of exposure
3) Chlorophenoxy herbicides have produced contact dermatitis in man, and chloracne in workers involved 2,4,5-T manufacture
4) The toxicity of the chlorophenoxy herbicides has been attributed at least in part to contaminants such as TCDD (2,3,78-tetrachlorodibenzo-p-dioxin)
5) See also 2,4,5-T listing

TOXICITY DATA

1) Oral LD50 in rat = 650 mg/kg
2) Oral LD50 in mammal = 650 mg/kg

TLV/TWA = N.A.

TRICHLOROPROPANE, N.O.S.

SYNONYM	STRUCTURE
1,1,1-trichloropropane	$Cl_3CCH_2CH_3$ (1,1,1-isomer)
1,1,2-trichloropropane	$Cl_2CHCHClCH_3$ (1,1,2-isomer)
1,2,2-trichloropropane	$ClCH_2CCl_2CH_3$ (1,2,2-isomer)
1,2,3-trichloropropane	$ClCH_2CHClCH_2Cl$ (1,2,3-isomer)

USE/OCCURRENCE

Solvents, degreasing agents, crosslinking agent (1,2,3-isomer)

HEALTH EFFECTS

See 1,2,3-TRICHLOROPROPANE listing

TOXICITY DATA

1) 100 ppm for 15 minutes is an irritant dose in human eye (1,1,1-trichloropropane)
2) 20 mg is a severe eye irritant in rabbit (1,1,1-trichloropropane)
3) 20 mg is a severe eye irritant in rabbit (1,1,2-trichloropropane)
4) 140 mg is a severe eye irritant in rabbit (1,2,3-trichloropropane)
5) Inhalation LCLo in rat = 8000 ppm for 4 hours (1,1,1-trichloropropane)
6) Inhalation LC50 in rat = 2000 ppm for 4 hours (1,1,2-trichloropropane)
7) Inhalation LCLo in rat = 320 mg/kg (1,2,3-trichloropropane)
8) Oral LD50 in rat = 1250 mg/kg (1,1,2-trichloropropane)
9) Oral LD50 in rat = 1230 mg/kg (1,2,2-trichloropropane)

TLV/TWA = 300 mg/m^3 (as 1,2,3-trichloropropane

1,2,3-TRICHLOROPROPANE

SYNONYM

trichlorohydrin

STRUCTURE

$Cl-CH_2-CHCl-CH_2Cl$

USE/OCCURRENCE

Paint and varnish remover, solvent, degreasing agent, cross-linking agent

HEALTH EFFECTS

1) High concentrations are irritating to eyes and mucous membranes
2) Exposure to elevated levels can cause narcosis
3) A possible liver toxicant
4) As a class, chlorinated aliphatic hydrocarbons emit highly toxic fumes of phosgene when heated to decomposition
5) Can see cumulative toxicity: a lipid solvent

TOXICITY DATA

1) Oral LD50 in rat = 320 mg/kg
2) Dermal LD50 in rabbit = 1770 mg/kg
3) 140 mg is a severe eye irritant in rabbit
4) 20 mg of 1,1,2-TC propane or 1,1,1-TC propane is a severe eye irritant in rabbit

TLV/TWA = 300 mg/m^3

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

SYNONYM

Freon 113

STRUCTURE

$FCl_2C-CClF_2$

USE/OCCURRENCE

See CHLORINATED FLUOROCARBONS listings

HEALTH EFFECTS

1) See CHLORINATED FLUOROCARBONS and TRICHLOROFLUOROMETHANE listings

TOXICITY DATA

1) Inhalation TCLo in human producing a CNS effect = 4500 ppm
2) Inhalation LCLo in rat = 87000 ppm for 6 hours
3) Oral LD50 in rat = 43 grams/kg
4) 500 mg is a mild skin (open) irritant dose in rabbit

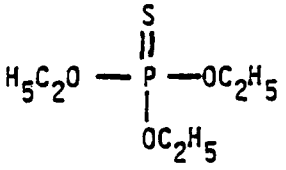
TLV/TWA = 7600 mg/m^3

O,O,O-TRIETHYL PHOSPHOROTHIOATE

SYNONYM

triethyl thiophosphate

STRUCTURE



USE/OCCURRENCE

Platicizer, lubricant additive, antifoam agent, hydraulic fluid, chemical intermediate

HEALTH EFFECTS

1) An organophosphate which may be expected to produce symptoms of chloinesterase inhibition in humans: see PARATHION listing
2) May be assumed to be absorbed dermally and via the oral route based on studies done on the structurally similar insecticide demeton
3) Triethyl phosphate, a possible metabolite of O,O,O-triethyl phosphoro-thioate, has been reported to be a weak experimental mutagen
4) The structurally related insecticide demeton has been reported to induce mild teratogenic and reproductive effects in experimental studies
5) See DISULFOTON listing

TOXICITY DATA

1) Inhalation LCLo in rat = 41 ppm for 4 hours
2) Intravenous LDLo in rat = 250 mg/kg

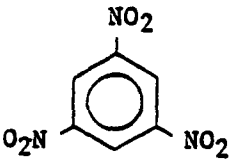
TLV/TWA = N.A.

TRINITROBENZENE

SYNONYM

1,3,5-Trinitrobenzene

STRUCTURE



USE/OCCURRENCE

Explosive, vulcanizing agent for natural rubber; powerful and brisant

HEALTH EFFECTS

1) CLASS A EXPLOSIVE (DOT); the DOT label is EXPLOSIVE A
2) Experimental toxicity studies have indicated that exposures result in liver and CNS damage
3) Acute exposures induce methemoglobin formation *in vivo*
4) Also see INITROBENZENE listing
5) When heated to decomposition, emits highly toxic fumes (NO_x) and explodes

TOXICITY DATA

1) Oral LD50 in rat =505 mg/kg
2) Oral DL50 in mouse =572 mg/kg
3) Intravenous LD50 in mouse = 32 mg/kg

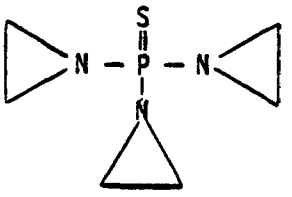
TLV/TWA = N.A.

TRIS (1-AZRIDINYL) PHOSPHINE SULFIDE

SYNONYM

TIFOSYL
Triethylenethiophorotriamide
Thio-TEPA

STRUCTURE



USE/OCCURRENCE

Alkylating antineoplastic drug

HEALTH EFFECTS

1) PSOITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) An experimental mutagen and teratogen
3) Side effects of use may include nausea, anorexia (loss of appetite), and bone marrow depression

TOXICITY DATA

1) Oral TDLo in woman producing a carcinogenic effect = 17 mg/kg for 56 weeks (intermittant exposure)
2) Parenteral TDLo in man producing CNS effects = 631 ug/kg
3) Intravenous LD50 in rat = 1 mg/kg
4) Intravenous LD50 in monkey = 2 mg/kg
5) Oral LD50 in mouse = 38 mg/kg

TLV/TWA = N.A.

TRIS(2,3-DIBROMOPROPYL)PHOSPHATE

SYNONYM

Firemaster T23P
Tris-BP

STRUCTURE

$(CH_2BrCHBrCH_2)_3PO_4$

USE/OCCURRENCE

Used as a flame retardant in children's sleepwear

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (NCI)
2) An experimental mutagen and neoplastic agent
3) Can be absorbed through the skin or ingested by infants after sucking on their sleepwear
4) May cause testicular atrophy and sterility

TOXICITY DATA

1) Oral LD50 in rat = 1010 mg/kg
2) Intraperitoneal LD50 in mouse = 300 mg/kg
3) 500 mg for 24 hours is a severe skin irritant in rabbit
4) 500mg for 24 hours is a moderate eye irritant in rabbit

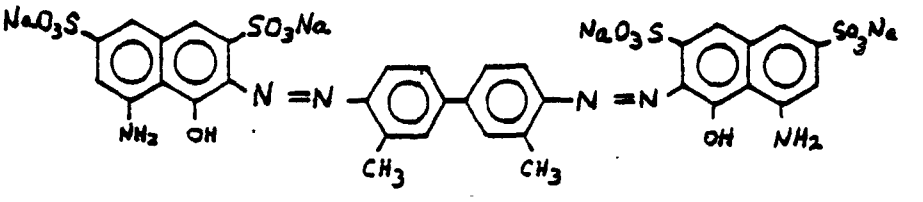
TLV/TWA = N.A.

TRYPAN BLUE

SYNONYM

amidine blue 4B
chrome leather blue 3B
naphthylamine blue

STRUCTURE



USE/OCCURRENCE

Dye/color agent

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC)
2) An experimental teratogen

TOXICITY DATA

1) Intraperitoneal LDLo in rat = 300 mg/kg
2) Intravenous LDLo in rat = 300 mg/kg

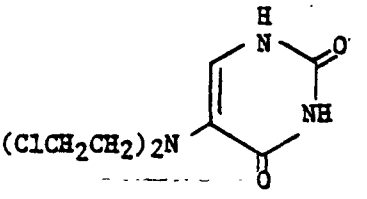
TLV/TWA = N.A.

URACIL MUSTARD

SYNONYM

Demethyldopan
5-(bis(2-chloroethyl)amine)uracil

STRUCTURE



USE/OCCURRENCE

Alkylating antineoplastic drug

HEALTH EFFECTS

1) POSITIVE ANIMAL CARCINOGEN (IARC/NCI)
2) An experimental mutagen, neoplastic agent and teratogen

TOXICITY DATA

1) Oral LD50 in rat = 7500 ug/kg
2) Intraperitoneal LD50 in rat = 2800 ug/kg

TLV/TWA = N.A.

URETHANE

See ETHYL CARBAMATE listing

VANADIC ACID, AMMONIUM SALT

SYNONYM

ammonium vanadate
ammonium metavanadate

STRUCTURE

NH_4VO_3

USE/OCCURRENCE

Dyeing and printing on woolens, wood staining, pottery finishing, inks production, photographic developer, analytical reagent

HEALTH EFFECTS

1) See VANADUUM PENTOXIDE listing for health effects information on vanaduim compounds
2) Highly toxic via oral route

TOXICITY DATA

1) Oral LD50 in rat = 18 mg/kg

TLV/TWA = N.A.

VANADIUM PENTOXIDE (DUST)

SYNONYM

vanadic anhydride

STRUCTURE

V_2O_5

USE/OCCURRENCE

Industrial catalyst in oxidation reactions, used in glass and ceramic glazes, a steel additive, used in welding electrode coatings; vandium compounds are common air contaminants; some medicinal use

HEALTH EFFECTS

1) An eye irritant which may produce profuse lacrimation and a burning sensation of the conjunctiva (membrane covering the eye)
2) A skin irritant which may cause intensely itching exzematous lesions, or a generalized uticaria (eruptive skin rash)
3) Exposure may result in a greenish discoloration of the tongue
4) Vanadium compounds are also respiratory tract irritants: brief exposures may result in serous or hemorrhagic rhinitis (inflammation of the nasal mucous membranes), sore throat, cough, trachcitis, bronchitis expectoration, and chest pain; exposures to higher concentrations of dust may result in pulmonary edema and pueumonia which can be fatal
5) Recovery after inhalation of high levels of dust may include persistant bronchitis attacks resembling asthma, and dyspnea (labored breathing)
6) Other effects, linked to industrial vanadium exposures, include GI distress nausea, vomiting, abdominal pain, cardiac palpitation, tremor, nervous depression, and kidney damage
7) Vanadium compounds, once inside the body, inhibit cholesterol synthesis and cholinesterase
8) Experimental studies have reported effects on adrenals, bone marrow, and liver as a result of exposure to vanadium compounds
9) No chronic-type effects have been reported; however, there have been postulates that heart disease is related to vanadium air pollution and cadmium

TOXICITY DATA

1) Inhalation TCLo in human producing pulmonary effects = 346 mg/m^3
2) Inhalation TCLo in human producing an allergic system response = 1 mg/m^3 for 8 hours
3) Inhalation LCLo in rat = 70 mg/m^3 for 2 hours
4) Oral LD50 in rat = 10 mg/kg

TLV/TWA = 0.5 mg/m^3 (as V_2O_5 dust)

TLV/C = 0.05 mg/m^3 (as V_2O_5 fume)

VINYL CHLORIDE

SYNONYM

chloroethylene

STRUCTURE

CH_2CHCL

USE/OCCURRENCE

Vinyl monomer for polyvinyl chloride, solvent, a chemical intermediate, etc.; all pesticide products containing vinyl chloride as an active or inactive ingredient have been cancelled or suspended for use in the home, food handling establishments, hospitals or in enclosed areas (US EPA)

HEALTH EFFECTS

1) POSITIVE HUMAN CARCINOGEN (IARC) of several organs, including angiosarcoma of the liver
2) FLAMMABLE GAS (DOT); same label
3) A skin irritant, may cause frostbite upon evaporation of liquid
4) Eyes may be immediately and severly irritated
5) A CNS depressant: acute exposures can result in death
6) Chronic exposures may result in acroosteolysis, Raynaud's phenomenon, and sclerodermatus skin changes
7) On standing, forms peroxides in air and can explode; when heated to decomposition, emits highly toxic fumes of phosgene
8) Large fires of this material are practically in extinguishable
9) An experimental mutagen and carcinogen

TOXICITY DATA

1) Inhalation TCLo in man producing a carcinogenic effect = 500 ppm for 4 years (intermittant exposure)
2) Inhalation TC in man producing a possible tumorigenic effect = 200 ppm for 15 years (intermittant exposure)
3) Inhalation TCLo in rat producing a carcinogenic effect = 50 ppm for 52 weeks (intermittant dosing)
4) Oral LD50 in rat = 500 mg/kg

TLV/TWA = 10 mg/m^3

VINYLIDENE CHLORIDE

See 1,1-DICHLOROETHYLENE listing

ZINC CYANIDE

SYNONYM

STRUCTURE

$Zn(CN)_2$

USE/OCCURRENCE

Electroplating, removing NH_3 from producer gas; formerly used as an antineurotic drug

HEALTH EFFECTS

1) POISON B (DOT); the DOT label is POISON
2) See CYANIDE listing

TOXICITY DATA

1) Intraperitoneal LDLo in rat = 100 mg/kg

TLV/TWA = 5 mg/m^3 (skin) (as CN)

ZINC PHOSPHIDE

SYNONYM

Mous-Con
Kilrat
Phosvin

STRUCTURE

P_2Zn_3

USE/OCCURRENCE

Rodenticide

HEALTH EFFECTS

1) FLAMMABLE SOLID (DOT); the DOT label is FLAMMABLE SOLID and DANGEROUS WHEN WET
2) High toxicity via the oral route; reacts with H_2O and HCl in the gastrointestinal tract to produce phosphine gas which causes severe gastrointestinal irritation
3) Reacts violently with acids, acid fumes, and moisture to emit highly toxic and flammable phosphine gas which inhaled in sufficient concentration can cause fatal pulmonary edema
4) When heated, may emit highly toxic fumes of POx
5) Reacts with acids to form flammable phosphine gas (PH_3)

TOXICITY DATA

1) Oral LDLo in woman = 20 mg/kg
2) Oral LD50 in rat = 40 mg/kg

TLV/TWA = N.A.

Appendix I. Acute Toxicity Rating System [1]

Rating	Oral LD50 (rat)	Dermal LD50 (rabbit)
Extremely Toxic	< 5 mg/kg	< 5 mg/kg
Highly Toxic	5-50 mg/kg	5-200 mg/kg
Moderately Toxic	> 50-500 mg/kg	> 200-500 mg/kg
Slightly Toxic	> 0.5-5 g/kg	> 0.5-5 g/kg
Relatively Nontoxic	> 5 g/kg	> 5 g/kg

[1] Michigan DNR, 1980

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