

Occupational Health Guideline for Methyl Cellosolve Acetate

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OCH}_3$
- Synonyms: 2-Methoxyethyl acetate; glycol mono-methyl ether acetate; ethylene glycol monomethyl ether acetate
- Appearance and odor: Colorless liquid with a mild, ether-like odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for methyl cellosolve acetate is 25 parts of methyl cellosolve acetate per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 120 milligrams of methyl cellosolve acetate per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

• Routes of exposure

Methyl cellosolve acetate can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed.

• Effects of overexposure

Swallowing a large single dose of methyl cellosolve acetate might be fatal. Swallowing repeated smaller doses of methyl cellosolve acetate or repeated breathing of high air levels of methyl cellosolve acetate might cause lung or kidney damage, brain damage, and death. It is unlikely that air levels of methyl cellosolve acetate will be dangerous unless the liquid is heated. Methyl cellosolve acetate might cause eye irritation if splashed

in the eyes. Methyl cellosolve acetate can be absorbed through intact skin. If a large amount is absorbed, death may result.

• Reporting signs and symptoms

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to methyl cellosolve acetate.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to methyl cellosolve acetate at potentially hazardous levels:

1. Initial Medical Screening: Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from methyl cellosolve acetate exposure.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of methyl cellosolve acetate might cause exacerbation of symptoms due to its irritant properties.

—Skin disease: Methyl cellosolve acetate is absorbed through the skin. It also is a defatting agent and may cause dryness and cracking. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—Kidney disease: Since methyl cellosolve acetate may cause kidney damage in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with possible impairment of renal function.

—Liver disease: Although methyl cellosolve acetate is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

2. Periodic Medical Examination: Any employee developing the above-listed conditions should be referred for further medical examination.

• Summary of toxicology

Methyl cellosolve acetate is irritating to the upper respiratory tract and is only slightly narcotic. Guinea

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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pigs and cats exposed to nearly saturated vapor died after some delay; concentrations of 1500 ppm for 7 hours killed cats, while 7000 ppm for 4 hours was lethal to some rats. On repeated exposures, 500 ppm for 8 hours killed some cats. There was irritation of upper respiratory tract, disturbance of equilibrium, drowsiness, and apathy followed by death. These animals had damage to the lung and kidney. There was only slight irritation of the eyes. There was no irritation upon skin contact, but absorption did occur. No chronic systemic effects have been reported in humans.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 118
2. Boiling point (760 mm Hg): 145 C (293 F)
3. Specific gravity (water = 1): 1.01
4. Vapor density (air = 1 at boiling point of methyl cellosolve acetate): 4.1
5. Melting point: -65 C (-85 F)
6. Vapor pressure at 20 C (68 F): 2 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Completely miscible
8. Evaporation rate (butyl acetate = 1): 0.3

• Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalis, and strong acids may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving methyl cellosolve acetate.
4. Special precautions: None

• Flammability

1. Flash point: 44 C (111 F) (closed cup)
2. Autoignition temperature: 393 C (740 F)
3. Flammable limits in air, % by volume: Lower: 1.7; Upper: 8.2
4. Extinguishant: Dry chemical, alcohol foam, carbon dioxide

• Warning properties

1. Odor Threshold: According to the *Handbook of Organic Industrial Solvents*, the odor threshold of methyl cellosolve acetate is twice the permissible exposure level.

2. Eye Irritation Level: According to Browning, methyl cellosolve acetate is only slightly irritating to the eyes and mucous membranes. No quantitative information is available concerning what concentrations produce the irritation, however. Union Carbide reports that "five drops of undiluted chemical produced minor injury in rabbit eyes."

3. Evaluation of Warning Properties: Since the odor threshold of methyl cellosolve acetate is only twice the permissible exposure level, it is treated as a material with good warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of methyl cellosolve acetate vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure methyl cellosolve acetate may be used. An analytical method for methyl cellosolve acetate is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid methyl cellosolve acetate.

• Clothing wet with liquid methyl cellosolve acetate should be placed in closed containers for storage until it can be discarded or until provision is made for the

removal of methyl cellosolve acetate from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the methyl cellosolve acetate, the person performing the operation should be informed of methyl cellosolve acetate's hazardous properties.

- Non-impervious clothing which becomes contaminated with liquid methyl cellosolve acetate should be removed promptly and not reworn until the methyl cellosolve acetate is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where liquid methyl cellosolve acetate may contact the eyes.

SANITATION

- Skin that becomes contaminated with liquid methyl cellosolve acetate should be promptly washed or showered to remove any methyl cellosolve acetate.
- Employees who handle liquid methyl cellosolve acetate should wash their hands thoroughly with soap or mild detergent and water before eating or smoking.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to methyl cellosolve acetate may occur and control methods which may be effective in each case:

Operation	Controls
Use as a solvent during spray or heat applications of surface coatings, including varnishes, dopes, lacquers, metal lacquers, cellulose lacquers for paper coatings, textile printing, and leather finishes	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a solvent during spray or heat applications of adhesives, including polyvinyl formal, polyvinyl butyral, and polyvinyl acetate adhesives	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of photographic film	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during dry cleaning operations	Local exhaust ventilation; personal protective equipment

Operation

Use as a solvent during manufacture of surface coatings, including lacquers, dopes, varnishes, nail polishes; use during manufacture of adhesives

Controls

Local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If methyl cellosolve acetate gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If methyl cellosolve acetate gets on the skin, promptly flush the contaminated skin with water. If methyl cellosolve acetate soaks through the clothing, remove the clothing immediately and flush the skin with water. If there is skin irritation, get medical attention.

• Breathing

If a person breathes in large amounts of methyl cellosolve acetate, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When methyl cellosolve acetate has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If methyl cellosolve acetate is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.

2. Ventilate area of spill or leak.
 3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Liquid methyl cellosolve acetate should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.
- Waste disposal methods:
- Methyl cellosolve acetate may be disposed of:
1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
 2. By atomizing in a suitable combustion chamber.

REFERENCES

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RESPIRATORY PROTECTION FOR METHYL CELLOSOLVE ACETATE

Condition	Minimum Respiratory Protection* Required Above 25 ppm
Vapor Concentration	
250 ppm or less	Any chemical cartridge respirator with an organic vapor cartridge(s). Any supplied-air respirator. Any self-contained breathing apparatus.
1000 ppm or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s). A gas mask with a chin-style or a front- or back-mounted organic vapor canister. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
4500 ppm or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 4500 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

