



Toluene

What is toluene?

- Toluene is a clear, colorless, flammable liquid with a distinctive smell.
- Toluene is produced in the process of making gasoline and other fuels from crude oil and coal.

What are the uses of toluene?

- Toluene is used in some printing operations, leather tanning and chemical processes.
- Toluene is present in household aerosols, paints, paint thinners, varnishes, shellac, rust inhibitors, adhesives and solvent-based cleaning and sanitizing agents.
- Toluene is used as an additive to gasoline to improve octane ratings. Gasoline contains 5 percent to 7 percent toluene.
- Toluene is also used as a solvent in cosmetic nail polishes at concentrations of up to 50 percent.
- Toluene is present in cigarette smoke.
- Industrial use of toluene is increasing, as it replaces the more toxic benzene.

Is toluene in the environment?

- Toluene readily becomes vapor at room temperature.
- Toluene enters air during the production of oil and natural gas. Toluene is also released into the atmosphere during the production, transport and combustion of gasoline.
- Toluene air concentrations are highest in areas of heavy traffic, near gasoline filling stations and near refineries where fumes from evaporating gasoline or fuel oil are present.
- Toluene vapor tends to break down in air rapidly, especially in the presence of other air pollutants.
- Toluene may be present in surface water and groundwater and is occasionally present in drinking water, usually at low levels.

How are people exposed to toluene?

- Exposure to outdoor toluene occurs primarily through air.

- Toluene has been reported to be present in rural and urban air at averages of 1.3 and 10.8 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), respectively.
- Exposure to indoor toluene occurs from breathing cigarette smoke and vapors from common household products. Toluene has been reported to be present in indoor air at averages of $31.5 \mu\text{g}/\text{m}^3$.
- Intentional inhalation of toluene makes it one of the most abused solvents. Glues, paints and solvent mixtures are the most commonly abused products containing toluene.
- Skin may come in contact with toluene during the use of certain household products.

How does toluene enter and leave the body?

- Toluene rapidly enters the body through the gut and the lungs when ingested or inhaled.
- Cigarette smokers absorb about 80 to 100 μg of toluene per cigarette into their body through the lungs.
- Toluene can slowly enter the body through intact skin, although the amount is small.
- Toluene moves quickly to the brain, liver and kidney and accumulates in fat and tissues with high fat content.
- Toluene crosses the placenta and is excreted in breast milk. Toluene in breast milk can be passed to the infant.
- Most of the toluene in the body is broken down in the liver to non-toxic compounds. The major non-toxic breakdown product is hippuric acid, which is excreted in urine.
- It takes only minutes to just over an hour to break down half the amount of toluene that enters the body.
- Most inhaled or ingested toluene is eliminated in urine within 12 hours.
- Drinking alcohol (ethanol) or taking aspirin may prolong the length of time toluene remains in the body.

How harmful is exposure to toluene?

- The primary health effect of toluene exposure is depression of brain function.
- Feelings of intoxication can begin with exposure to 100 parts per million (ppm).
- If swallowed, toluene can irritate the stomach, causing nausea, vomiting and diarrhea.
- Toluene is irritating to the skin, eyes and respiratory tract.
- Repeated or prolonged skin contact with toluene can cause it to crack and peel.

- Eye irritation from toluene vapor begins at concentrations of approximately 300 ppm.
- Persons with asthma and other respiratory disorders can experience coughing, wheezing, shortness of breath and difficulty breathing on exposure to toluene.
- Symptoms of toluene poisoning may include nausea, vomiting, headache, drowsiness, dizziness, lack of muscle coordination, an exaggerated feeling of mental and physical well being, hallucinations, respiratory effects and chemical imbalances.
- Fatigue, sleepiness, headache, nausea and loss of muscle coordination can occur within minutes following exposure to 600 ppm.
- Permanent psychiatric effects, liver and kidney damage, and irregular heart rhythm possibly leading to death can occur with chronic abuse of toluene-containing solvents.
- Concurrent use of alcohol or aspirin increases the risk of adverse effects from toluene exposure.

Can exposure to toluene cause cancer?

- The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) and the U.S. Environmental Protection Agency (EPA) have not determined whether exposure to elevated levels of toluene causes cancer.

Is there a medical test to show whether I've been exposed to toluene?

- Toluene can be measured in blood, and one of its breakdown products, hippuric acid, can be measured in urine, but these levels have little clinical relevance.
- A blood sample taken within one day after exposure can be used to confirm toluene exposure (normal for unexposed population is 0.1 milligrams/deciliter (mg/dL). However, the toluene level obtained will not correlate well to the degree of exposure or to symptoms.
- Because toluene accumulates in fatty tissues, persons who are overweight tend to retain more toluene than persons of normal weight. The clinical significance of this is unknown.

What is the treatment for toluene poisoning?

- There is no antidote for toluene poisoning.
- Treatment consists of support of respiratory and cardiovascular functions.

Are there recommendations to protect public health?

- The Occupational Safety Health Association's (OSHA) Permissible Exposure Limit (PEL) for toluene in air is 200 ppm averaged over an 8-hour workshift.
- OSHA's ceiling for toluene in air is 300 ppm.

- OSHA's short-term exposure limit (STEL) for toluene in air is 500 ppm (10 – minute exposure).
- EPA has set an enforceable limit, the maximum contaminant level (MCL) of 1.0 milligram per liter (mg/L) for toluene in drinking water.

What can I do to prevent exposure to toluene?

- Use toluene-containing products in well ventilated areas.
- When not in use, toluene-containing products should be tightly sealed to prevent evaporation into the air.

What should I do if I believe I am ill as a result of exposure to toluene?

- Terminate exposure and seek rapid emergency medical treatment in a hospital setting if your condition or history suggests toluene poisoning.

Where can I get more information?

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology, P.O. Box 90, Harrisburg, PA, 17108. Telephone number: 717-787-1708.

The U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA. Telephone number: 800-232-4636.

References

- (1) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA., Division of Toxicology and Environmental Medicine, ToxFAQs™; Toluene, February 2001.
- (2) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA., September 2000, Toxicological Profile for Toluene.
- (3) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR) Atlanta, GA., February, 2001. Case Studies in Environmental Medicine (CSEM), Toluene.