

Occupational Health Guideline for Heptachlor *

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: $C_{10}H_5Cl$, (principal ingredient)
- Synonyms: 1,4,5,6,7,8,8a-Heptachloro-3a,4,7,7a-tetra-hydro-4, 7-methanoindene (principal ingredient)
- Appearance and odor: Light tan, waxy solid with an odor like camphor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for heptachlor is 0.5 milligram of heptachlor per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

• Routes of exposure

Heptachlor can affect the body if it is inhaled, if it comes in contact with the eyes or skin, or if it is swallowed. It may enter the body through the skin.

• Effects of overexposure

In animals, exposure to heptachlor has produced tremors, convulsions, and liver damage. Heptachlor is very similar to chlordane. Exposure to chlordane has caused convulsions and kidney damage in humans.

• 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 heptachlor.

• Recommended medical surveillance

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

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Persons with a history of convulsive disorders would be expected to be at increased risk from exposure. Examination of the eyes, nervous system, liver, and kidneys should be stressed.

2. Periodic Medical Examination: The aforementioned medical examination should be repeated on an annual basis.

• Summary of toxicology

Heptachlor dust is a convulsant in animals. In rats the oral LD50 was 90 mg/kg; within 30 to 60 minutes after administration there were tremors and convulsions; liver damage occurred. Multiple applications of a solution to the skin of rats of 20 mg/kg were toxic, indicating a marked cumulative action. The carcinogenicity of heptachlor was tested in rats by oral administration; one of five experiments suggested hepatocarcinogenicity, but this was not reproduced in the other experiments within the same dose range. Rats given heptachlor in the diet at 6 mg/kg body weight developed cataracts after 4.5 to 9.5 months of feeding. In animals, heptachlor is more potent than chlordane, to which it is closely related chemically; ingestion of chlordane has caused convulsions and kidney damage in humans.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 373.5 (principal ingredient)
2. Boiling point (760 mm Hg): Decomposes
3. Specific gravity (water = 1): 1.65
4. Vapor density (air = 1 at boiling point of heptachlor): Not applicable
5. Melting point: 46–74 C (114–165 F)
6. Vapor pressure at 20 C (68 F): 0.0003 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F):

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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

- **Reactivity**

1. Conditions contributing to instability: Solid: None. Liquid (above 74 C (165 F): Can react with iron and rust to form toxic hydrogen chloride gas.

2. Incompatibilities: Contact of melted heptachlor with iron and rust may form hydrogen chloride gas.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released when heptachlor decomposes.

4. Special precautions: None.

- **Flammability**

1. Not combustible, but may be dissolved in flammable liquid

- **Warning properties**

1. Odor Threshold: No quantitative information is available concerning the odor threshold of heptachlor.

2. Eye Irritation Level: Heptachlor is not known to be an eye irritant.

3. Evaluation of Warning Properties: Since there is no quantitative information available relating warning properties to air concentrations of heptachlor, it has been treated as a material with poor warning properties. Its concentration in saturated air at 20 C could result in a significant exposure relative to the permissible exposure.

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 heptachlor is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 5, 1979, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00349-1).

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 skin contact with heptachlor or liquids containing heptachlor where skin contact may occur.

- If employees' clothing has had any possibility of being contaminated with heptachlor or liquids containing heptachlor, employees should change into uncontaminated clothing before leaving the work premises.

- Clothing which has had any possibility of being contaminated with heptachlor should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of heptachlor from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the heptachlor, the person performing the operation should be informed of heptachlor's hazardous properties.

- Where exposure of an employee's body to heptachlor or liquids containing heptachlor may occur, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

- Non-impervious clothing which becomes contaminated with heptachlor should be removed immediately and not reworn until the heptachlor is removed from the clothing.

- Employees should be provided with and required to use dust- and splash-proof safety goggles where heptachlor or liquids containing heptachlor may contact the eyes.

SANITATION

- Skin that becomes contaminated with heptachlor should be immediately washed or showered with soap or mild detergent and water to remove any heptachlor.

- Workers subject to skin contact with heptachlor or liquids containing heptachlor should wash with soap or mild detergent and water any areas of the body which may have contacted heptachlor at the end of each work day.

- Eating and smoking should not be permitted in areas where heptachlor or liquids containing heptachlor are handled, processed, or stored.

- Employees who handle heptachlor or liquids contain-

ing heptachlor should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Formulation of pesticides supplied as an emulsifiable concentrate, wettable powder, dust or granular material	Local exhaust ventilation; personal protective equipment; general dilution ventilation
Use as an insecticide in seed treatment, preplanting soil application, dipping tops of plants and roots for control of insects, flies and mosquitoes; use on household plots and on agricultural crops and fruits; use in termite control (dispensed in caulking guns)	Personal protective equipment
Manufacture of heptachlor	Process enclosure; local exhaust 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 heptachlor or liquids containing heptachlor get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If heptachlor or liquids containing heptachlor get on the skin, immediately wash the contaminated skin using soap or mild detergent and water. If heptachlor or liquids containing heptachlor soak through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.

• Breathing

If a person breathes in large amounts of heptachlor, 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 heptachlor or liquids containing heptachlor 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.

• 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 AND DISPOSAL PROCEDURES

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

• If heptachlor 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 heptachlor should be absorbed in vermiculite, dry sand, earth, or a similar material.

• Waste disposal method:

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

REFERENCES

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* SPECIAL NOTE

The International Agency for Research on Cancer (IARC) has evaluated the data on this chemical and has concluded that it causes cancer. See *IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man*, Volume 5, 1974.

RESPIRATORY PROTECTION FOR HEPTACHLOR

Condition	Minimum Respiratory Protection* Required Above 0.5 mg/m³
Particulate or Vapor Concentration	
5mg/m³ or less	<i>Any supplied-air respirator. Any self-contained breathing apparatus.</i>
25 mg/m³ or less	<i>Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.</i>
500 mg/m³ or less	<i>A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.</i>
700 mg/m³ or less	<i>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.</i>
Greater than 700 mg/m³** or entry and escape from unknown concentrations	<i>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.</i>
Fire Fighting	<i>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</i>
Escape	<i>Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.</i>

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

**Use of supplied-air suits may be necessary to prevent skin contact while providing respiratory protection from airborne concentrations of heptachlor; however, this equipment should be selected, used, and maintained under the immediate supervision of trained personnel. Where supplied-air suits are used above a concentration of 700 mg/m³, an auxiliary self-contained breathing apparatus operated in positive pressure mode should also be worn.