

Chloroform Toxicity

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Abstract:

Chloroform is basically an anesthetic—but one that is no longer used due to the fact that it can seriously damage your liver, kidney and heart. It is known as trichloroethane. Researches have performed on mice which suggests that even it is dangerous for lactating, and pregnant woman which results to miscarriages, and fetal abnormalities. It is carcinogenic in nature. So, results of studies of people who drank chlorinated water showed a possible link between the chloroform in chlorinated water and the occurrence of cancer of the colon and urinary bladder. Chloroform can be made in laboratory as it is used as a solvent. It is pain relieving and can be used in small amount in dentistry. Its fatal dose is 54 gm in 60 kg human.

Using chloroform to knock someone out in a matter of seconds is not real. Its take nearly 5 minutes to knock someone out. It lasts for 20 minutes to two hours with a 20–30 minutes recovery time; during which there will be intense shivering, severe nausea and more than likely vomiting, then a severe headache lasting hour.

Introduction:

Have you ever heard a word chloroform or seen a scene in the movie or serial, villain or certain character holding a cloth with few drops of chloroform on the mouth and nose of target and target gets unconscious quickly? Have you ever thought about quick action of chloroform? If yes, then let us discuss about what is chloroform and how does it work?

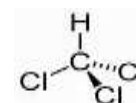
Chloroform is a man-made by-product formed when chlorine is used to disinfect water. It is colorless. It has a sweet, pungent odor and sweet burning taste. It is nonflammable and volatile liquid; used at one time as an anesthetic even in small dose. *It can also knock people unconscious, even when consumed in small doses. It was once used as a general anesthetic in surgery, but has been replaced by less toxic, safer anesthetics, such as Ether.*

Occurrence of chloroform:

Chloroform is a naturally-occurring organic compound that can be found in the air and in coastal waters, lakes, inland rivers and groundwater. However, most of the chloroform you come across in the environment is produced by humans.

Higher levels of chloroform can be found in industrial areas and in the air above swimming pools where the water has been disinfected with chlorine.

Properties of chloroform:



- It is also known as trichloromethane.
- Its chemical formula is CHCl_3 . Molecular weight is 119.37 g/mol.
- It has a boiling point of 61.15°C and a density of 1.488 g/cm^3 (at 20°C).
- It dissolves freely in ethanol and ether, but does not mix with water. It will burn the skin if reaches to very high temperature.
- It reacts to form phosgene, a poisonous gas when exposed to sunlight and air.

Production of chloroform:

Chloroform was first produced by the French chemist Eugène Soubeiran, in 1831. Soubeiran took acetone and ethanol, and used bleach powder for reaction.

Chloroform is produced by reaction of chlorine with ethanol, by heating a mixture of chlorine and either chloromethane (CH_3Cl) or methane (CH_4). AT 400 TO 500°C , a free radical halogenation occurs, converting these precursors to progressively

more chlorinated compounds: $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$
 $CH_3Cl + Cl_2 \rightarrow CH_2Cl_2 + HCl$

Uses of chloroform:

- Chloroform is used as a solvent for fats, alkaloids, iodine, and other substances in paper, building and wood processing industries, as well as in pesticide production.
- Chloroform is also used in the extraction of antibiotics, vitamins, and flavors, owing to its solvent property.
- Chloroform can still be legally used as a local anesthetic and solvent in dentistry, especially in root canal procedures.
- It is used in veterinary formulations, to control screw worm infections in pets and livestock.
- It was used in toothpaste, mouthwash, and toothache-relieving medicines because it has pain relieving property and it is 40 times sweeter than sugar.

How does chloroform affect the human body?

- The effects of chloroform exposure on a human increase proportionally along with its dosage. While in small amounts, chloroform can make you feel lethargic and disoriented, as the dosage increases, you can quickly become unconscious and feel no pain or any sensation.
- Symptoms following chloroform inhalation include fatigue, dizziness, drowsiness, headache, shortness of breath, nose and throat irritation, agitation, nausea and vomiting. If ingested can cause rectal or bladder cancer and liver necrosis. Large amounts of chloroform can cause sores when the chloroform touches your skin.

Effect of chloroform on animal:

- Miscarriages occurred in rats and mice that breathed air containing elevated levels (30 to 300 ppm) of chloroform during pregnancy and in rats that ate chloroform during pregnancy.
- Abnormal sperm were found in mice that breathed air containing elevated levels (400 ppm) of chloroform for a few days.

- Offspring of rats and mice that breathed chloroform during pregnancy had birth defects.
- Results of studies of people who drank chlorinated water showed a possible link between the chloroform in chlorinated water and the occurrence of cancer of the colon and urinary bladder. Cancer of the liver and kidneys developed in rats and mice that ate food or drank water that had large amounts of chloroform in it for a long time.
- The International Agency for Research on Cancer (IARC) has determined that chloroform is possibly carcinogenic to humans (2B). (https://en.wikipedia.org/wiki/List_of_IARC_Group_2B_carcinogens)

Fatal dose of chloroform:

Oral LD50 is 900 mg/kg in rats. So, assuming a similar value for humans, it would be 54 g in a 60 kg human. This corresponds to about 36 mL of chloroform.

(<http://www.jtbaker.com/msds/englishhtml/C2915.htm>)

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