Appendix B -

Uses, Sources and Potential Exposure to Toxic Air Pollutants Evaluated in the Community Air Screen Program[1]

1,1,1-Trichloroethane[2] (71-55-6)[3]

Uses

Because 1,1,1-trichloroethane is an ozone-depleting chemical, production of it has been highly regulated. 1,1,1-Trichloroethane was used as a solvent and degreasing agent in industry. Currently, it is almost entirely used as a precursor for hydrofluorocarbons, commonly used for refrigeration. On a limited basis, it may be used for essential applications such as medical devices and aviation safety.

Sources and Potential Exposure

1,1,1-Trichloroethane was used an ingredient in consumer products such as household cleaners, glues, and aerosol sprays. Therefore, the general population may be exposed to limited amounts through volatilization from these products and primarily indoors rather than outdoors.

1,1,2,2-Tetrachloroethane[4] (79-34-5)

Uses

There is very little production of 1,1,2,2-tetrachloroethane in the U.S. Any remaining production would likely be for on-site uses as a chemical intermediate, as a trace constituent with other chemicals, or as part of a waste stream in releases to the environment. In the past, 1,1,2,2-tetrachloroethane was used in large amounts to produce trichloroethylene, tetrachloroethylene, and 1,2,-dichloroethylene. It was also used as a solvent, in cleaning and degreasing metals, in paint removers, varnishes and lacquers, in photographic films, as an extractant for oils and fats, and in pesticides.

Sources and Potential Exposure

As it is no longer widely used in the U.S. as an end-product, present sources of 1,1,2,2-tetrachloroethane are fugitive emissions or discharges when it is generated as a by-product and during chemical production activities in which it is an intermediate product. Exposure of the general population is expected to be very low. Limited occupational exposure to 1,1,2,2-

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[1] Unless otherwise noted, the primary source for information on uses, sources and potential exposure was the USEPA's Health Effects Notebook for Hazardous Air Pollutants available online at: http://www.epa.gov/ttnatw01/hlthef/hapindex.html

[2] http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=432&tid=76

[3] Number in parenthesis is called the CAS number. It is a unique identifier assigned to each chemical by the Chemical Abstract Service (CAS) which is a function of the American Chemical Society. CAS numbers are assigned because the same chemical can be identified by many different names. For example, 1,1,1-trichloroethane is also called methyl chloroform, Solvent 111, Genklene and R-140a.

[4] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for 1,1,2,2-Tetrachloroethane (Update). U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2008.

tetrachloroethane may occur through inhalation of the vapors or through skin contact due to spills or accidents in the workplace.

1,1,2-Trichloroethane (79-00-5)

Uses

1,1,2-Trichloroethane is primarily used as a chemical intermediate in the production of 1,1-dichloroethene. It is also used as a solvent for chlorinated rubbers, fats, oils, waxes, and resins.

Sources and Potential Exposure

1,1,2-Trichloroethane has not been reported in food or soil, and exposure from contaminated drinking water appears to be rare. Exposure to 1,1,2-trichloroethane may occur in the workplace where it is used as a solvent.

1,1-Dichloroethane[5] (75-34-3)

Uses

1,1-Dichloroethane is used as an intermediate in the manufacture of other products such as vinyl chloride, l,l,l-trichloroethane, and to a lesser extent high vacuum rubber. It also has limited use as a solvent for plastics, oils, and fats, and is used as both a cleaning agent and a degreaser.

Sources and Potential Exposure

Based on its industrial use, 1,1-dichloroethane is primarily released to the atmosphere, and people are potentially exposed to this chemical through the inhalation or ingestion of contaminated air or water. However, because data available on production, import, export, use, and disposal are limited, it is difficult to estimate the potential for human exposure.

1,1-Dichloroethylene (75-35-4)

Uses

1,1-Dichloroethylene is primarily used as a chemical intermediate for organic chemical synthesis. It is also used in the production of polyvinylidene chloride copolymers. The major application of these chloride copolymers is in the production of flexible films for food packaging (SARAN® and VELON® wraps).

Sources and Potential Exposure

Air releases, primarily from emissions from polymer synthesis and fabrication industries, are the greatest source of ambient 1,1-dichloroethylene. Occupational exposure to 1,1-dichloroethylene may occur by inhalation or dermal contact. 1,1-Dichloroethylene has been detected at low levels in a number of drinking water supplies across the United States.

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[5] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for 1,1-Dichloroethane. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1990.

1,2,4-Trichlorobenzene[6] (120-82-1)

Uses

1,2,4-Trichlorobenzene is primarily used as a solvent to dissolve special materials as oils, waxes, resins, greases, and rubber. It is also frequently used to produce dyes and textiles. 1,2,4-Trichlorobenzene is also one of the most important solvents used for extracting fullerenes from soot.

Sources and Potential Exposure

The general population is exposed to 1,2,4-trichlorobenzene from inhalation of ambient air and ingestion of food and drinking water. Exposures may be greater near heavily industrialized areas or at Superfund sites where this solvent is present.

1,2,4-Trimethylbenzene[7,8] (95-63-6)

Uses

1,2,4-Trimethylbenzene is used as a solvent in manufacture of dyes, perfumes, resins and in the manufacture of pharmaceuticals. It is used as a solvent and paint thinner. Production of 1,2,4-trimethylbenzene occurs during petroleum refining as a major component of the C9 aromatic hydrocarbon fraction. It typically constitutes around 40% of the C9 fraction. Another primary use is as a gasoline additive.

Sources and Potential Exposure

1,2,4-Trimethylbenzene is released directly to the environment as a component of gasoline and as an emission from gasoline-powered vehicles, municipal waste-treatment plants, and coal-fired power stations. Occupational exposure may also occur from industrial uses.

1,2-Dibromoethane (106-93-4)

Uses

1,2-dibromoethane is the third most common groundwater contaminant due to leaking of underground storage tanks.[9] 1,2-dibromoethane appears to be formed naturally by algae growth[10,11] and has been detected in ocean waters and air.[12] 1,2-dibromoethane was used as a

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[6] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Trichlorobenzenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2010.

[7] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

[8] http://www.epa.gov/chemfact/s_trimet.txt

[9] Ron Falta. *EDB and DCA from Leaded Gasoline.* Clemson University Symposium presentation. 2005 Available online at: http://www.clemson.edu/ces/hydro/symposium/2005_present/Falta_EDB.pdf

[10] Laturnus, F., et.al., *Finding the scattered pieces of the mechanisms behind the formation of volatile halogen-containing C_1- and C_2-compounds by polar and cold-temperate macroalgae.* Reports on Polar and Marine Research. 271(2008).

[11] Laturnus, Frank. *Release of Volatile Halogenated Organic Compounds by Unialgal Cultures of Polar Macroalgae.* Chemosphere 31(6). 1995.

[12] T.H. Class, K. Ballschmiter. *Chemistry of Organic Traces in Air, VIII: Sources and Distribution of Bromo- and Bromochloromethanes in Marine Air and Surfacewater of the Atlantic Ocean.* Journal of Atmospheric Chemistry 6 (1988) 35-46.

fumigant to protect against insects, pests, and nematodes in citrus, vegetable, and grain crops, and as a fumigant for turf, particularly on golf courses. In 1984, EPA banned its use as a soil and grain fumigant. Currently, there are no registered allowable pesticide or fumigant uses for 1,2-dibromoethane in New York.[13] Trace quantities of 1,2-dibromoethane emissions have been measured from natural gas fired reciprocating engines used at pipeline compressor and storage stations. [14] It is still used in some engine lubricants and greases[15] and as an intermediate for dyes, resins, waxes, and gums.

1,2-dibromoethane is used in leaded aviation fuel (known as avgas)[16] because it acts as a lead scavenger.[17] When aircraft power down such as during descent or when an aircraft is idling or taxing on the ground, incomplete combustion occurs because the engine is not running as efficiently as it does under full power. The hotter the temperature inside the combustion chamber of the engine, the more efficiently the fuel is burned. [18] Incomplete combustion results in the release of carbon monoxide and unburned fuel.[19] EPA proposed changes to aviation fuel primarily to address lead emissions but also to address the inclusion of 1,2-dibromoethane in fuel. EPA concluded that aircraft using leaded fuel are currently an ambient source of 1,2-dibromoethane.[20] Aircraft operating on avgas have spark-ignited internal-combustion engines which are propeller airplanes. At large airports the proportion of flights using avgas is small. For example, at the LaGuardia and JFK airports less than 1% of the flights use this type of fuel.[21] Since 1988 the amount of aviation gasoline supplied in the U.S. has steadily decreased with a 50% reduction between 1988 and 2012.[22]

Sources and Potential Exposure

Possible sources of 1,2-dibromoethane emissions to the ambient air are production and processing facilities. Exposure could occur from inhalation of ambient air near industries that use 1,2-dibromoethane or through the ingestion of contaminated drinking water. Exposures also can occur from aircraft using avgas or racing cars using leaded gasoline.

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[13] Personal communication on 2/27/2014 with Jeanine Broughel, Chief, Product Registration and Pest Management Alternatives Section, Bureau of Pest Management for DEC.

[14] US Environmental Protection Agency 2000. AP 42, Compilation of Air Pollutant Emission Factors. Volume 1, Fifth Edition. Available On-line at: http://www.epa.gov/ttn/chief/ap42/ch03/index.html

[15] US Environmental Protection Agency 2009. Hazard Characterization Document. Screening –Level Hazard Characterization 1,2-Dibromoethane (CASRN 106-93-4).

[16] Seyferth, D., "The Rise and Fall of Tetraethyllead. 2", Organometallics, 2003, volume 22, pages 5154-5178.

[17] US Environmental Protection Agency. 2006 Historical Uses (1,2-dibromoethane and 1,2-dichloroethane). Cleaning Up Underground Storage Tank Releases. 1,2-dibromoethane is added to tetraethyl lead blend with a composition by weight of approximately 18% of the blend. 1,2-dichloroethane is also added at 19% by weight of the blend.

[18] John P. Hinz, Lt Col David M. Sonntag, Capt. Brian M. Clarke. *Interim Base-Level Guide for Exposure to Jet Fuel and Additives* December 2011.

[19] Glenn Research Center – Safegarding Our Atmosphere. Available online at: http://www.nasa.gov/centers/glenn/about/fs10grc.html

[20] U.S. Environmental Protection Agency. *Advanced Notice of Proposed Rulemaking on Lead Emissions from Piston-Engine Aircraft Using Leaded Aviation Gasoline: Proposed Rule.* Federal Register, Vol 75, No 81. 4/28/2010. Available online at: http://www.gpo.gov/fdsys/pkg/FR-2010-04-28/html/2010-9603.htm

[21] Federal Aviation Agency FAA Operations & Performance Data. Available online at: https://www.faa.gov

[22] U.S. Energy Information Administration. Petroleum & Other Liquids. U.S. Product Supplied of Aviation Gasoline. Available online at: http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGAUPUS1&f=A

1,2-Dichlorobenzene[23,24,25] (95-50-1)

Uses

The greatest use of 1,2-dichlorobenzene is as a chemical intermediate for making agricultural chemicals, primarily herbicides. Other present and past uses include: solvent for waxes, gums, resins, wood preservatives, paints; insecticide for termites and borers; in making dyes; as a coolant, deodorizer, and degreaser.

Sources and Potential Exposure

Occupational exposure to 1,2-dichlorobenzene may be through inhalation and dermal contact with this compound at workplaces where 1,2-dichlorobenzene is produced or used. The general population may be exposed to 1,2-dichlorobenzene via inhalation of ambient air, ingestion of food and drinking water. 1,2-Dichlorobenzene is a by-product in the manufacture of 1,4-dichlorobenzene and may be a pathway by which 1,2-dichlorobenzene is released into the environment.

1,2-Dichloroethane[26] (107-06-2)

Uses

1,2-Dichloroethane is currently used as a chemical intermediate and as a solvent in closed systems. In the U.S., about 98% of the 1,2-dichloroethane produced is used to manufacture vinyl chloride. Smaller amounts of 1,2-dichloroethane are used in the synthesis of 1,1-dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, aziridines, and ethylene diamines and in chlorinated solvents.

Sources and Potential Exposure

There are no known natural sources of 1,2-dichloroethane. Releases of this compound to the environment may result from the manufacture, use, storage, distribution, and disposal of 1,2-dichloroethane.

1,2-Dichloropropane[27,28] (78-87-5)

Uses

1,2-Dichloropropane is used as a chemical intermediate in the production of chlorinated organic chemicals, as an industrial solvent, in ion exchange manufacture, in toluene diisocyanate production, in photographic film manufacture, for paper coating, and for petroleum catalyst regeneration. 1,2-Dichloropropane is used in furniture finish, dry cleaning fluid, and paint remover, gum processing, metal degreasing, oil processing, and as a rubber- and wax-making

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[23] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.
[24] http://www.epa.gov/ogwdw/pdfs/factsheets/voc/tech/o-dichlo.pdf
[25] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Dichlorobenzenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2006.
[26] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for 1,2-Dichloroethane. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2001.
[27] USEPA's Health Effects Notebook for Hazardous Air Pollutants
[28] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

agent, and a chemical intermediate in the production of tetrachloroethylene and carbon tetrachloride. Previously used as an agricultural soil fumigant.

Sources and Potential Exposure

Occupational exposure to 1,2-dichloropropane may occur during its production, during its use in chemical reactions or as an industrial solvent, or from evaporation from wastewater that contains the chemical. General population exposures may occur if exposed to contaminated water sources.[29]

1,3,5-Trimethylbenzene[30] (108-67-8)

Uses

Used as a paint thinner, solvent, and motor fuel component. It is also used as an intermediate in the synthesis of dyes and antioxidants.

Sources and Potential Exposure

1,3,5-Trimethylbenzene is released directly to the environment as a component of gasoline and as an emission from gasoline-powered vehicles, municipal waste-treatment plants, and coal-fired power stations. Workers and the general population that operate gasoline-pumping stations and off-set printers may be exposed 1,3,5-trimethylbenzene.

1,3-Butadiene[31] (106-99-0)

Uses

1,3-Butadiene is used in the production of rubber and plastics. It is also used in copolymers including acrylics.

Sources and Potential Exposure

Sources of 1,3-butadiene released into the air include motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion, and cigarette smoke. Higher levels of 1,3-butadiene may be found in highly industrialized cities or near oil refineries, chemical manufacturing plants, and plastic and rubber factories. 1,3-Butadiene has been found in drinking water and in plastic or rubber food containers, and very low levels in some food samples. Occupational exposure to 1,3-butadiene may occur in the rubber, plastics, and resins industries.

1,3-Dichlorobenzene[32] (541-73-1)

Uses

1,3-Dichlorobenzene has been used in the production of herbicides and insecticides as well as in the production of pharmaceuticals and dyes.

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[29] Environmental Working Group – Drinking Water Quality Report. http://www.ewg.org/tap-water/whatsinyourwater/2983/NY/NewYork/12-Dichloropropane/

[30] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

[31] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for 1,3-Butadiene. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2009.

[32] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Dichlorobenzenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2006.

Sources and Potential Exposure

1,3-Dichlorobenzene is not found frequently in the air of homes and buildings because this chemicals is not used in household products. Whereas, 1,4-dichlorobenzene is used as a deodorant. Occupational exposures may occur where this chemical is used in production.

1,4-Dichlorobenzene[33] (106-46-7)

Uses

For the past 20 years, 1,4-dichlorobenzene has been used principally (25–55% of all uses) as a space deodorant for toilets and refuse containers, and as a fumigant for control of moths, molds, and mildews. In recent years, the use of 1,4-dichlorobenzene in the production of polyphenylene sulfide resin has increased steadily (25– 50% of its total use). 1,4-Dichlorobenzene is also used as an intermediate in the production of other chemicals such as 1,2,4-trichlorobenzene (approximately 10%). Minor uses of 1,4-dichlorobenzene include its use in the control of certain tree-boring insects and ants, and in the control of blue mold in tobacco seed beds.

Sources and Potential Exposure

People are exposed to 1,4-dichlorobenzene mainly by breathing vapors from 1,4-dichlorobenzene products used in the home, such as mothballs and toilet-deodorizer blocks. Reported levels of 1,4-dichlorobenzene in some homes and public restrooms have ranged from 0.291 to 272 ppb of 1,4-dichlorobenzene in air. 1,4-Dichlorobenzene has been found in 13% of surface water samples collected during a national survey. These samples contained about 0.008–154 ppb of 1,4-dichlorobenzene.

Individuals can be occupationally exposed to 1,4-dichlorobenzene in workplace air at much higher levels than the general public is exposed. Levels measured in the air of factories that make or process 1,4-dichlorobenzene products have ranged from 5.6 to 748 ppm of air. In addition, people who live or work near industrial facilities or hazardous waste sites that have high levels of 1,4-dichlorobenzene may have greater exposure to these compounds due to emissions from the facilities and waste sites. People who work or live in buildings where air fresheners, toilet block deodorants, or moth balls containing 1,4-dichlorobenzene are used also are expected to have a higher exposure to this compound, which could occur from skin contact as well as by breathing.

a-Chlorotoluene (Benzylchloride)[34,35] (100-44-7)

Uses

The primary use of *a*-chlorotoluene is in the manufacture of benzyl butyl phthalate and other flexible poly(vinyl chloride) uses such as food packaging. *a*-Chlorotoluene is used as a chemical intermediate in the manufacture of certain dyes and pharmaceutical, perfume and flavor products. *a*-Chlorotoluene can be used in the manufacture of synthetic tannins and as a gasoline gum inhibitor.

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[33] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Dichlorobenzenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2006

[34] USEPA's Health Effects Notebook for Hazardous Air Pollutants

[35] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

Sources and Potential Exposure

Sources of *a*-chlorotoluene emissions into the air include emissions or venting with other gases in industrial settings. Emissions of *a*-chlorotoluene from floor tile plasticized by butyl benzyl phthalate have been reported. *a*-Chlorotoluene has also been detected in emissions from the burning of polyvinyl chloride, neoprene and rigid urethane foam compounds. Individuals may be exposed to *a*-chlorotoluene through breathing contaminated air or from exposure to water or soil that has been contaminated with *a*-chlorotoluene. Individuals may be exposed to *a*-chlorotoluene if exposed to gasoline where this chemical has been used.

Benzene[36] (71-43-2)

Uses

Benzene is used as a constituent in motor fuels; as a solvent for fats, waxes, resins, oils, inks, paints, plastics, and rubber; in the extraction of oils from seeds and nuts; and in photogravure printing. It is also used as a chemical intermediate. Benzene is also used in the manufacture of detergents, explosives, pharmaceuticals, and dyestuffs.

Sources and Potential Exposure

Everyone is exposed to a small amount of benzene every day, primarily through breathing air that contains benzene. The major sources of benzene exposure are tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions. Air releases from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure. Auto exhaust and industrial emissions account for about 20% of the total national exposure to benzene. About half of the exposure to benzene in the United States results from smoking tobacco or from exposure to tobacco smoke. Individuals employed in industries that manufacture or use benzene may be exposed to the highest levels of benzene. These industries include benzene production (petrochemicals, petroleum refining, and coke and coal chemical manufacturing), rubber tire manufacturing, and storage or transport of benzene and petroleum products containing benzene. Other workers who may be exposed to benzene include workers in the steel industry, printers, rubber workers, shoe makers, laboratory technicians, firefighters, and gas station employees. Individuals may also be exposed to benzene by consuming contaminated water. Non-anthropogenic sources of benzene include volcanoes and forest fires.

Bromodichloromethane[37,38] (75-27-4)

Uses

The principal use of bromodichloromethane is as a chemical intermediate for organic synthesis and as a laboratory reagent.

Sources and Potential Exposure

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[36] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Benzene. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2007

[37] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Bromodichloromethane. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1989

[38] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

Bromodichloromethane's production and use as a chemical intermediate and solvent may result in its release to the environment through various waste streams. The general population is exposed to bromodichloromethane through consumption of contaminated drinking water, beverages, and food products. The contamination is a result of inadvertent formation during chlorination treatment of the drinking water and subsequent use of chlorinated tap water to produce food products. Exposure can also occur through inhalation of background levels in ambient air and through dermal exposure in chlorinated swimming pool water. The predominant anthropogenic source of bromodichloromethane release to the environment is its inadvertent formation during chlorination treatment processes of water.

Bromomethane (Methyl bromide) (74-83-9)

Uses

The primary use of methyl bromide is as a fumigant in soil to control fungi, nematodes, and weeds; in space fumigation of food commodities (e.g., grains); and in storage facilities (such as mills, warehouses, vaults, ships, and freight cars) to control insects and rodents.

Sources and Potential Exposure

Workers who fumigate homes and fields may be exposed to high levels of methyl bromide if proper safety precautions are not followed. Some methyl bromide is formed naturally by algae or kelp in the ocean.

Carbon disulfide (75-15-0)

Uses

Carbon disulfide is used predominantly in the manufacture of rayon, cellophane, and carbon tetrachloride. Carbon disulfide is also used to produce rubber chemicals and pesticides.

Sources and Potential Exposure

Carbon disulfide was one of the seven sulfur-gas released from problem drywall installed in U.S. homes.[39] The main route of exposure to this compound is in the workplace. Workers in plants that use carbon disulfide in their manufacturing processes have a high degree of exposure potential. Releases of carbon disulfide from industrial processes are almost exclusively to the air; individuals in proximity to these sites may be exposed. Carbon disulfide has been detected in some samples of drinking water. Low amounts of carbon disulfide may be emitted naturally from volcanoes and marshes.

Carbon tetrachloride[40] (56-23-5)

Uses

The major use of carbon tetrachloride has historically been for the production of chlorofluorocarbons, such as dichlorodifluoromethane (F-12) and trichlorofluoromethane (F-11),

[39] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Carbon disulfide. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. Addendum to the Profile August 2012.

[40] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Carbon tetrachloride. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2005.

which are used primarily as refrigerants. Historically, it was widely used as a cleaning fluid in the home and as a degreaser in industry. Carbon tetrachloride was phased out in January 1996 by the Montreal Protocol. It is only available for those uses for which no effective substitute has been found. The atmospheric half-life for carbon tetrachloride is 50 years or more and therefore, it will remain a ubiquitously distributed airborne contaminant for many years to come.

Sources and Potential Exposure

The general public is exposed to a small amount carbon tetrachloride everyday because of global circulating concentrations because this chemical has a long atmospheric half-life. Individuals may be exposed to carbon tetrachloride in the air from accidental releases from production and uses, and from its disposal in landfills where it may evaporate into the air or leach into groundwater. Carbon tetrachloride is also a common contaminant of indoor air; the sources of exposure appear to be building materials or products, such as cleaning agents, used in the home. Workers directly involved in the manufacture or use of carbon tetrachloride are most likely to have significant exposures to carbon tetrachloride. Individuals may also be exposed to carbon tetrachloride by drinking contaminated water.

Chlorobenzene (108-90-7)

Uses

The primary uses of chlorobenzene are as a solvent for pesticide formulations, diisocyanate manufacture, and degreasing automobile parts and for the production of nitrochlorobenzene. In the past, chlorobenzene was used as an intermediate in phenol and DDT production.

Sources and Potential Exposure

Exposure to chlorobenzene appears to be primarily occupational. In urban areas, chlorobenzene may be released to the ambient air during its manufacture and use.

Chloroethane (75-00-3)

Uses

Chloroethane is used in the production of ethyl cellulose, use as a solvent, refrigerant, in the manufacture of dyes, chemicals, and pharmaceuticals, and as a medication to alleviate pain associated with insect burns and stings. In the past, chloroethane was used in the production of tetraethyl lead, an anti-knock additive to leaded gasoline. Government-mandated reduction in the amount of lead additives used in gasoline in the United States and a shift to the use of unleaded gasoline has caused a drastic reduction in the amount of chloroethane required for the production of tetraethyl lead.

Sources and Potential Exposure

Sources of possible chloroethane exposure include the inhalation of contaminated air and ingestion of contaminated drinking water at very low levels. The general population can be exposed to chloroethane by skin contact with consumer products that contain chloroethane such as solvents and refrigerants. Occupational exposure by inhalation or dermal contact with chloroethane can occur in industries such as medical and health services; automotive dealers and service stations; wholesale trade, electric, gas, and sanitary services; machinery (except electrical) and special trade contractors; fabricated metal productions; printing and publishing; painting; rubber and plastic products; and food.

Chloroform (67-66-3)

Uses

The vast majority of the chloroform produced in the United States is used to make HCFC-22. The rest is produced for export and for miscellaneous uses. Chloroform was used in the past as an extraction solvent for fats, oils, greases, and other products; as a dry cleaning spot remover; in fire extinguishers; as a fumigant; and as an anesthetic. However, chloroform is no longer used in these products.

Sources and Potential Exposure

Chloroform may be released to the air from a large number of sources related to its manufacture and use, as well as its formation in the chlorination of drinking water, wastewater, and swimming pools. Pulp and paper mills, hazardous waste sites, and sanitary landfills are also sources of air emissions. Human exposure to chloroform may occur through drinking water, where chloroform is formed as a result of the chlorination of naturally occurring organic materials found in raw water supplies. Chloroform may also be found in some foods and beverages, largely from the use of tap water during production processes.

Chloromethane (74-87-3)

Uses

Chloromethane is used mainly in the production of silicones where it is used to make methylate silicon. It is also used in the production of agricultural chemicals, methyl cellulose, quaternary amines, and butyl rubber and for miscellaneous uses including tetramethyl lead. Chloromethane was used widely in refrigerators in the past, but generally this use has been taken over by newer chemicals such as Freon.

Sources and Potential Exposure

Chloromethane is formed in the oceans by natural processes (e.g., marine phytoplankton) and from biomass burning in grasslands and forested areas (e.g., forest fires); it has been detected at low levels in air all over the world. Other sources of exposure to chloromethane include cigarette smoke, polystyrene insulation, and aerosol propellants; home burning of wood, coal, or certain plastics; and chlorinated swimming pools. Chloromethane is also present in some lakes and streams and has been found in drinking water at very low levels. Occupations that present a higher risk of exposure include building contracting, metal industries, transportation, car dealers, and service-station attendants.

cis1,3-Dichloropropene (542-75-6)

Uses

Cis-1,3-Dichloropropene is the predominant component of several formulations used in agriculture as soil fumigants for parasitic nematodes.

Sources and Potential Exposure

Workers may be occupationally exposed to 1,3-dichloropropene, dermally or by inhalation, during its manufacture, formulation, or application as a soil fumigant. The general public may be exposed via inhalation near source areas or from the consumption of contaminated drinking water from wells near some hazardous waste sites.

cis1,2-Dichloroethylene[41] (156-59-2)

Uses

Cis-1,2-Dichloroethylene has been used as a solvent for fats, phenols, camphor, and also to retard fermentation. It has been used in the rubber manufacturing, as a refrigerant, an additive to dye and lacquer solutions, a low-temperature solvent for heat-sensitive substances (eg, caffeine), constituent of perfumes and thermoplastics and used in organic synthesis and medicine.

Sources and Potential Exposure

Occupational exposures may occur where this chemical is used in manufacturing. Monitoring data indicate that the general population may be exposed to cis-1,2-dichloroethylene via drinking water containing this compound.

Dichlorodifluoromethane[42] (75-71-8)

Uses

Historical use has been as a refrigerant. Fully halogenated chlorofluorocarbons (CFCs) such as dichlorodifluoromethane were scheduled for production phase-out in 1987 by the Montreal Protocol. Although originally scheduled for 50% production phase-out by the year 2000 in developed countries, the worsening ozone depletion has forced acceleration of the CFC phase-out.

Sources and Potential Exposure

Due to its long atmospheric residence time, the general population may be exposed to dichlorodifluoromethane via inhalation of ambient air.

Dichlorotetrafluoroethane (76-14-2)

Uses

Historical use has been as a refrigerant, blowing agent for cellular polymers, and foaming agent in fire extinguishing. Fully halogenated chlorofluorocarbons (CFCs) such as dichlorodifluoromethane were scheduled for production phase-out in 1987 by the Montreal Protocol. Although originally scheduled for 50% production phase-out by the year 2000 in developed countries, the worsening ozone depletion has forced acceleration of the CFC phase-out.

Sources and Potential Exposure

Due to its long atmospheric residence time, the general population may be exposed to dichlorotetrafluoroethane via inhalation of ambient air.

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[41] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

[42] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

Ethylbenzene[43] (100-41-4)

Uses

Ethylbenzene is used primarily in the production of styrene. It is also used as a solvent, as a constituent of asphalt and naphtha, and in fuels.

Sources and Potential Exposure

Exposure to ethylbenzene occurs from the use of consumer products, gasoline, pesticides, solvents, carpet glues, varnishes, paints, and tobacco smoke. Occupational exposure to ethylbenzene occurs in factories that use ethylbenzene to produce other chemicals; for gas and oil workers; and for varnish workers, spray painters, and persons involved in gluing operations.

Hexachloro-1,3-butadiene (87-68-3)

Uses

Hexachlorobutadiene is used mainly as an intermediate in the manufacture of rubber compounds. It is also used in the production of lubricants, as a fluid for gyroscopes, as a heat transfer liquid, and in hydraulic fluids.

Sources and Potential Exposure

Persons working in industries where hexachlorobutadiene is formed or used may be exposed to the chemical. Individuals who consume large amounts of fish from contaminated waters may also be exposed to hexachlorobutadiene.

m,p-Xylene[44] (1330-20-7)

Uses

Xylenes are primarily used in the production of ethylbenzene and as solvents in products such as paints and coatings, and are blended into gasoline.

Sources and Potential Exposure

Mixed xylenes are distributed throughout the environment; they have been detected in air, rainwater, soils, surface water, sediments, drinking water, and aquatic organisms. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents and from paints and surface coatings. Xylenes are commonly found in indoor air of homes and buildings. Occupational exposure to mixed xylenes may occur at workplaces where mixed xylenes are produced and used as industrial solvents.

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[43] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Ethylbenzene. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2010.

[44] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Xylenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2007.

Methyl tert butyl ether[45] (1634-04-4)

Uses

Nearly all methyl tert-butyl ether (MTBE) produced in the United States is used as an additive in unleaded gasoline to increase octane levels and reduce carbon monoxide emissions. MTBE was used in New York, until its statewide ban on January 1, 2004. The expanding use of MTBE in gasoline from 1979 to 2004, in conjunction with its physical and chemical properties resulted in significant MTBE impacts to the groundwater resources in the State.[46] MTBE is used in small quantities as a laboratory reagent to extract semi-volatile organic compounds from such sample types as leachates or solid wastes. MTBE is also a pharmaceutical agent, which can be used as an alternative to surgery in dissolving gallstones when injected intraductally.

Sources and Potential Exposure

In New York, the general public may be exposed to MTBE if contamination is present in surface water, groundwater and soil. Because it is no longer used as an automotive fuel in New York, the general population is unlikely to be exposed through auto exhaust or gasoline fumes. Workers may be occupationally exposed via inhalation or dermal contact.

Methylene chloride[47] (dichloromethane) (75-09-2)

Uses

Methylene chloride is predominantly used as a solvent in paint strippers and removers; as a process solvent in the manufacture of drugs, pharmaceuticals, and film coatings; as a metal cleaning and finishing solvent in electronics manufacturing; and as an agent in urethane foam blowing. Methylene chloride is also used as a propellant in aerosols for products such as paints, automotive products, and insect sprays. Methylene chloride is also approved for use as a postharvest fumigant for grains and strawberries and as a degreening agent for citrus fruit.

Sources and Potential Exposure

The principal route of human exposure to methylene chloride is inhalation of ambient air. Occupational and consumer exposure to methylene chloride in indoor air may be much higher, especially from spray painting or other aerosol uses. People who work in these places can breathe in the chemical or it may come in contact with the skin. Methylene chloride has been detected in both surface water and groundwater samples taken at hazardous waste sites and in drinking water at very low concentrations.

o-Xylene[48] (95-47-6)

Uses

Xylenes are primarily used in the production of ethylbenzene and as solvents in products such as paints and coatings, and are blended into gasoline.

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[45] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Methyl tert butyl ether. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1996.
[46] http://www.dec.ny.gov/chemical/8428.html
[47] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Methylene chloride. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2000.
[48] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Xylenes. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2007.

Sources and Potential Exposure

Mixed xylenes are distributed throughout the environment; they have been detected in air, rainwater, soils, surface water, sediments, drinking water, and aquatic organisms. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents and from paints and surface coatings. Xylenes are commonly found in indoor air of homes and buildings. Occupational exposure to mixed xylenes may occur at workplaces where mixed xylenes are produced and used as industrial solvents.

Styrene[49] (100-42-5)

Uses

Styrene is used predominately in the production of polystyrene plastics and resins. In addition, fiberglass products used for boats are also made from polyester resins dissolved in styrene. Styrene is also used as an intermediate in the synthesis of materials used for ion exchange resins and to produce copolymers such as styrene-acrylonitrile (SAN) and acrylonitrilebutadiene-Styrene (ABS), both representing approximately 9% of styrene use, and styrene-butadiene rubber (SBR), representing approximately 6% of styrene use. SBR is used for such products as car tires, hoses used for industrial applications, and shoes. Styrene-butadiene latex is used in making carpet, coatings for paper, and as part of latex paints. SAN and ABS are used for materials such as piping, automotive components, refrigerator liners, plastic drinking glasses, and car battery enclosures. Styrene is used in resins to make boat hulls, and is used to make thermoplastics, glues and adhesives. Styrene copolymers are frequently used in liquid toner for photocopiers and printers. The Food and Drug Administration permits styrene to be used as a direct additive for synthetic flavoring and an indirect additive in polyester resins, ion-exchange membranes, and in food packaging material.

Sources and Potential Exposure

Occupational exposure to styrene occurs in the reinforced plastics industry and polystyrene factories. The general public is mostly likely exposed to styrene in indoor air attributable to releases from building materials, consumer products, and tobacco smoke.

Tetrachloroethylene (perchloroethylene) (127-18-4)

Uses

Tetrachloroethylene is used for dry cleaning and textile processing, as a chemical intermediate, and for vapor degreasing in metal-cleaning operations.

Sources and Potential Exposure

Occupational exposure to tetrachloroethylene may occur, primarily in dry cleaning establishments and at industries manufacturing or using the chemical. The general public may be exposed in residential dwellings which are attached to dry cleaning establishments using tetrachloroethylene. The general public may be exposed if near clothes that have been dry cleaned using tetrachloroethylene. Exposures may occur if showering or bathing in water contaminated with tetrachloroethylene.

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[49] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Styrene. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2010.

Toluene (108-88-3)

Uses

The major use of toluene is as a mixture added to gasoline to improve octane ratings. Toluene is also used to produce benzene and as a solvent in paints, coatings, synthetic fragrances, adhesives, inks, and cleaning agents. Toluene is also used in the production of polymers used to make nylon, plastic soda bottles, and polyurethanes and for pharmaceuticals, dyes, cosmetic nail products, and the synthesis of organic chemicals. Toluene is also used as a starting material in the synthesis of trinitrotoluene.

Sources and Potential Exposure

The highest concentrations of toluene usually occur in indoor air from the use of common household products (paints, paint thinners, adhesives, synthetic fragrances and nail polish) and cigarette smoke. Toluene exposure may also occur in the workplace, especially in occupations such as printing or painting, where toluene is frequently used as a solvent. Automobile emissions are the principal source of toluene to the ambient air. Toluene may also be released to the ambient air during the production, use, and disposal of industrial and consumer products that contain toluene.

trans1,3-Dichloropropene (542-75-6)

Uses

1,3-Dichloropropene is the predominant component of several formulations used in agriculture as soil fumigants for parasitic nematodes.

Sources and Potential Exposure

Workers may be occupationally exposed to 1,3-dichloropropene, dermally or by inhalation, during its manufacture, formulation, or application as a soil fumigant. The general public may be exposed via inhalation near source areas or from the consumption of contaminated drinking water from wells near some hazardous waste sites.

Trichloroethylene (79-01-6)

Uses

The main use of trichloroethylene is in the vapor degreasing of metal parts. Trichloroethylene is also used as an extraction solvent for greases, oils, fats, waxes, and tars, a chemical intermediate in the production of other chemicals, and as a refrigerant. Trichloroethylene is used in consumer products such as typewriter correction fluids, paint removers/strippers, adhesives, spot removers, and rug-cleaning fluids.

Sources and Potential Exposure

Because of its moderate water solubility, trichloroethylene in soil has the potential to migrate into groundwater. The relatively frequent detection of trichloroethylene in groundwater confirms its mobility in soils. Drinking water supplies relying on contaminated groundwater sources may contain trichloroethylene. The Agency for Toxic Substance and Disease Registry reports that trichloroethylene is the most frequently reported organic contaminant in groundwater. Workers may be exposed to trichloroethylene where it is manufactured or used. In addition, the general public may be exposed to trichloroethylene if released from facilities where it is manufactured or

used. Persons may also be exposed to trichloroethylene through the use of products containing the chemical and from evaporation and leaching from waste disposal sites.

Trichlorofluoromethane[50] (75-69-4)

Uses

Historical use has been as a refrigerant, polyurethane foam, and degreasing agent. Fully halogenated chlorofluorocarbons (CFCs) such as trichlorofluoromethane were scheduled for production phase-out in 1987 by the Montreal Protocol. Although originally scheduled for 50% production phase-out by the year 2000 in developed countries, the worsening ozone depletion has forced acceleration of the CFC phase-out.

Sources and Potential Exposure

Due to its long atmospheric residence time, the general population may be exposed to trichlorofluoromethane via inhalation of ambient air, ingestion of drinking water, and dermal contact with this chemical and other consumer products containing trichlorofluoromethane. Trichlorofluoromethane has been identified in emissions from volcanoes.

Trichlorotrifluoroethane[51] (76-13-1)

Uses

Historical use has been as a dry-cleaning solvent, fire extinguishers, to make chlorotrifluoroethylene, blowing agent, polymer intermediate, solvent drying, drying electronic parts and precision equipment. Fully halogenated chlorofluorocarbons (CFCs) such as trichlorotrifluoroethane were scheduled for production phase-out in 1987 by the Montreal Protocol. Although originally scheduled for 50% production phase-out by the year 2000 in developed countries, the worsening ozone depletion has forced acceleration of the CFC phase-out.

Sources and Potential Exposure

Due to its long atmospheric residence time, the general population may be exposed to trichlorotrifluoroethane via inhalation of ambient air, ingestion of drinking water, and dermal contact with this chemical and other consumer products containing trichlorotrifluoroethane.

Vinyl chloride (75-01-4)

Uses

Most of the vinyl chloride produced in the United States is used to make polyvinyl chloride (PVC), a material used to manufacture a variety of plastic and vinyl products including pipes, wire and cable coatings, and packaging materials. Smaller amounts of vinyl chloride are used in furniture and automobile upholstery, wall coverings, house wares, and automotive parts.

Sources and Potential Exposure

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[50] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD

[51] U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD

Air inside new cars may contain vinyl chloride at higher levels than detected in ambient air because vinyl chloride may be released into the air from the new plastic parts. Drinking water may contain low levels of vinyl chloride released from contact with polyvinyl pipes. Vinyl chloride is a microbial degradation product of trichloroethylene in groundwater, and thus can be found in groundwater affected by trichloroethylene contamination. Occupational exposure to vinyl chloride may occur in those workers concerned with the production, use, transport, storage, and disposal of the chemical.