

Book Reviews

Gasoline Toxicity, Case Study in Environmental Medicine 31, Agency for Toxic Substances and Disease Registry, US Department of Health & Human Services, Public Health Service, Atlanta, GA 30333, 1993, 24 pages

Leaking of underground storage tanks is a growing environmental problem. Of the estimated 1.4 million underground gasoline storage tanks in the US, about 85% have no protection against corrosion.

Gasoline inhalation exposures to the general public during self-service automobile refueling probably are not a significant health risk.

Misuse of gasoline as a solvent or cleaner can cause skin and eye irritation and central nervous system toxicity after extensive overexposure.

A case study is introduced in which a 29-year-old man has been having frequent headaches for the past month. His wife indicates that at times he is somewhat confused and forgetful. She feels these symptoms have developed since they moved to a new home six months ago. She admits that she has also been irritable and that several of their neighbors have been complaining of nonspecific symptoms, including headaches and forgetfulness. A nearby gasoline station was recently fined for having a leaking underground storage tank, and she feels her family and neighbors are being poisoned by contaminated drinking water. The patient had been an Air Force mechanic, and now works on old cars in a garage in the back of the house.

Exposure pathways note that motor fuel is highly flammable and potentially explosive. It contains more than 250 hydrocarbons, typical chemical structures of which are shown. Benzene, a known hematotoxic agent, is present at an average of approximately 1% in US gasoline, but can be as high as 5% in Europe. There is much discussion as to the use of ethanol as a substitute for the benzene to improve the combustion by introducing oxygen into the mixture. Other additives are added for specific purposes.

Gasoline that contains more than 0.05 grams of lead per gram of gasoline is considered leaded gasoline. Organic lead is added to enhance a fuel's octane rating, which rates the antiknock on an industry standard. In 1989, only 10% of the gasoline purchased was leaded gasoline; by 1997 the use of leaded gasoline will have virtually ceased.

The composition of gasoline vapor differs considerably from the composition of liquid. While the typical liquid contains about 60% total alkanes, the vapor consists of nearly 90%. Aromatic compounds represent 30% of the liquid phase compared to only about 2% of the vapor phase. Benzene that is 2.1% of the liquid phase constitutes

about 0.9% of the vapor phase. *n*-Hexane, a neurotoxic agent, is about 2.7% of the liquid phase and 0.9% of the vapor phase.

Gasoline exposure to the general population occurs primarily through inhalation of the vapor during auto refueling. The EPA estimates that about 4 million gallons were admitted into the atmosphere during 1982 alone, most of which occurred at auto service stations, where customers typically experience short-term exposure during refueling of approximately 200 parts per million (ppm) and less than 1 ppm benzene for periods of about 2 min. OSHA short-term exposure limit (STEL) averaged over 15 min for gasoline hydrocarbons is 500 ppm for gasoline hydrocarbons and 5 ppm for benzene. Thus, exposure during self-service refueling is not likely to be a significant hazard to the public.

Inhalation is the main exposure route for employees of the petroleum and auto industries. Gasoline vapor is released into the air during refining of crude petroleum, bulk transfer of gasoline, and leaks from storage containers and loading equipment, as well as refueling of vehicles.

Exposure to liquid gasoline

Human exposure to liquid gasoline occurs by unintentional or intentional ingestion, accidental skin contact, or by misuse of the solvent. Misuse of gasoline, especially to clean and degrease floors, tools, and machine parts, represents the single most human risk to the public. Gasoline kept in the home for degreasing and to power lawn tools, boats, motorcycles, and recreational vehicles is both a fire and a toxic hazard. It should be stored in a properly labeled, tightly sealed, metal container out of the reach of children. Gasoline improperly stored in containers such as soft drink or milk bottles can lead to unintentional ingestion, especially by children. Adults have also been known to unintentionally ingest gasoline while attempting to siphon the fuel. Contaminated water is a potential source of exposure for the general public, not only through inhalation, but also through inhalation and dermal exposure during bathing and laundering.

Avoidance of further exposure is the most important intervention in cases of gasoline misuse. Persons who intentionally inhale gasoline may require intensive psychological therapy in most cases.

Standards and regulations for gasoline are noted in some detail, and a suggested reading list is added.

This is very practical source of information about a very common chemical which may be used safely.

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Dangerous Properties of Industrial and Consumer Chemicals, compiled by Nicholas P. Cheremisinoff, John A. King and Randi Boyko, Marcel Dekker, New York, NY, 1994, 799 pages, price US\$ 195.00, ISBN 0-8247-9183-5

Despite the title, this compilation of over 1000 chemicals does not give any data on the properties of the compounds, such as explosive limits, volatility, flammability, or