

# Formaldehyde

**Overexposure to formaldehyde irritates the eyes, nose, throat, and skin.** Formaldehyde can cause allergic reactions of the skin (dermatitis) and the lungs (asthma). Formaldehyde is a known cause of cancer in humans.

## How to find out if you are working with formaldehyde

Your employer must tell you if you are working with formaldehyde, and must train you to use it safely, under California's Formaldehyde Standard and the Hazard Communication Standard (see page 8). If you think you may be exposed to formaldehyde on the job, ask to see the Material Safety Data Sheets (MSDSs) for the products you are using. The MSDS must identify formaldehyde in Section 2, by the Chemical Abstract Service (CAS) number 50-00-0.

Formaldehyde is commonly used as formalin, a mixture of 30-50% formaldehyde and 10-20% methyl alcohol in water. Formalin readily gives off irritating vapors with a strong odor.

## Some synonyms and trade names of formaldehyde products

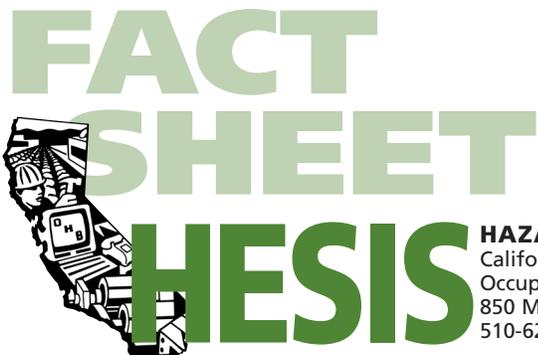
formalin	BFV
methaldehyde	Fannoform
methanal	Formalith
methyl aldehyde	Formol
methylene glycol	Fyde
methylene oxide	Ivalon
oxomethane	Karsan
oxymethylene	Lysoform
paraform	Morbicid
paraformaldehyde	

## How formaldehyde is used and where it's found

Formaldehyde is used as a...

- disinfectant and sterilant,\*
- fumigant,
- preservative, and in...
- embalming fluid,
- some keratin-based hair smoothing treatments.

\* (other aldehydes used include glutaraldehyde and ortho-phthalaldehyde)



**HAZARD EVALUATION SYSTEM & INFORMATION SERVICE**  
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Occupational Health Branch  
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It is used in making...

- chemical resins • wrinkle-proof fabrics
- rubber products • latex paints • dyes
- plastics • paper products, and • cosmetics.

It is found in...

- insulation materials • plywood • particle board
- adhesives • glues • paint primers, and
- fingernail products.

Any of these materials may give off formaldehyde vapors.

Formaldehyde is also present in combustion products, such as vehicle exhaust and tobacco smoke.

## Some workers who may have substantial exposure to formaldehyde

chemical and rubber workers  
embalmers  
laboratory workers  
health care workers  
clothing and textile workers  
furniture or wood product makers  
foundry workers  
insulation workers

## How formaldehyde affects your body

Formaldehyde can affect you when you breathe its vapors or touch the liquid. Because formaldehyde reacts quickly with body tissues, it mainly affects the place of direct contact, such as the eyes, nose, and skin. The most common effect of overexposure is irritation of the eyes, nose, and throat.

**Eyes, Nose, and Throat.** The eyes, nose, and throat are irritated by formaldehyde vapors at levels as low as about 0.3 part formaldehyde per million parts of air (0.3 part per million, or 0.3 “ppm” – see “Legal Exposure Limits”). This exposure can cause red, teary, burning eyes, sneezing and coughing, and sore throat. Some people have irritant symptoms at these very low exposure levels, while others can tolerate levels as high as a few ppm with little or no reaction.

Liquid formaldehyde solutions contacting the eyes can damage the cornea, possibly causing blindness.

**Lungs.** High levels (5–30 ppm and higher) can severely irritate the lungs, causing chest pain and shortness of breath.

Repeated exposure to formaldehyde can cause allergic asthma. Symptoms of asthma include chest tightness, shortness of breath, wheezing, and coughing. Formaldehyde’s long-term effects on the lungs are not fully understood.

**Skin.** Formaldehyde solutions can destroy your skin’s natural protective oils, causing dryness, flaking, cracking, and dermatitis (skin rash). Skin contact can also cause an allergic reaction (redness, itching, hives, and blisters). As many as one in twenty workers who are regularly exposed to formaldehyde develop an allergic skin reaction.

**Cancer.** Formaldehyde exposure can cause cancer of the nose and sinuses in humans, as well as some types of leukemia and lymphoma. Formaldehyde is regulated as a carcinogen by Cal/OSHA and Cal/EPA.

**Reproductive System.** Formaldehyde’s effect on pregnancy and the reproductive system has been studied in both humans and in laboratory animals. Formaldehyde has been shown to decrease fertility and increase the risk of spontaneous abortion (miscarriage) in humans. In laboratory animals, formaldehyde can harm the developing fetus and damage sperm. In order to avoid risk to pregnancy and the reproductive system, HESIS recommends minimizing workplace exposures to formaldehyde prior to and during pregnancy.

# Legal exposure limits

**Permissible Exposure Limits.** The Occupational Safety and Health Standards Board sets Permissible Exposure Limits (PELs) for the amounts of chemicals in workplace air. PELs are intended to protect the health of most workers who are exposed every day over a working lifetime.

The **PEL** for formaldehyde is 0.75 part of formaldehyde per million parts of air (0.75 part per million, or **0.75 ppm**). Legally, your exposure may be above the PEL at times, but only if it is below the PEL at other times, so that your average exposure for any 8-hour workshift is no more than 0.75 ppm.

The **Short-Term Exposure Limit (STEL)** for formaldehyde is **2 ppm**. Your average exposure during any 15-minute period must not exceed 2 ppm. Exposure at or above the STEL triggers special requirements.

The **Action Level** for formaldehyde is **0.5 ppm** averaged over an 8-hour period. Air monitoring, medical surveillance, and other special requirements are triggered at or above this level.

Cal/OSHA's formaldehyde standard, California Code of Regulations, Title 8, Section 5217, contains many other specific requirements (see information on page 8).

## Monitoring your exposure

To reduce your risk of developing health problems from exposure to formaldehyde, your employer must...

- Identify employees who may be exposed at or above the action level or STEL.
- Test the air to accurately determine how much formaldehyde each identified employee is breathing.
- Test the air periodically if the first tests show that exposures are at or above the action level or STEL.

- Re-test the air for formaldehyde each time there is a change that may result in new or additional exposure.
- Determine exposures promptly, if employees are having formaldehyde-related respiratory or skin symptoms.
- Allow employees or their designated representatives to observe any required exposure monitoring.
- Notify employees in writing within 15 days after receiving the exposure monitoring results.

See the formaldehyde standard (information on page 8) for additional exposure monitoring requirements.

## Tests for exposure and medical effects

**Blood or urine tests.** Formaldehyde does not stay in your body. No medical or laboratory test can accurately measure the amount of formaldehyde to which you have previously been exposed. There is no medical reason to do blood or urine tests for formaldehyde.

**Medical Surveillance.** If you are exposed to formaldehyde at or above the action level or above the STEL, your employer must have a *medical surveillance program* to monitor effects on your health.

Your employer also must...

- Provide the *medical surveillance program* if you develop signs and symptoms of overexposure to formaldehyde, or if you are exposed to formaldehyde during an emergency.
- Provide a *medical disease questionnaire* before assignment to jobs where exposures are at or above the action level or above the STEL, and promptly when you experience signs and symptoms that indicate overexposure to formaldehyde.

- Ensure a *medical examination*
  - if evaluation of the questionnaire indicates that you may be at increased risk for health effects;
  - at the time you first start using a respirator (if you are required to wear one) and then once a year;
  - as soon as possible if you are exposed to formaldehyde in an emergency.

- Provide the medical exam at a reasonable time and place, at no cost to you, and without loss of pay.
- Have a *licensed physician* or someone under the physician's supervision perform all medical procedures, including administration of the medical disease questionnaire.
- Provide specific information about your job, and a copy of the formaldehyde standard and the appendices, to the health care provider.
- Provide you with a copy of the *physician's written opinion* within 15 days after receiving it.

**Medical Removal.** If you experience significant *irritation of the eyes, throat, or lungs, or asthma-like symptoms* such as chest tightness, shortness of breath, coughing, or wheezing, a physician must determine whether you need to be removed from exposure to formaldehyde. A physician must also evaluate *skin irritation or skin allergies* caused by products that contain at least 0.1% formaldehyde.

See the Cal/OSHA formaldehyde regulation for other specific medical removal requirements including job transfer or job training with retention of current

earnings, seniority and other benefits, and provisions for multiple physician review of evaluation results.



## Reducing exposure

By law, employers must provide a safe and healthy workplace. Here are some ways employers and workers can work together to reduce exposures to formaldehyde. See the formaldehyde regulation for specific Cal/OSHA requirements (information on page 8).

### Use safer substitutes whenever possible

- *Hydrogen peroxide-based solutions* often can be used as disinfectants.
- *Ethyl alcohol, polyethylene glycol, or phenoxyethanol* can be used as fixatives or preservatives.

### Ventilate the work area

- Install *professionally designed ventilation systems* to maintain formaldehyde exposures below legal exposure limits.
- Conduct *regular maintenance on ventilation systems* and ensure that they are functioning properly.
- Do not allow ventilation systems to recirculate formaldehyde vapors.



### Use personal protective equipment

- *Protective clothing and equipment* must be provided at no cost to prevent skin and eye contact with liquids containing 1% or more formaldehyde. Employers must ensure that employees use it.
- *Change rooms* as specified in Title 8, Section 3367 must be provided for employees who are required to change from work clothes to protective clothing.
- *Gloves made of nitrile, neoprene, butyl rubber or polyethylene laminate* protect against incidental hand or skin contact with formaldehyde. Gloves made of latex may not provide adequate protection and can cause allergic reactions.

- *Chemical resistant aprons* protect against splashes to the body.
- *Chemical safety goggles* protect eyes from splashes.
- *Face shields with chemical safety goggles* protect the entire face from splashes.
- *Respirators* should be used as specified in the formaldehyde regulation, *only if ventilation and other control methods are not effective or feasible*. Employers also must comply with the Cal/OSHA Respiratory Protection Standard (Title 8, Section 5144).

### **Inform and train workers**

- Explain and discuss the *formaldehyde regulation* and *MSDSs*.
- Educate employees about formaldehyde *health hazards* and *symptoms of overexposure*. Emphasize the importance of reporting symptoms early.
- Instruct employees on the use of *safe work procedures*.
- Demonstrate the proper *use and maintenance* of fume hoods and other *local exhaust ventilation systems*.
- Explain the *purpose and limitations of personal protective clothing and equipment* and demonstrate how to use them properly.
- Instruct employees on how to respond to *spills* and *emergencies*, and on safe *clean-up procedures*.
- Conduct drills on *emergency procedures* that include each employee's specific duties.
- Ensure that *employees understand the information and training*.

### **Establish and use safe work procedures**

- Identify *regulated areas* where formaldehyde concentrations exceed the PEL or the STEL. Post with signs required by the regulation, and limit access to persons trained on the hazards of formaldehyde.

- Provide eyewash facilities in areas where splashing may occur with solutions that contain 0.1% or more formaldehyde. Provide emergency showers in areas where solutions of 1% or more formaldehyde are used. Where both are required, locate them together within 10 seconds of the splash area (Title 8, Section 5162).
- Use *laboratory fume hoods* when working with open containers of formaldehyde and specimens preserved in formaldehyde.
- *Label all containers* as specified in the formaldehyde regulation.
- *Cap storage containers* immediately when formaldehyde is not in use.
- Do not use formaldehyde on surfaces like carpets that can't be cleaned easily.

### **Minimize exposure from spills and contaminated material**

- Perform *preventive maintenance on equipment* and *inspect frequently* to detect leaks and spills.
- Develop *procedures to contain spills, decontaminate work areas*, and dispose of waste in work areas where spills may occur.
- Use *formaldehyde neutralization pads* or sheets where small spills or drips may occur on work surfaces.
- *Repair all leaks* and *clean up spills* promptly. Ensure that employees are wearing suitable protective equipment and are trained.
- Use *formaldehyde neutralization products* that neutralize quickly and don't generate hazardous by-products.
- Promptly *remove contaminated material*, such as towels, clothing, and sponges from the work area.
- *Ventilate contaminated clothing and equipment* in properly labeled and established storage areas. Have only persons trained in formaldehyde hazards remove them.
- Place *contaminated waste* and debris for disposal in *sealed, labeled containers* that warn of formaldehyde hazards.

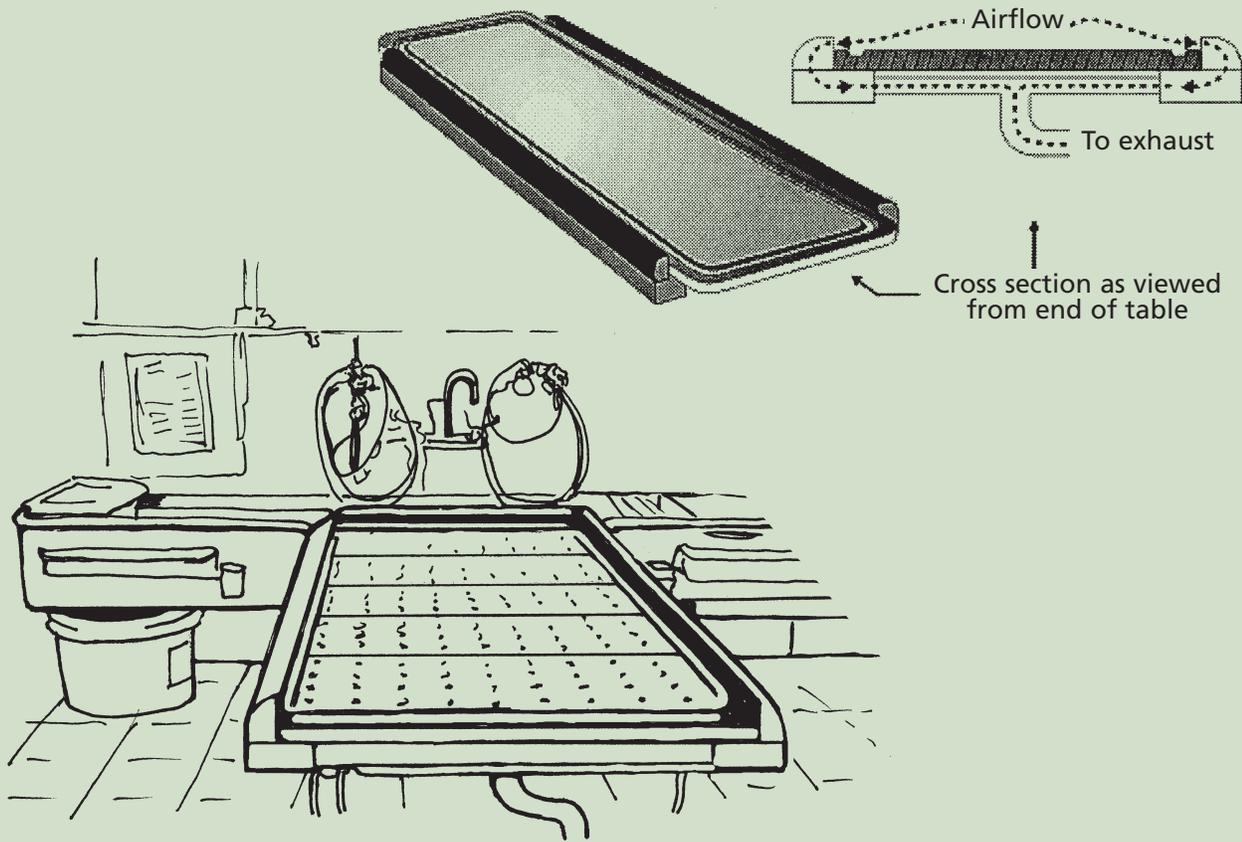
# SPECIFIC WAYS TO REDUCE EXPOSURES FOR VARIOUS INDUSTRIES

## FUNERAL

- Use *embalming fluid substitutes* that contain ethyl alcohol, polyethylene glycol, or phenoxyethanol. Be aware that embalming creams and drying and hardening powders may also contain formaldehyde.
- Use *embalming tables with local exhaust ventilation* that draws air down at the sides and carries it out of the room through ducts. These systems are sold for existing tables.
- Use *small quantities* for easy and safe handling.
- Use personal protective equipment such as gloves, chemical safety goggles, face shields, and aprons.

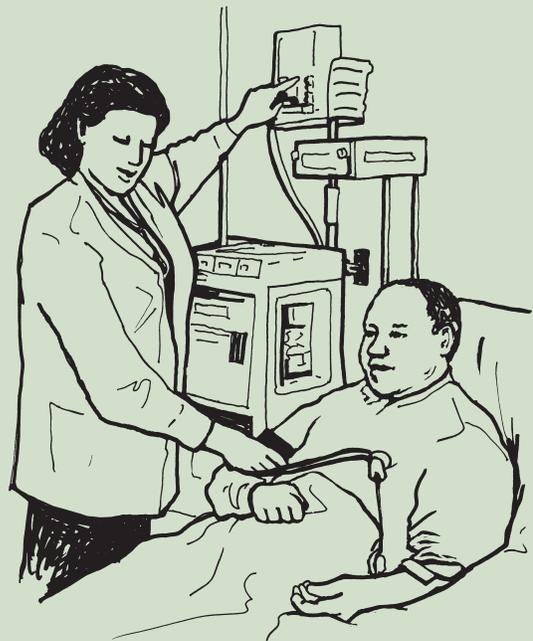
## APPAREL AND TEXTILE

- Use *low formaldehyde-containing cross-linking agents* in textile manufacturing processes, when possible.
- Use a *roof exhaust fan* or other ventilation systems to remove formaldehyde vapors from stored apparel and to provide a *continuous supply of fresh air*.



## MEDICAL AND HEALTH SERVICES

- Use other sterilization methods, such as *low temperature plasma* or *autoclaving*, instead of formaldehyde whenever possible.
- Use non-formaldehyde disinfectants. *Hydrogen peroxide-based solutions* may be suitable.
- Use formaldehyde-free fixatives for histopathological procedures, when possible.
- Use formaldehyde-based fixatives with the lowest concentration of formaldehyde possible.
- Incorporate *automatic dispensing systems* to replace manual formaldehyde handling procedures, such as washing, disinfecting, or dispensing.
- Conduct work with open containers in laboratory fume hoods or using other local exhaust ventilation systems.



- Ensure that *hemodialysis* drain line connections are airtight to prevent formaldehyde vapors from escaping into treatment rooms.
- Spend as little time as possible in areas where *hemodialyzers* are reprocessed.

## FOUNDRY AND FURNITURE

- Convert to *low-emitting formaldehyde resins*, when possible.
- Use *formaldehyde-free wood products*.
- Provide a *continuous supply of fresh air* where furniture is stored.

## ELECTRONICS

- Consider switching to *formaldehyde-free alternatives* in printed circuit boards. Carbon, graphite, organic-palladium, tin-palladium, sodium hypophosphite electroless copper, and conductive polymer technology are examples.

# RESOURCES

## REGULATIONS THAT HELP TO PROTECT WORKERS

- **Formaldehyde Standard.** This comprehensive standard, California Code of Regulations (CCR), (Title 8, Section 5217) requires employers to take specific actions to protect workers from allergic reactions, irritation, and cancer that can result from exposure to formaldehyde. See [www.dir.ca.gov/title8/5217.html](http://www.dir.ca.gov/title8/5217.html).
- **Hazard Communication Standard.** Under this standard (Title 8, Section 5194), your employer must tell you if you are working with any hazardous substances, must train you to use them safely, and must make Material Safety Data Sheets available. See [www.dir.ca.gov/title8/5194.html](http://www.dir.ca.gov/title8/5194.html).
- **Injury and Illness Prevention Program.** Every employer must have an effective, written Injury and Illness Prevention Program (IIPP) that identifies a person with the authority and responsibility to run the program (Title 8, Section 3203). The IIPP must include methods for identifying workplace hazards, methods for correcting hazards quickly, health and safety training at specified times, a system for communicating clearly with all employees about health and safety matters (including safe ways for employees to tell the employer about hazards), and recordkeeping to document the steps taken to comply with the IIPP. See [www.dir.ca.gov/title8/3203.html](http://www.dir.ca.gov/title8/3203.html).
- **Access to Medical and Exposure Records.** You have the right to see and copy your own medical records, and any records of toxic substance exposure monitoring (Title 8, Section 3204). These records are important in determining whether your health has been affected by your work. Employers who have such records must keep them and make them available to you for at least 30 years after the end of your employment. See [www.dir.ca.gov/title8/3204.html](http://www.dir.ca.gov/title8/3204.html).

## WHERE TO GET HELP

- **HESIS.** Answers questions about formaldehyde and other workplace hazards for California workers, employers, and health care professionals. Call **866-282-5516**. HESIS also has many free publications available. To request publications, leave a message at **(866) 627-1586**, visit our website at [www.cdph.ca.gov/ohb](http://www.cdph.ca.gov/ohb), or write to HESIS at 850 Marina Bay Parkway, Building P, 3rd Floor, Richmond, CA 94804.
- **National Institute for Occupational Safety and Health (NIOSH).** Hazard Control 26 / *Controlling Formaldehyde Exposures During Embalming*: [www.cdc.gov/niosh/hc26.html](http://www.cdc.gov/niosh/hc26.html).
- **California Division of Occupational Safety and Health (Cal/OSHA).** Investigates workers' complaints and answers questions about workplace health and safety regulations. Complainants' identities are kept confidential. Contact the nearest Cal/OSHA Enforcement District Office. They are listed in the blue government section near the front of the phone book, under "State Government / Industrial Relations /Occupational Safety and Health /Enforcement" or visit their website at [www.dir.ca.gov/DOSH](http://www.dir.ca.gov/DOSH).
- **Other resources for employees** may include your supervisor, your union, your company health and safety officer, your doctor, or your company doctor.
- **Cal/OSHA Consultation Service.** Helps employers who want free non-enforcement assistance to improve health and safety conditions. Employers can call **1-800-963-9424**.

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