

# Methylene Chloride

**Methylene chloride most often affects the central nervous system (the brain)** causing headaches, nausea, dizziness, clumsiness, drowsiness, and other effects like those of drinking alcohol. At very high levels it can cause unconsciousness and death. Methylene chloride causes cancer in animals, and is regulated as a cancer-causing substance in the workplace. Because it forms carbon monoxide in the body, methylene chloride can increase angina (chest pains) and can cause other heart symptoms in workers who have heart disease.

## How to find out if you are working with methylene chloride

Methylene chloride is a solvent. It is used in many industries and for a variety of job tasks. Your employer must tell you if you are working with methylene chloride, and must train you to use it safely under California's Methylene Chloride Standard and the Hazard Communication Standard (see page 8). If you think you may be exposed to methylene chloride on the job, ask to see the Material Safety Data Sheets (MSDSs) for the products you are using. The MSDS must identify methylene chloride in Section 2, by the Chemical Abstract Service (CAS) number 75-09-2.

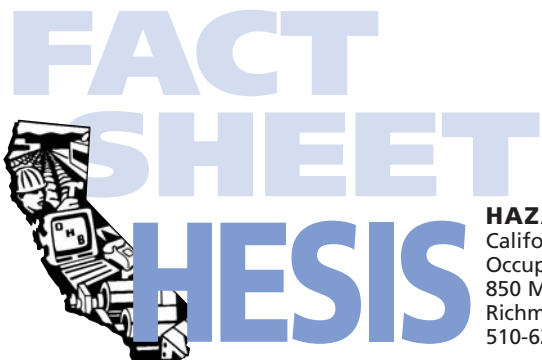
## Some products that contain methylene chloride

Bix Stripper  
KS Brushable Stripper  
Benco #B7 Industrial Paint Remover  
V-1106 Rejuvenator Plus  
32 Fast Setting Steam Adhesive  
Lifteeze Paint & Varnish Remover  
Savogran Strypeeze Paint/Varnish Remover  
Aqua Mix Sealer and Adhesive Remover  
Zinc It Electric Grade Lubricant  
Klean Strip Deep Down Stain Stripper  
Klean Strip Graffiti Remover

These are examples of products with methylene chloride listed on the MSDSs. This is not a complete list. Be sure to check the MSDS for the ingredients of the product you are using.

## Some industries and job tasks where methylene chloride is used

- construction • paint stripping • vapor degreasing • printing • foam manufacturing
- spice extraction • electronics manufacturing • chemical manufacturing • cleaning



### HAZARD EVALUATION SYSTEM & INFORMATION SERVICE

California Department of Health Services  
Occupational Health Branch  
850 Marina Bay Parkway, Building P, 3rd Floor  
Richmond, CA 94804  
510-620-5757 • [www.dhs.ca.gov/ohb](http://www.dhs.ca.gov/ohb)

# How methylene chloride enters your body

Methylene chloride enters your body when you breathe its vapors or droplets of spray in the air. Your risk of health effects depends on the amount of methylene chloride that enters your body. That depends mainly on the amount you breathe and how long you are exposed.

# How methylene chloride affects your health

Overexposure most often affects the nervous system (brain), skin, eyes, nose, and throat.

**Nervous System.** Methylene chloride can affect your brain the same way drinking alcohol does. Overexposure for a short time causes headaches and nausea, dizziness, clumsiness, drowsiness, and other effects like those of being drunk. These effects can increase your risk of being injured. Drinking alcohol within a few hours of exposure increases these effects and makes them last longer, because the effects of alcohol and methylene chloride add together. The symptoms of short-term exposure usually clear up within a few hours after exposure stops.

Repeated, frequent overexposure to methylene chloride and other solvents over months and years can have long-lasting and possibly permanent effects on the nervous system. The symptoms include fatigue, sleeplessness, poor coordination, loss of short-term memory, and personality changes such as depression, anxiety, and irritability.

**Skin.** If methylene chloride from wet shoes, gloves, or other clothes gets on your skin and stays there for a long time, it can cause severe burns. Methylene chloride evaporates quickly from bare skin, so brief contact causes only mild irritation. Repeated skin contact can cause dermatitis (skin rash) with dryness, redness, flaking, and cracking of the skin.

**Eyes, Nose, Throat.** Methylene chloride can irritate your eyes, nose, and throat. If methylene chloride is splashed into your eyes, it may be very painful, but it is unlikely to cause permanent injury

**Heart.** Methylene chloride can make pre-existing angina (heart pain) worse and cause other heart symptoms in people with heart disease. In healthy people, methylene chloride is not likely to affect the heart. Extremely high exposure levels, however, can cause heart failure and sudden death.

**Liver and Kidney.** Methylene chloride is not likely to damage the liver or kidney if exposures are kept at legal limits and there are no noticeable effects on the nervous system.

**Cancer.** Methylene chloride causes cancer in animals and potentially can cause cancer in humans. It is regulated as a cancer-causing chemical in the workplace.

**Reproductive System.** Methylene chloride does not appear to be more harmful to the developing fetus than to the adult. It does not cause birth defects or other developmental harm when tested in pregnant animals. Like most organic solvents, when inhaled, methylene chloride can reach the developing fetus through the placenta and can enter the breast milk. You should avoid overexposure if you are pregnant or breastfeeding.

**Carbon Monoxide Effects.** Methylene chloride breaks down into carbon monoxide (CO) in your body. CO can cause nervous system effects like those described above. Smoking also puts CO in your blood, so smokers can have these symptoms at lower methylene chloride levels than nonsmokers. CO also stresses the heart, and people with angina (chest pains) from coronary artery disease are extremely sensitive to CO; methylene chloride can make angina worse, even with exposures below the limits. People with heart or lung conditions, smokers, people who are overweight or pregnant, and people with other exposure to carbon monoxide should limit their exposures to methylene chloride.

# Legal exposure limits

**Permissible Exposure Limits.** The Cal/OSHA 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 methylene chloride is 25 parts of methylene chloride per million parts of air (25 parts per million or **25 ppm**) averaged over an eight-hour work period. 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 eight-hour work period is no more than 25 ppm.

The **Short-Term Exposure Limit (STEL)** for methylene chloride is **125 ppm**. Your average exposure during any 15-minute period must not exceed 125 ppm. Exposure at or above the STEL triggers special requirements.

The **Action Level** for methylene chloride is **12.5 ppm**. Air monitoring, medical surveillance, and other special requirements are triggered at or above this level.

Cal/OSHA's methylene chloride standard, California Code of Regulations (CCR), Title 8, Section 5202 contains many other specific requirements (see information on page 8).

## Monitoring your exposure

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

- ▶ Test the air to determine each employee's exposure and ensure that the test methods meet specific accuracy requirements.
- ▶ Test the air periodically if the first tests show that exposures are at or above the Action Level or STEL. The exposure monitoring program must comply with the standard.

- ▶ Re-test the air when a change in your work may increase your exposure.
- ▶ Test the air for methylene chloride released from spills, broken equipment, and other incidents *after* the area is decontaminated (spills are cleaned up, equipment is repaired, etc.).
- ▶ 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.
- ▶ Describe in writing actions that will be taken to reduce exposures to or below the PEL or STEL and the schedule for completing the actions.

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

## Tests for exposure and medical effects

**Blood and Exhaled Air Tests.** The amount of methylene chloride in your blood or in the air that you exhale is a good measure of your recent exposure. The amount of carboxyhemoglobin in your blood is also a good guide. However, methylene chloride is quickly eliminated from your body, so these tests are only useful if they are done within a few hours after exposure (usually at the end of a work shift). Smoking and exercise can confuse the test results.

**Medical Surveillance.** If you are or may be exposed to methylene chloride at or above the Action Level, PEL, or STEL (under the conditions specified in the standard, see page 8), your employer must make medical surveillance available to monitor effects on your health.

Your employer also must...

- Provide *medical surveillance before* you begin work and
  - periodically as described in the standard
  - at time periods specified in medical opinions
  - upon termination of employment or reassignment as specified in the standard and
  - if you are exposed during an emergency.
- Obtain and update each year, a *comprehensive medical and work history* that includes specific information required by the standard.
- Provide a *physical examination*. It must be based on your health status, analysis of your medical and work history, and on other requirements of the standard.
- Expand the scope of the medical examination and provide additional medical surveillance if a health care professional determines it is needed.
- Provide *laboratory tests* (such as carboxyhemoglobin levels and electrocardiograms) based on your health status and medical and work history.
- Include in the medical surveillance any information the health care professional needs to assess your health in relation to methylene chloride exposure.
- Ensure that the medical surveillance after you are exposed in an emergency meets the requirements of the standard.
- Provide the medical surveillance *at no cost* to you, without loss of pay, and at a reasonable time and place.
- Ensure that all medical surveillance procedures are performed by a licensed health care professional.
- Provide *specific information about your job*, previous job-related medical surveillance, and information on medical surveillance from the standard and its appendices to the licensed health care professional.
- Provide you with a copy of the physician's *written medical opinion* within the time periods specified in the standard.

**Medical Removal.** If exposure to methylene chloride is contributing to or aggravating your existing heart, liver, neurological (nerves, including stroke), or skin disease, and your physician recommends removal from exposure, your employer must provide *medical removal protection benefits*. These benefits include retention for up to six months of your earnings, seniority, and other employment benefits and rights as though you had not been removed from your job.

See the Cal/OSHA methylene chloride standard for other specific medical removal requirements.

## Reducing exposure

By law, employers must provide a safe and healthy workplace using ventilation and other controls, and work practices described in the Cal/OSHA methylene chloride standard. Here are some ways employers and employees can work together to reduce exposures.

### Use safer substitutes whenever possible

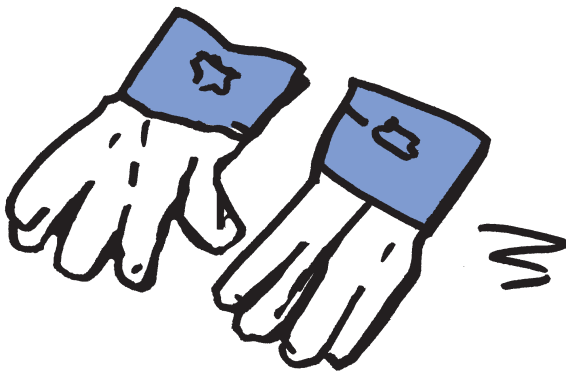
- *Water-based* and *vegetable-based* products are safe and effective substitutes for methylene chloride for many cleaning jobs
- *Ethyl acetate* is an FDA-approved substitute for decaffeinating coffee.

### Ventilate the work area

- Install *professionally designed ventilation systems* to maintain methylene chloride 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 methylene chloride vapors.

## Use personal protective equipment

- ▶ Protective clothing and equipment that's clean and resistant to methylene chloride must be provided at no cost to employees. Employers must ensure that employees use the protective clothing and equipment, and must clean, repair, replace, and dispose of it as needed.
- ▶ Gloves made of *polyethylene vinyl alcohol and ethylene vinyl alcohol (PVA/EVA)* are resistant to methylene chloride and protect against skin exposure. Methylene chloride easily penetrates many other types of gloves, including nitrile and neoprene, and can burn the skin.
- ▶ Methylene chloride resistant *aprons* protect against splashes to the body.
- ▶ *Face shields* and *chemical safety goggles* protect the entire face from splashes.
- ▶ *Respirators* should be used as specified in the methylene chloride regulation, only if ventilation and other control methods are not effective or feasible. Employers must comply with specified sections of the Cal/OSHA Respiratory Protection Standard (Title 8, Section 5144).



## Inform and train workers

- ▶ Make sure employees know and understand the requirements of the methylene chloride standard and know about the appendices to the standard. Tell them how to access the standard or to obtain a copy in the workplace.
- ▶ Train employees on methylene chloride *health hazards, symptoms of overexposure, and protective measures*. Emphasize the importance of reporting symptoms early. Update the training to address new potential exposures. Make sure employees understand the information.
- ▶ Inform employees who are (or may be) exposed above the Action Level of the *quantity, location, use, release, and storage* of methylene chloride, and *specific work activities* that could result in exposure, especially above the PEL and STEL.

## Minimize exposure to spills

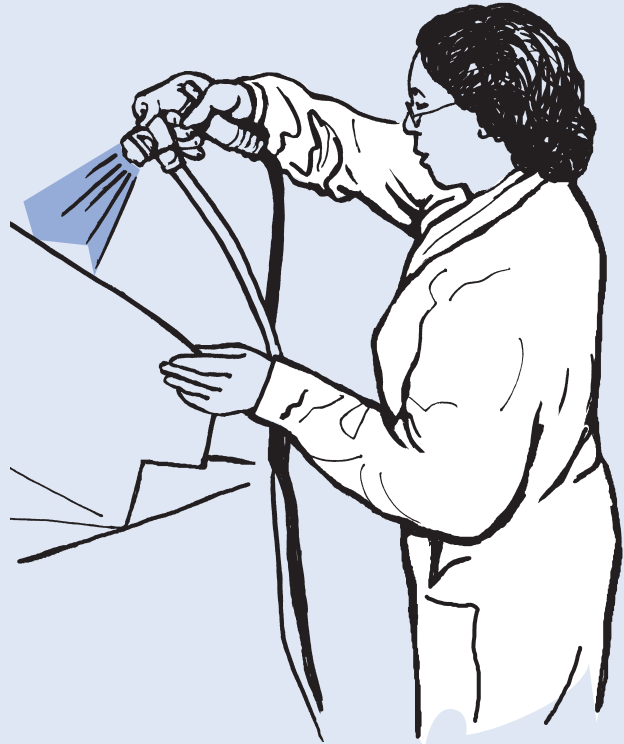
- ▶ Perform *preventive maintenance* on equipment and inspect frequently to detect leaks and spills.
- ▶ Develop *procedures to contain spills*, decontaminate work areas, and dispose of waste in work areas where spills may occur.
- ▶ Repair all leaks and *clean up spills promptly*. Ensure that employees are wearing suitable protective equipment and are trained.



# SPECIFIC WAYS TO REDUCE EXPOSURES FOR VARIOUS INDUSTRIES AND JOB TASKS

## FLEXIBLE FOAM MANUFACTURING

- ▶ Blow foam in a *vacuum* instead of using chemical blowing agents whenever possible.
- ▶ Use *carbon dioxide* and *acetone* instead of methylene chloride if a vacuum system is not feasible. Work safely with acetone to protect against fires.
- ▶ Use *water-based adhesives* instead of adhesives containing methylene chloride, 1-bromopropane, and other toxic solvents.

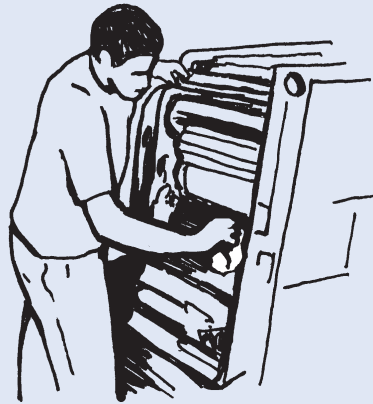


## PAINT STRIPPING

- ▶ Use *soy-based strippers* that do not contain methylene chloride, N-methylpyrrolidone, or other toxic solvents.
- ▶ Use *mechanical methods* such as wheat starch blasting to remove paint instead of solvent-based strippers, whenever possible.
- ▶ Substitute *benzyl alcohol* for methylene chloride and N-methylpyrrolidone if you must use a solvent-based stripper. Use local exhaust ventilation and chemical resistant gloves to protect against exposure.

## PRINTING PRESS CLEANING

- Use an *automatic blanket washing* system instead of manual cleaning, if possible.
- Convert to *water-washable inks* where feasible. This will reduce or eliminate the use of toxic clean-up solvents.
- Use *water-based* and *vegetable oil-based* blanket washes, and *terpene-based* cleaners instead of solvent-based cleaners.



## INDUSTRIAL AND PRECISION CLEANING

- Convert to a *water-based cleaning system* for cleaning parts and other precision cleaning.
- Use *hot water-based detergents* when possible, instead of vapor degreasing and cold cleaning operations that use toxic solvents like methylene chloride and 1-bromopropane.



## ELECTRONICS

- Use *low solids flux* that does not require removal on circuit boards and printed wiring assemblies.
- Use *water-soluble fluxes* that can be removed with de-ionized water.
- Use *water-based cleaners* instead of solvent-based cleaners to remove rosin-based fluxes.



# RESOURCES

## REGULATIONS THAT HELP TO PROTECT WORKERS

- **Methylene Chloride Standard.** This comprehensive standard, California Code of Regulations, (Title 8, Section 5202) requires employers to take specific actions to protect workers from cancer, adverse effects on the heart and nervous system, and skin and eye irritation that can result from exposure to methylene chloride. See [www.dir.ca.gov/title8/5202.html](http://www.dir.ca.gov/title8/5202.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 includes: (1) methods for identifying and quickly correcting workplace hazards; (2) health and safety training; (3) a system for communicating clearly with all employees about health and safety matters and (4) recordkeeping (Title 8, Section 3203). See [www.dir.ca.gov/title8/3203.html](http://www.dir.ca.gov/title8/3203.html).
- **Access to Medical and Exposure Records.** You have a right to see and copy your own medical records, and any records of toxic substance exposure monitoring in your work area (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 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 methylene chloride and other workplace hazards, and has many free publications available.
  - **For information on workplace hazards:** (Toll Free in CA) **866-282-5516**. Please leave a message and your call will be returned.
  - **For HESIS Publications:** (Toll Free in CA) **866-627-1586**. Call, write, or visit our website at [www.dhs.ca.gov/ohb](http://www.dhs.ca.gov/ohb).
- **Institute for Research and Technical Assistance (IRTA)** has information on safe alternatives for solvents. Call **(818) 244-0300** or visit the IRTA website at [www.irta.us](http://www.irta.us).
- **California Division of Occupational Safety and Health (Cal/OSHA)** investigates workers' complaints, makes enforcement inspections, and answers questions about workplace health and safety regulations. Complainants' identities are kept confidential. Call the nearest Cal/OSHA district office to your workplace, which you can find at: [www.dir.ca.gov/DOSH/districtoffices.htm](http://www.dir.ca.gov/DOSH/districtoffices.htm).
- **Cal/OSHA Consultation Service.** Helps employers who want free non-enforcement assistance to improve health and safety conditions. Employers can call **(800) 963-9424**.



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