What is trichloroethylene?

Trichloroethylene (TCE) is a colorless liquid with an odor similar to ether. It is man-made and does not occur naturally in the environment. TCE is used mainly as a solvent to remove oils and grease from metal parts.

How can trichloroethylene affect human health?

Dizziness, headaches, slowed reaction time, sleepiness, and facial numbness have occurred in workers breathing trichloroethylene or in people using trichloroethylene products in small, poorly ventilated areas. These effects are also caused by ingestion of several ounces of undiluted TCE. Irritation of the eyes, nose, and throat can also occur under these conditions. More severe effects, such as unconsciousness or possibly death, can occur from drinking or breathing higher amounts of TCE. Generally, the less severe central nervous system effects that result from one or several exposures to trichloroethylene disappear when exposure ends.

Results of a few studies of pregnant animals exposed to trichloroethylene in air or in food showed effects on unborn animals or on newborns. Current information based on animal studies is not sufficient to determine whether cancer, or the effects seen in animal embryos following exposure to TCE, may also occur in humans.

Some harmful health effects may persist following long-term exposure to trichloroethylene. This information is based largely on animal studies. These studies show that ingesting or breathing levels of TCE that are higher than typical background levels can produce nervous system changes; liver and kidney damage; effects on the blood; tumors of the liver, kidney, lung, and male sex organs; and possibly cancer of the tissues that form white blood cells (leukemia). Alcohol consumption can heighten susceptibility to liver and kidney injury caused by trichloroethylene exposure.

How might exposure to trichloroethylene occur?

Trichloroethylene has been found in approximately 745 of the 1,300 hazardous waste sites on the National Priorities List (NPL). Various federal and state surveys indicate that between 9 and 34% of the water supply sources in the United States may be contaminated with trichloroethylene. In addition, TCE present at disposal sites is released to the air by evaporation and to underground water as leachate.

Trichloroethylene can also be released to the environment through evaporation from adhesive glues, paints, coatings, and other chemicals; and during their production. Releases can also occur during air-cleaning processes at treatment facilities that receive wastewater containing TCE, and during incineration of municipal and hazardous wastes.

Is there a medical test to identify trichloroethylene exposure?

Recent or ongoing exposures to trichloroethylene can be determined by measuring TCE in the breath. Another way of determining whether exposure to trichloroethylene has occurred is by measuring a number of breakdown products (metabolites) of TCE in the urine or blood. Because one of the breakdown products, trichloroacetic acid, is removed very slowly from the body, it can be measured in the urine for up to about one week following exposure. Exposure to other chemicals can produce the same breakdown products in the urine and blood as TCE. Therefore, these methods cannot be used to indicate conclusively that exposure to trichloroethylene has occurred.

How does trichloroethylene enter the body?

Trichloroethylene can enter the body through inhalation of contaminated air or ingestion of contaminated water. TCE can also enter the body through contact with the skin.
What levels of exposure have resulted in harmful health effects.

Tests using laboratory animals and humans show that short-term and long-term exposures to air containing about 50 parts per million (ppm) or more of trichloroethylene have produced harmful effects. The term "parts per million" is a way of expressing the concentration of a contaminant in a liquid or air. One part per million is equal to one inch in a distance of about sixteen miles (or a penny in ten thousand dollars), a very small amount. Ingestion of TCE for more than two weeks produced harmful effects in the livers of animals. Drinking TCE over longer periods of time caused effects on unborn animals and the kidneys as well as the liver.

Based on animal studies, the Environmental Protection Agency (EPA) has estimated that breathing air containing 1 ppm trichloroethylene every day for 70 years may place as many as 930 persons in a population of 100,000 at risk of developing cancer. EPA has also estimated that drinking water containing 1 ppm TCE every day over a lifetime may place as many as 32 persons in a population of 100,000 at risk of developing cancer.

What recommendations has the federal government made to protect human health?

EPA has established a drinking water standard of 5 parts of trichloroethylene per billion parts of water (ppb). EPA requires industry to report spills of 1,000 pounds or more of trichloroethylene. A reduction of this amount to 100 pounds has been proposed.

What are the methods of treatment and disposal of trichloroethylene?

The recommended method of TCE disposal is incineration following mixing with a combustible fuel. Complete combustion must be achieved to prevent the formation of phosgene, a poisonous gas. An acid scrubber must be used to remove the haloacids produced. There has been an emphasis on recovery and recycling of TCE to reduce emissions into the atmosphere.