

Volatile Organic Compounds' Impact on Indoor Air Quality

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Introduction

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands. Organic chemicals are widely used as ingredients in household products. Paints, varnishes and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing and hobby products. Fuels are made up of organic chemicals. All of these products can release organic compounds while you are using them, and, to some degree, when they are stored. EPA's Office of Research and Development's "Total Exposure Assessment Methodology (TEAM) Study" (Volumes I through IV, completed in 1985) found levels of about a dozen common organic pollutants to be 2 to 5 times higher inside homes than outside, regardless of whether the homes were located in rural or highly industrial areas. TEAM studies indicated that while people are using products containing organic chemicals, they can expose themselves and others to very high pollutant levels, and elevated concentrations can persist in the air long after the activity is completed.

Sources of VOCs

Household products, including:

- paints, paint strippers and other solvents
- wood preservatives
- aerosol sprays
- cleansers and disinfectants
- moth repellents and air fresheners
- stored fuels and automotive products
- hobby supplies

- dry-cleaned clothing
- pesticide

Other products, including:

- building materials and furnishings
 - office equipment such as copiers and printers, correction fluids and carbonless copy paper
 - graphics and craft materials including glues and adhesives, permanent markers and photographic solutions.
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Health Effects

Health effects may include:

- Eye, nose and throat irritation
- headaches, loss of coordination and nausea
- damage to liver, kidney and central nervous system
- Some organics can cause cancer in animals, some are suspected or known to cause cancer in humans.

Key signs or symptoms associated with exposure to VOCs include:

- conjunctival irritation
- nose and throat discomfort
- headache
- allergic skin reaction
- dyspnea
- declines in serum cholinesterase levels
- nausea
- emesis
- epistaxis
- fatigue
- dizziness

The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those with no known health effect.

As with other pollutants, the extent and nature of the health effect will depend on many factors including level of exposure and length of time exposed. Among the immediate symptoms that some people have experienced soon after exposure to some organics include:

- Eye and respiratory tract irritation
- headaches
- dizziness
- visual disorders and memory impairment

At present, not much is known about what health effects occur from the levels of organics usually found in homes.

- Search EPA's [Integrated Risk Information System \(IRIS\)](#)
 - A compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects
 - EPA's Office of Drinking Water regulations
 - [List of Contaminants and Their MCLs: Organic Chemicals](#)
 - U.S. Geology Survey's [National Water-Quality Assessment \(NAWQA\) Program](#)
 - Information on VOCs in water sources
 - U.S. Geology Survey's Toxic Substances Hydrology Program: [Toxic Program Research on VOCs](#)
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Levels in Homes

Studies have found that levels of several organics average 2 to 5 times higher indoors than outdoors. During and for several hours immediately after certain activities, such as paint stripping, levels may be 1,000 times background outdoor levels.

Standards or Guidelines

No federally enforceable standards have been set for VOCs in non-industrial settings. To learn more about VOC's, including current guidelines or recommendations set by various organizations for formaldehyde concentrations, visit [Lawrence Berkeley National Laboratory's Indoor Air Quality Scientific Findings Resource Bank](#).

Additional Resources

- [ASHRAE: Indoor Air Quality Guide](#), Strategies 5.1 and 5.2
- [ASHRAE Standard 189.1-2014](#), Sections 10.3.1.4 and 10.3.1.4 (b) 1
- [California Department of Public Health: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers \(Emission Testing Method for California Specification 01350\)](#)
- [California Title 17 ATCM to Reduce Formaldehyde Emissions from Composite Wood Products](#)
- [Carpet and Rug Institute: Green Label Plus](#)
- [Collaborative for High Performance Schools: High Performance Products Database](#)
- [EPA: Formaldehyde Standards for Composite Wood Products](#)
- [Indoor Air Fact Sheet No. 4 \(revised\) - Sick Building Syndrome](#)
- Explains the term "sick building syndrome" (SBS) and "building related illness" (BRI). Discusses causes of sick building syndrome, describes building investigation procedures and provides general solutions for resolving the syndrome.
- [Indoor Air Pollution: An Introduction for Health Professionals](#)

- Assists health professionals (especially the primary care physician) in diagnosis of patient symptoms that could be related to an indoor air pollution problem. Addresses the health problems that may be caused by contaminants encountered daily in the home and office. Organized according to pollutant or pollutant groups such as environmental tobacco smoke, VOCs, biological pollutants and sick building syndrome, this booklet lists key signs and symptoms from exposure to these pollutants, provides a diagnostic checklist and quick reference summary, and includes suggestions for remedial action. Also includes references for information contained in each section. This booklet was coauthored with the American Lung Association, the American Medical Association and the U.S. Consumer Product Safety Commission.