



Formaldehyde

What is formaldehyde?

Formaldehyde is a colorless, strong-smelling gas used in making building materials and many household products. It is used in pressed-wood products, such as particleboard, plywood, and fiberboard; glues and adhesives; permanent-press fabrics; paper product coatings; and certain insulation materials. It is also used to make other chemicals.

Formaldehyde is quickly broken down in the air – generally within hours. It dissolves easily in water, but does not last long there, either.

When dissolved in water it is called *formalin*, which is commonly used as an industrial disinfectant, and as a preservative in funeral homes and medical labs. It can also be used as a preservative in some foods and in products, such as antiseptics, medicines, and cosmetics. Sometimes, although formaldehyde is not used, substances that release formaldehyde are. These have been found in cosmetics, soaps, shampoos, lotions and sunscreens, and cleaning products.

Formaldehyde can be added as a preservative to food, but it can also be produced as the result of cooking and smoking.

Formaldehyde also occurs naturally in the environment. Humans and most other living organisms make small amounts as part of normal metabolic processes.

How are people exposed to formaldehyde?

The main way people are exposed to formaldehyde is by inhaling it. The liquid form can be absorbed through the skin. People can also be exposed to small amounts by eating foods or drinking liquids containing formaldehyde.

Formaldehyde is normally made in the body. Enzymes in the body break down formaldehyde into formate (formic acid), which can be further broken down into carbon dioxide. Most inhaled formaldehyde is broken down by the cells lining the mouth, nose, throat, and airways, so that less than a third is absorbed into the blood.

According to the US Consumer Product Safety Commission, formaldehyde is normally present at low levels (less than 0.03 parts per million) in both indoor and outdoor air. Materials containing formaldehyde can release it as a gas or vapor into the air. Automobile exhaust is a major source of formaldehyde in outdoor air.

During the 1970s, urea-formaldehyde foam insulation (UFFI) was used in many homes. But few homes are now insulated with UFFI. Homes in which UFFI was installed many years ago are not likely to have high formaldehyde levels now.

Pressed-wood products containing formaldehyde resins are often a source of formaldehyde in homes. Using unvented fuel-burning appliances, such as gas stoves, wood-burning stoves, and kerosene heaters can also raise formaldehyde levels indoors.

Formaldehyde is also a component of [tobacco smoke](#)¹ and both smokers and those breathing [secondhand smoke](#)² are exposed to higher levels of formaldehyde. One study found much higher levels of formaldehyde bound to DNA in the white blood cells of smokers compared to non-smokers.

Formaldehyde and other chemicals that release formaldehyde are sometimes used in low concentrations in cosmetics and other personal care products like lotions, shampoo, conditioner, shower gel, and some fingernail polishes. These may raise the concentration of formaldehyde in the air inside the room for a short time, but the levels reached are far below what is considered to be hazardous.

Professional keratin hair smoothing treatments can contain formaldehyde or formaldehyde releasing chemicals. Using these can raise indoor air concentrations of formaldehyde to levels that could be a potential hazard.

Workers in industries that make formaldehyde or formaldehyde-containing products, lab technicians, some health care professionals, and funeral home employees may be exposed to higher levels of formaldehyde than the general public. Exposure occurs mainly by inhaling formaldehyde gas or vapor from the air or by absorbing liquids containing formaldehyde through the skin. In one large study of workers in industries that make or use formaldehyde, the average level of formaldehyde exposure was 0.45 parts per million (ppm) overall, with less than 3% of workers experiencing more than 2 ppm on average.

Can formaldehyde cause cancer?

Exposure to formaldehyde has been shown to cause cancer in laboratory test animals. Exposure to relatively high amounts of formaldehyde in medical and occupational settings has been linked to some types of cancer in humans, but the effect of exposure to small amounts is less clear.

Studies in the lab

In rats, inhaled formaldehyde was linked to cancers of the nasal cavity and leukemia. In one study of rats given drinking water containing formaldehyde there was an increase in stomach tumors, while another showed no increase in any kind of tumor or cancer.

In mice, applying a 10% solution of formaldehyde to the skin was linked to quicker development of cancers caused by another chemical.

Studies in people

In one study, inhaling formaldehyde at levels at a concentration of 1.9 parts per million (ppm) for 40 minutes did not increase blood levels of formaldehyde.

Several epidemiology studies of people exposed to formaldehyde in the workplace have reported a link between formaldehyde exposure and [cancer of the nasopharynx](#)³ (the uppermost part of the throat), but this outcome has not been observed in other studies. These studies looked at workers in occupational setting that use or make formaldehyde and formaldehyde resins, as well as at people who work as embalmers.

Studies of people exposed to formaldehyde in the workplace have also found a possible link to [cancer of the nasal sinuses](#)⁴.

Several studies have found that embalmers and medical professionals that use formaldehyde have an increased risk of [leukemia](#)⁵, particularly myeloid leukemia. Some studies of industrial workers exposed to formaldehyde have also found increased risks of leukemia, but not all studies have shown an increased risk.

Studies looking at the link between workplace exposure to formaldehyde and other types of cancer have not found a consistent link.

One study found that workers exposed to formaldehyde had higher than normal levels of chromosome changes in early white blood cells in their bone marrow. This finding supports the possible link between formaldehyde exposure and leukemia.

What expert agencies say

Several agencies (national and international) study different substances in the environment to determine if they can cause cancer. (A substance that causes cancer or helps cancer grow is called a *carcinogen*.) The American Cancer Society looks to these organizations to evaluate the risks based on evidence from laboratory, animal, and human research studies.

Based on the available evidence, some of these expert agencies have evaluated the cancer-causing potential of formaldehyde.

The **National Toxicology Program (NTP)** is formed from parts of several different US government agencies, including the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), and the Food and Drug Administration (FDA). The NTP lists formaldehyde as "known to be a human carcinogen."

The **International Agency for Research on Cancer (IARC)** is part of the World Health Organization (WHO). Its major goal is to identify causes of cancer. IARC has concluded that formaldehyde is "carcinogenic to humans" based on higher risks of nasopharyngeal cancer and leukemia.

The **Environmental Protection Agency (EPA)** maintains the Integrated Risk Information System (IRIS), an electronic database that contains information on human health effects from exposure to various substances in the environment. The EPA has classified formaldehyde as a "probable human carcinogen."

National Cancer Institute researchers have concluded that, based on data from studies in people and from lab research, exposure to formaldehyde may cause leukemia, particularly myeloid leukemia, in humans.

(For more information on the classification systems used by some of these agencies, see [Known and Probable Human Carcinogens](#)⁶.)

Does formaldehyde cause any other health problems?

When formaldehyde is present in the air at levels higher than 0.1 parts per million (ppm), some people may have health effects, such as:

- watery eyes
- burning sensations of the eyes, nose, and throat
- coughing

- wheezing
- nausea
- skin irritation

Some people are very sensitive to formaldehyde, but others have no reaction to the same level of exposure.

Formaldehyde in consumer products such as cosmetics and lotions can cause an allergic reaction in the skin (allergic contact dermatitis), which can lead to an itchy, red rash which may become raised or develop blisters.

How can I limit my exposure to formaldehyde?

In the home

The EPA recommends using "exterior-grade" pressed-wood products to limit formaldehyde exposure in the home. These products give off less formaldehyde because they contain phenol resins, not urea resins. Before buying pressed-wood products, including building materials, cabinetry, and furniture, buyers should ask about the formaldehyde content of these products.

Formaldehyde levels in homes can also be reduced by not allowing smoking inside and by ensuring adequate ventilation (use your stove vent fan for example), moderate temperatures, and reduced humidity levels through the use of air conditioners and dehumidifiers.

People who are concerned about formaldehyde exposure from personal care products and cosmetics can avoid using products that contain or release formaldehyde. Still, because the amount of formaldehyde released from these products is low, it isn't clear that this will provide any health benefit.

Formaldehyde can be listed on a product label by other names, such as:

- Formalin
- Formic aldehyde
- Methanediol
- Methanal
- Methyl aldehyde
- Methylene glycol

- Methylene oxide

Some chemicals that are used as preservatives can release formaldehyde, such as:

- Benzylhemiformal
- 2-bromo-2-nitropropane-1,3-diol
- 5-bromo-5-nitro-1,3-dioxane
- Diazolidinyl urea
- 1,3-dimethylol-5,5-dimethylhydantoin (or DMDM hydantoin)
- Imidazolidinyl urea
- Sodium hydroxymethylglycinate
- Quaternium-15

In the workplace

The US Occupational Safety and Health Administration (OSHA) has established limits for the amount of formaldehyde that workers can be exposed to at their place of work. At present the limit is at 0.75 ppm on average over an 8 hour workday. The highest concentration that a worker can be exposed to is 2 ppm, and that can only occur over 15 minutes. Employers must monitor formaldehyde levels and provide respirators and protective clothing as needed to limit exposure. This includes workers in any workplace where formaldehyde exposure is likely, including hair salons that use commercial hair smoothing products that release formaldehyde.

Hyperlinks

1. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html
2. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/secondhand-smoke.html
3. www.cancer.org/cancer/nasopharyngeal-cancer.html
4. www.cancer.org/cancer/nasal-cavity-and-paranasal-sinus-cancer.html
5. www.cancer.org/cancer/leukemia.html
6. www.cancer.org/cancer/cancer-causes/general-info/known-and-probable-human-carcinogens.html
7. www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/CSCP/Pages/CSCP.aspx
8. <http://www.cpsc.gov/>
9. <http://www.fda.gov/>
10. www.osha.gov/

11. <http://www.fema.gov/>

Additional resources

In addition to the American Cancer Society, other sources of information and support include*:

California Safe Cosmetics Program

Website: www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/CSCP/Pages/CSCP.aspx
x (www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/CSCP/Pages/CSCP.aspx)⁷

- Collects information on hazardous and potentially hazardous ingredients in cosmetic products sold in California. Its searchable database has information about which cosmetics contain potential hazards such as formaldehyde.

US Consumer Product Safety Commission Toll-free number: 1-800-638-2772 (1-800-638-CPSC) Website: www.cpsc.gov (<http://www.cpsc.gov>)⁸

- The Consumer Product Safety Commission (CPSC) has information about household products that contain formaldehyde.

US Food and Drug Administration Toll-free number: 1-888-463-6332 (1-888-INFO-FDA) Website: www.fda.gov (<http://www.fda.gov>)⁹

- The Food and Drug Administration (FDA) maintains information about cosmetics and drugs that contain formaldehyde.

Occupational Safety and Health Administration Toll-free number: 1-800-321-6742 (1-800-321-OSHA) Website: www.osha.gov (www.osha.gov)¹⁰

- The Occupational Safety and Health Administration (OSHA) has information about workplace exposure limits for formaldehyde.

Federal Emergency Management Agency Toll-free number: 1-800-621-3362 (1-800-

621-FEMA) Website: www.fema.gov (<http://www.fema.gov/>)¹¹

- The Federal Emergency Management Agency (FEMA) has information about formaldehyde exposure levels in mobile homes and trailers supplied by FEMA after Hurricane Katrina.

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

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