

Appendix E: Vinyl Chloride and ATSDR

Vinyl Chloride

This appendix answers the most frequently asked questions about vinyl chloride. For more information, call the ATSDR Information Center at 1-800-447-1544.

This appendix is provided to help you understand more about **vinyl chloride** and its health effects. It is important that you understand this information because this substance is harmful to human health. The effects of exposure to any hazardous substance depend on the amount you are exposed, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

What is vinyl chloride?

Vinyl chloride is a colorless, flammable gas at normal temperatures with a mild, sweet odor. It is a manufactured substance that is used to make polyvinyl chloride, commonly known as PVC. PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and the furniture and automobile upholstery.

Vinyl chloride also results from the breakdown of other substances, such as trichloroethane, trichloroethylene, and tetrachloroethylene. Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

- Liquid vinyl chloride evaporates easily into the air. Vinyl chloride, if it is near the surface of soil or water, can also evaporate.
- Vinyl chloride in the air can break down within a few days to other substances, some of which can be harmful.
- Small amounts of vinyl chloride can dissolve in water.
- Vinyl chloride formed from the breakdown of other chemicals can enter groundwater.
- Vinyl chloride is unlikely to build up in plants or animals.

How might I be exposed to vinyl chloride?

- Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
- Breathing vinyl chloride in air during contact with your skin or eyes if you work with vinyl chloride in the workplace.
- Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, or even cause death in extreme cases.

Most of the studies on long-term exposure (1 year or longer) to vinyl chloride are about workers that make or use vinyl chloride. They were exposed to much higher levels of vinyl chloride in the air

than the general population. People who breathe vinyl chloride for long periods of time can experience changes to the structure of their livers.

People who work with vinyl chloride have developed nerve damage and immune reactions. Other workers have developed problems with the blood flow in their hands and the tips of their fingers turn white and hurt when they are in cold temperatures. Sometimes, the bones in the tips of their fingers have broken down.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term (1 year or longer) exposure to vinyl chloride can damage sperm and the testes. It has not been proven that vinyl chloride causes birth defects in humans, but animal studies have shown that breathing vinyl chloride can harm unborn offspring and may also cause increases in incidence of early miscarriages.

Quick Facts

Exposure to vinyl chloride occurs mainly in the workplace where vinyl chloride is used or manufactured. Breathing high levels of vinyl chloride for short periods of time (**acute** exposure) can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time (**chronic** exposure) can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found at about a third of all NPL sites.

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services has determined that vinyl chloride is a known **human carcinogen** (cancer-causing agent). Vinyl chloride exposure can result in liver cancer in people.

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

There are several tests that may show if you've been exposed to vinyl chloride.

- If breath samples are taken just after exposure, vinyl chloride can be measured, but this is not very helpful for measuring very low levels of the chemical.
- Better information is obtained by measuring a breakdown product of vinyl chloride, thiodiglycolic acid, in the urine shortly after exposure. However, this test will not give information on the level of exposure. Exposure to other chemicals can also produce the same breakdown product in urine.
- The binding of vinyl chloride to genetic material in your blood or tissue can tell whether you have been exposed to vinyl chloride, but this is not sensitive enough to determine the effects resulting from exposure.

These tests are not available at most doctor's offices, but can be done at special laboratories that have the necessary equipment.

Has the federal government made recommendations to protect human health?

The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter of water. The EPA requires that spills or accidental

Where Can I Learn More?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances.

For more information, contact ATSDR Division of Toxicology at 1600 Clifton Road N.E., Mailstop E-29, Atlanta, GA 30333.
Phone: 1-800-447-1544

You can also browse on the website:
<http://atsdr1.atsdr.cdc.gov:8080/ToxFAQ.html>.

releases into the environment of 1 pound or more of vinyl chloride be reported to the EPA.

The **Occupational Safety and Health Administration (OSHA)** has set the maximum allowable level of vinyl chloride in workroom air during an 8-hour work day, in a 40-hour work week, at 1 part vinyl chloride per million parts of air.

Source of Information: Information provided above was taken from the 1997 Toxicological Profile for Vinyl Chloride (Update) produced by ATSDR and U.S. Department of Health and Human Services.

ATSDR

The **Agency for Toxic Substances and Disease Registry, ATSDR**, was established by Congress in 1980 under **CERCLA**, also known as the **Superfund** law. Since 1986, ATSDR has been required by law to conduct a **public health assessment (PHA)** at each of the sites on EPA's **National Priorities List (NPL)**. The aim of the PHA is to find out if people are being exposed to

hazardous substances, and if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the state with which ATSDR has cooperative agreements. The PHA allows the scientists flexibility in the format or structure of their responses at hazardous waste sites. For example, a PHA could be one document, or it could be a compilation of several **health consultations** – the structure could vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

ATSDR also needs to learn what the community knows about the Site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near the Site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, a draft version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the PHA report.

Steps in the Public Health Assessment

1. Determine Exposure

As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information

provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data are needed.

2. Identify Potential Health Effects

If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact on children is considered first when evaluating the health threat to a community. The health impacts on other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic, and epidemiologic studies and data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances, or interaction between substances, is not available. When this is the case, the report will suggest what further public health actions are needed.

3. Conclusions

The PHA report presents conclusions about the public health threat, if any, posed by a site. When health effects have been determined for high risk groups, they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies including past medical history, disease registries, surveillance studies or research on specific hazardous substances.