Occupational Health Guideline for 2-Ethoxyethylacetate

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: $C_2H_5OCH_2CH_2OCOCH_3$
- Synonyms: Cellosolve acetate; glycol monoethyl ether acetate; ethylene glycol monoethyl ether acetate
- Appearance and odor: Colorless liquid with a mild, non-residual odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for 2-ethoxyethylacetate is 100 parts of 2-ethoxyethylacetate per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 540 milligrams of 2-ethoxyethylacetate per cubic meter of air (mg/m³). The American Conference of Governmental Industrial Hygienists has issued a Notice of Intended Changes of their recommended Threshold Limit Value for 2-ethoxyethylacetate from 100 ppm to 50 ppm with a skin notation.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

2-Ethoxyethylacetate can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed.

- **Effects of overexposure**

High air concentrations of 2-ethoxyethylacetate may cause irritation of the eyes and nose. The material is not very toxic when swallowed, but if a large enough dose is swallowed, death may result. It is not very toxic when inhaled in amounts likely to be encountered under ordinary conditions, but inhaling large amounts might cause vomiting, kidney damage, paralysis, and death. The material may be absorbed through the skin and, if a large amount of it is absorbed in this way, 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 2-ethoxyethylacetate.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to 2-ethoxyethylacetate 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 2-ethoxyethylacetate exposure.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of 2-ethoxyethylacetate might cause exacerbation of symptoms due to its irritant properties.

—Skin disease: 2-Ethoxyethylacetate 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: Although 2-ethoxyethylacetate is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Liver disease: Although 2-ethoxyethylacetate 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**

High concentrations of 2-ethoxyethylacetate vapor are

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irritating to the eyes and mucous membranes. Guinea pigs and rabbits survived exposure to saturated vapor-air mixtures (4000 ppm) for 1 hour, but two such exposures for 4 to 6 hours caused delayed death to cats.

There was narcosis before death in these animals, and damage to the kidneys was found at autopsy. This agent is absorbed through the skin. Lethal doses have been administered through the skin to rabbits. No chronic systemic effects have been reported in humans.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  1. Molecular weight: 132
  2. Boiling point (760 mm Hg): 156 C (313 F)
  3. Specific gravity (water = 1): 0.98
  4. Vapor density (air = 1 at boiling point of 2-ethoxyethylacetate): 4.6
  5. Melting point: −62 C (−80 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): 23
  8. Evaporation rate (butyl acetate = 1): 0.2
- **Reactivity**
  1. Conditions contributing to instability: Heat
  2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, 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 2-ethoxyethylacetate.
  4. Special precautions: None
- **Flammability**
  1. Flash point: 47 C (117 F) (closed cup)
  2. Autoignition temperature: 380 C (716 F)
  3. Flammable limits in air, % by volume: Lower: 1.7
  4. Extinguishant: Dry chemical, alcohol foam, carbon dioxide
- **Warning properties**
  1. Odor Threshold: According to the *Handbook of Organic Industrial Solvents*, the odor of 2-ethoxyethylacetate is detectable at the threshold limit.
  2. Eye Irritation Level: According to the *Documentation of TLV's*, dogs exposed to "120 seven-hour inhalations of 600 ppm" experienced eye and nose irritation. No quantitative information is available, however, concerning the threshold of eye irritation. Patty reports that "high concentrations of vapor . . . are irritating to the eyes and nose."
  3. Evaluation of Warning Properties: Since the odor of 2-ethoxyethylacetate can be detected at the TLV, 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 2-ethoxyethylacetate 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 2-ethoxyethylacetate may be used. An analytical method for 2-ethoxyethylacetate 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 2-ethoxyethylacetate.
- Clothing wet with liquid 2-ethoxyethylacetate should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of 2-ethoxyethylacetate from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the 2-ethoxyethylacetate, the person performing the operation should be informed of 2-ethoxyethylacetate's hazardous properties.

• Non-impervious clothing which becomes wet with 2-ethoxyethylacetate should be removed promptly and not reworn until the 2-ethoxyethylacetate is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where liquid 2-ethoxyethylacetate may contact the eyes.

SANITATION

• Skin that becomes wet with liquid 2-ethoxyethylacetate should be promptly washed or showered to remove any 2-ethoxyethylacetate.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to 2-ethoxyethylacetate may occur and control methods which may be effective in each case:

Operation	Controls
Use as a solvent vehicle during hot and cold spray applications of lacquers and wood stains, including automobiles, airplanes, and metal and wood finishing	Local exhaust ventilation; personal protective equipment
Use in manufacture of varnishes, thinners, lacquers, wood stains, adhesives, varnish removers, fabric coatings, paper coatings, and textile sizing	General dilution ventilation; personal protective equipment
Liberation during manufacture of cellulose acetate films, including transparent wrapping material, safety film, packaging film, and photographic film	General dilution ventilation
Liberation during coating process of fabrics, leather, and paper for water-proofing, sizing, and laminating	General dilution ventilation
Use during dipping application of lacquers and enamels of small articles having rounded or cylindrical shapes, wire flash bulbs, etc.	General dilution ventilation; personal protective equipment
Use during brushing or other hand applications of lacquers, adhesives, enamels, household cement, specialized lacquers, etc.	General dilution ventilation; personal protective equipment
Use during solvent recovery during equipment maintenance, pouring solvent, and refilling containers	General dilution ventilation; personal protective equipment
Use as a solvent for many oils and gums	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 2-ethoxyethylacetate 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 2-ethoxyethylacetate gets on the skin, promptly flush the contaminated skin with water. If 2-ethoxyethylacetate soaks through the clothing, remove the clothing promptly and flush the skin with water. If there is skin irritation, get medical attention.

• **Breathing**

If a person breathes in large amounts of 2-ethoxyethylacetate, 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 2-ethoxyethylacetate 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 2-ethoxyethylacetate 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. 2-Ethoxyethylacetate should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

• Waste disposal methods:

2-Ethoxyethylacetate 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

• American Conference of Governmental Industrial Hygienists: "2-Ethoxyethylacetate," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.

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• Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.

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• Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.

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RESPIRATORY PROTECTION FOR 2-ETHOXYETHYLACETATE (CELLOSOLVE ACETATE)

Condition	Minimum Respiratory Protection* *Required Above 100 ppm*
Vapor Concentration	
1000 ppm or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s).
2500 ppm or less	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.*
Greater than 2500 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.