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Solvents

What Are Solvents?

Solvents are any class of chemicals used to dissolve materials. Usually, solvents are extremely volatile and reactive, meaning they quickly evaporate into their gaseous form and interact with other molecules to form byproducts (or different chemical combinations) quickly.[1]

Because of their ability to dissolve solids, solvents are often used to clean and sanitize. Solvents are also used industrially for many purposes such as degreasing equipment or cleaning electronics before sale.[1]

How Are We Exposed?

People can be exposed to solvents in a number of ways:

- The main route of exposure for solvents is breathing it in.
- Household exposures to solvents are fairly common. Solvents are commonly added to many household products such as cleaning supplies and paints.[1]
- Individuals may also be exposed to solvents in the workplace, while working with solvents.[1]
- Indirect exposure can occur when solvents added to consumer products—such as paint or gasoline—evaporate into the air.
- Environmental exposures to solvents are also possible, as some solvents persist in the environment due to improper disposal.[2] Other solvents such as benzene are released into the air from gasoline exhaust.[3]

Symptoms & Health Outcomes

There are different health effects of solvent exposure depending on the specific solvent and the length of exposure. Different solvents will result in a range of symptoms. The health effects of some common solvents are included here.

Ammonia

Ammonia is commonly occurring and naturally present in the environment. Exposure to these background levels is not harmful.[4] However, important research shows that acute exposure to high concentrations of ammonia and chronic exposure to moderate levels can be harmful or deadly.

At low levels, ammonia inflicts tissue damage to the exposed area, including the nose, throat, and lungs if it is inhaled.[5,6] At higher levels, animal studies suggest it may interfere with neurological processes, especially when ingested.[7,8] Airborne ammonia can cause irritation of the eyes resulting in inflammation, short-term blindness or altered vision, watering eyes, and corneal abrasions.[4]

Bleach

Sodium hypochlorite is the active ingredient in chlorine bleach and cleaning products containing bleach. Exposure to sodium hypochlorite irritates skin and mucus membranes, and high concentrations of sodium hypochlorite can cause serious tissue damage.[9]

In addition to being acutely toxic, sodium hypochlorite can react with other cleaners and organic matter to form dangerous chemicals. Chloroform can be created when bleach contacts organic matter during cleaning[10] and can be created in chlorinated drinking water as well.[11] Free chlorine gas can be created when bleach is mixed with acidic solutions.[12]

Chloroform is a probable human carcinogen according to the US EPA.[13] Chronic exposure is known to cause depression, lack of concentration, and irritability. Chlorine gas is acutely toxic and can cause irritation to the nose and throat, chest pain, vomiting, and even death.[14]

Benzene

Benzene is a petrochemical, meaning it is a refined product of oil. It is present in the environment in water, soil and air. Some of the major sources of benzene are car exhaust, cigarette smoke, and paint or glues.[3] Exposure to benzene through food, water, and soil is not common, unless there is a local source of contamination. Approximately 95% of exposure to benzene is through inhalation.[15] Acute exposure can cause dizziness, rapid heart rate, tremors and unconsciousness.[3]

Benzene is known to cause cancer. The most significant health risk to low level exposure to benzene is leukemia.[15] However, research suggests that benzene can induce other diseases of the blood, such as anemia, and uncontrolled bleeding.[16] Benzene may also cause reproductive effects such as irregular menstruation and birth defects.[3] *(Please see the Benzene fact sheet for more details.)*

Simple Green

Simple Green contains 2-butoxyethanol, a type of chemicals known as ethylene glycol ethers (EGEs), that are commonly used as solvents both in businesses and industries.

In humans, long term exposure to EGEs can result in dizziness, lethargy, headaches, and memory loss as well as hematopoietic effects such as decreases in some types of blood cells.[17,18] Long-term exposure in animals has been linked to damage to DNA, sperm and blood cells.[19,20,21] Exposure to 2-butoxyethanol is known to cause hemolysis, or destruction of blood cells, and reduce concentrations of hemoglobin in rats,[22] and research has correlated 2-butoxyethanol exposure to an increase in tumors in rats and mice.[23]

Toluene

Exposure to toluene can happen in many different ways, but the main route of exposure is inhalation from contaminated air. Gasoline, car exhaust, cigarette smoke, and paint or paint thinner are all common sources of toluene.[24] Using nail polish significantly increases concentrations of toluene in the air.[25] Acute exposure to toluene has been shown to result in dizziness, headaches,[26] manual impairment, intoxication, and loss of color recognition.[27]

In humans, long-term exposure to toluene has been linked to mucus membrane irritation, altered temperature and sound perception, intoxication[24] and an increase in spontaneous abortions.[28] It is also linked to dizziness, headaches,[29] and hearing loss.[30] In animals, toluene exposure has been linked to lower dopamine and noradrenaline levels, important neural hormones[31] and an overall decrease in brain weight.[32]

Follow Up Action

- If you think your patient may have been exposed to solvents, refer patient to a physician.

REDUCING OUR EXPOSURE

You can prevent or minimize exposure to solvents in the following ways:

- Whenever possible, buy products that do not contain harmful solvents. Water-based paints and glues and citrus-based cleaners are safer to use.
- If you have solvents or products containing solvents in your home, carefully label them and store them in a safe place, especially in homes with young children.
- When you use products with solvents, such as paints, cleaners, or nail polish, make sure they are used in well ventilated areas and open windows or use fans to reduce the amount of solvents in the air.
- Never mix cleaning solutions or solvents, as the resulting vapors can be harmful or deadly.
- Gasoline and exhaust are major sources of solvents and other contaminants. Turn off the engines of cars, ATVs, and snow machines when not needed.

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