

Occupational Health Guideline for Methoxychlor

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: $C_{15}H_{15}Cl_3O_2$
- Synonyms: 2,2-Bis(p-methoxyphenyl)-1,1,1-trichloroethane
- Appearance and odor: Colorless to tan solid with a slight fruity odor (or emulsifiable solution in heavy aromatic naphtha).

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for methoxychlor is 15 milligrams of methoxychlor per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. The American Conference of Governmental Industrial Hygienists has recommended for methoxychlor a Threshold Limit Value of $10 mg/m^3$.

HEALTH HAZARD INFORMATION

- **Routes of exposure**
Methoxychlor can affect the body if it is inhaled. It can also affect the body if it is swallowed.
- **Effects of overexposure**
There are no reported effects in humans from exposure to methoxychlor. Animal experiments have shown that this chemical may produce trembling, convulsions, and mild kidney and liver damage. Women may be at increased risk.
- **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 methoxychlor.

- **Recommended medical surveillance**

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

—Liver disease: Methoxychlor causes liver damage in animals. The importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

—Kidney disease: Methoxychlor causes kidney damage in animals. The importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Convulsive and other neurologic disorders: Methoxychlor causes convulsions and other neurologic disorders in animals. Persons with a history of such disorders may be more susceptible to the effects of this agent.

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

- **Summary of toxicology**

Methoxychlor affects the nervous system and causes convulsions in animals. The oral LD50 in rats is 6 g/kg; the fatal oral dose in humans is estimated to be 450 g. Although some liver tumors were observed in rats fed up to 2000 ppm in the diet, it is not possible to evaluate adequately the carcinogenicity of methoxychlor due to inadequate reporting of these data; three other feeding studies produced no evidence of carcinogenesis. Dogs fed a daily diet containing 4 g/kg body weight developed signs of chlorinated hydrocarbon intoxication, including fasciculations, tremor, hyperesthesia, tonic seizures, and tetanic convulsions after 5 to 8 weeks; most of the dogs died within 3 weeks after onset of effects. Rabbits given 200 mg/kg orally per day died

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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after 4 to 5 doses; autopsy findings included mild liver damage and nephrosis. In mice given 5 mg orally over 3 days and in rats given 20 mg, there was a uterotrophic effect manifested as a marked increase in weight of the uterus. There are no reported effects in humans.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 345.7
2. Boiling point (760 mm Hg): Decomposes
3. Specific gravity (water = 1): 1.41
4. Vapor density (air = 1 at boiling point of methoxychlor): Not applicable
5. Melting point: 78 or 86 C (172 or 187 F) (dimorphic)
6. Vapor pressure at 20 C (68 F): Very low
7. Solubility in water, g/100 g water at 20 C (68 F): 0.01
8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released when methoxychlor decomposes.
4. Special precautions: Methoxychlor will attack some forms of plastics, rubber, and coatings.

• Flammability

1. Flash point: Not applicable
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Not applicable
4. Extinguishant: For solids: Dry chemical, water, carbon dioxide, and foam

• Warning properties

Since the vapor pressure of this substance is very low, and since methoxychlor decomposes upon heating, warning properties are not considered.

Methoxychlor is not known to be an eye irritant.

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

An analytical method for methoxychlor is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 4, 1978, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00317-3).

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 methoxychlor or liquids containing methoxychlor.
- Non-impervious clothing which becomes contaminated with methoxychlor should be removed promptly and not reworn until the methoxychlor is removed from the clothing.

SANITATION

- Skin that becomes contaminated with methoxychlor should be promptly washed or showered with soap or mild detergent and water to remove any methoxychlor.
- Employees who handle methoxychlor or liquids containing methoxychlor 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 methoxychlor may occur and control methods which may be effective in each case:

Operation

Use as an agricultural insecticide on fruits, vegetables, foliage, crops, and ornamentals; agricultural premises; and animal treatment

Liberation during formulation and manufacture for use as an agricultural insecticide

Controls

Personal protective equipment

General dilution ventilation; personal protective equipment

Methoxychlor may be disposed of in sealed containers in a secured sanitary landfill.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Methoxychlor," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- International Agency for Research on Cancer: *Some Organochlorine Pesticides, Vol. 5 in IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man*, Lyon, France, 1974.
- Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.
- Spector, W. S. (Vols. I, II), Negherbon, W. O. (Vol. III), Grebe, R. M. (Vol. IV), and Dittmer, D. S. (Vol. V) (eds.): *Handbook of Toxicology*, Saunders, Philadelphia, 1956-1959.
- *Survey of Compounds Which Have Been Tested for Carcinogenic Activity*, U.S. Public Health Service Publication No. 149, Original, Supplements 1 and 2, 1961-1967, 1968-1969, and 1970-1971.
- Tegeris, A. S., et al.: "Methoxychlor Toxicity," *Archives of Environmental Health*, 13:776-787, 1966.
- Tullner, W. W.: "Uterotrophic Action of the Insecticide Methoxychlor," *Science*, 133:647-648, 1961.

EMERGENCY FIRST AID PROCEDURES

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

• Skin Exposure

If methoxychlor or liquids containing methoxychlor get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands well before eating or smoking and at the end of work.

• Breathing

If a person breathes in large amounts of methoxychlor, move the exposed person to fresh air at once.

• Swallowing

When methoxychlor or liquids containing methoxychlor have been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

SPILL AND DISPOSAL PROCEDURES

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

• If methoxychlor is spilled, the following steps should be taken:

1. Ventilate area of spill.

2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation, or for disposal in a secured sanitary landfill. Liquid containing methoxychlor should be absorbed in vermiculite, dry sand, earth, or a similar material.

• Waste disposal method:

RESPIRATORY PROTECTION FOR METHOXYCHLOR

Condition	Minimum Respiratory Protection* Required Above 15 mg/m ³
Particulate Concentration	
150 mg/m ³ or less	<p>Any chemical cartridge respirator with an organic vapor cartridge(s) and dust, mist, and fume filter(s), including pesticide respirators which meet the requirements of this class.</p> <p>Any supplied-air respirator.</p> <p>Any self-contained breathing apparatus.</p>
750 mg/m ³ or less	<p>A chemical cartridge respirator with a full facepiece, organic vapor cartridge(s), and dust, mist, and fume filter(s), including pesticide respirators which meet the requirements of this class.</p> <p>A gas mask with a chin-style or a front- or back-mounted organic vapor canister and dust, mist, and fume filter, including pesticide respirators which meet the requirements of this class.</p> <p>Any supplied-air respirator with a full facepiece, helmet, or hood.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p>
7500 mg/m ³ or less	<p>A powered chemical cartridge respirator with an organic vapor cartridge and a high efficiency particulate filter, including pesticide respirators which meet the requirements of this class.</p> <p>A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.</p>
Greater than 7500 mg/m ³ or entry and escape from unknown concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p> <p>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.</p>
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

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