

**RM Number: 8466 (Renewals)**  
**MSDS Number: 8466**  
**RM Name:  $\gamma$ -Hexachlorocyclohexane**  
**(Lindane)**  
**Issued: May, 1992**

## **MATERIAL SAFETY DATA SHEET**

**National Institute of Standards and Technology**  
**Standard Reference Materials Program**  
**Gaithersburg, Maryland 20899**  
**(301) 975-2019**

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### **SECTION I. MATERIAL IDENTIFICATION**

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**Material Name:**  $\gamma$ -Hexachlorocyclohexane

**Description:** This material is the gamma isomer of 1,2,3,4,5,6-hexachlorocyclohexane. A unit of RM 8466 consists of one vial containing approximately 100 mg of lindane.

**Other Designations:**  $1\alpha,2\alpha,3\beta,4\alpha,5\alpha,6\beta$ -hexachlorocyclohexane;  $\gamma$ -benzene hexachloride; gamma benzene hexachloride; benzene hexachloride; gamma hexachlor; gamma-hexachlorocyclohexane; gamma-hexachlorocyclohexane; Gamma HCH; ENT 7796; Aparasin; Aphantiria; Esoderm;  $\gamma$ -BHC; Gammalin; Gamene; Gamiso; Gammexane; Gexane; Jacutin; Kwell; Lindafor; Lindatox; Lorexane; Quellada; Streunex; Tri-6; Viton

**Chemical Formula:**  $C_6H_6Cl_6$

**CAS Reg. No.:** 58-89-9

**DOT Classification:** Class 6.1 Poison

**Manufacturer/Supplier:** Available from a number of suppliers.

Trade Names

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## SECTION II. HAZARDOUS INGREDIENTS

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<u>Hazardous Component</u>	<u>Nominal Concentration</u>	<u>Limits and Toxicity Data</u>
Lindane	~ 100%	OSHA TLV-TWA:  0.5 mg/m <sup>3</sup> (skin)  ACGIH TLV-TWA:  0.5 mg/m <sup>3</sup>  DFG MAK TWA:  0.5 mg/m <sup>3</sup> (total dust/skin)  DFG MAK 30 Min Peak:  5.0 mg/m <sup>3</sup>  Man, Skin (intermittent):  TD <sub>L0</sub> : 20 mk/kg for 6 wks  Rabbit, Skin:  LD <sub>50</sub> : 50 mg/kg  Rat, Skin:  LD <sub>50</sub> : 500 mg/kg

Child, Oral:

TD<sub>10</sub>: 111 mg/kg

TD<sub>10</sub>: 180 mg/kg

Rat, Oral:

LD<sub>50</sub>: 76 mg/kg

Mouse, Oral:

LD<sub>50</sub>: 44 mg/kg

Rabbit, Oral:

LD<sub>50</sub>: 60 mg/kg

Guinea Pig, Oral:

LD<sub>50</sub>: 127 mg/kg

Dog, Oral:

LD<sub>50</sub>: 40 mg/kg

Hamster, Oral:

LD<sub>50</sub>: 360 mg/kg

Cat, Oral:

LD<sub>50</sub>: 25 mg/kg

Rabbit, Intravenous:

LD<sub>10</sub>: 4500 µg/kg

Dog, Intravenous:

LD<sub>10</sub>: 8 mg/kg

Rat, Intraperitoneal:

LD<sub>50</sub>: 35 mg/kg

Mouse, Intraperitoneal:

LD<sub>50</sub>: 125 mg/kg

Hamster, Intraperitoneal:

LD<sub>50</sub>: 640 mg/kg

**Note:** 1000 mg/ m<sup>3</sup> is immediately dangerous to life or health.

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### SECTION III. PHYSICAL/ CHEMICAL CHARACTERISTICS

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#### Lindane

**Appearance and Odor:** A crystalline material with a slightly musty odor.

**Molecular Weight:** 290.85

**Specific Gravity:** 1.89

**Boiling Point:** 323 °C

**Melting Point:** 112.5 °C

**Vapor Pressure:** 0.03 mmHg

**Solubility in Water:** Insoluble in water.

**Solubility in Other Compounds (g/100 g at 20 °C):**

acetone .....	43.5
benzene .....	28.9
chloroform ..	24.0
ether .....	20.8
ethanol .....	6.4

Also soluble in cyclohexanone, xylene, fats, and oils; moderately soluble in ethanol, methanol, and kerosene.

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### SECTION IV. FIRE AND EXPLOSION HAZARD DATA

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**Flash Point:** N/A

**(Method Used):** N/A

**Autoignition Temperature:** N/A

**Flammability Limits in Air (Volume %):** UPPER: N/A  
LOWER: N/A

**Extinguishing Media:** Use dry chemical, water spray of regular foam.

**Special Fire Procedures:** Fire-fighters should wear self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode and other protective clothing when fighting fires involving this material.

**Unusual Fire and Explosion Hazards:** This material is a negligible fire hazard when exposed to heat or flame. This material may burn but does not ignite readily. Containers may explode in the heat of a fire.

Lindane with n,n-dimethylacetamide produces an endothermic and a possible violent reaction.

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## SECTION V. REACTIVITY DATA

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**Stability:**      X   Stable               Unstable

**Conditions to Avoid:** Avoid incompatible materials.

**Incompatibility (Materials to Avoid):** Lindane in the presence of alkali materials, aluminum, iron or zinc may decompose. Dimethylformamide + iron with lindane can cause a dangerous reaction.

See Section IV: Fire and Explosion Hazard Data.

**Hazardous Decomposition or Byproducts:** Thermal decomposition products may include highly toxic fumes of phosgene, toxic and corrosive fumes of chlorides and oxides of carbon.

**Hazardous Polymerization:**               Will Occur          X   Will Not Occur

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## SECTION VI. HEALTH HAZARD DATA

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**Route of Entry:**      X   Inhalation          X   Skin          X   Ingestion

**Health Hazards (Acute and Chronic):** The vapors produced by this material are irritating to the nose throat and *mucous membranes*. Lindane may be absorbed from the lungs and produce central nervous system effects with symptoms of *motor hyperexcitability* that may include muscle twitching, *myoclonic jerking* and *convulsive seizures*. The convulsions may occur with periods of unconsciousness. In cases of extreme overexposure, convulsions may occur without any prior symptoms. Several instances of diminution of vision and blindness have also been observed. Reports also indicate that Lindane produces *blood dyscrasias* (blood abnormalities), primarily *aplastic anemia* (anemia that is characterized by defective function of the blood forming organs, as the bone marrow, and is caused by toxic agents), however these reports have not been substantiated. *Cirrhosis* (fibrosis with hardening caused by excessive formation of connective tissue followed by contraction) and *chronic hepatitis* (persistent inflammation of the liver) were observed in liver biopsies from eight workers heavily exposed to lindane and/or DDT for a period of 5 to 13 years.

Exposure of lindane to skin or eyes may cause irritation. A lethal dose by topical application was observed in rabbits. This material may be absorbed through the skin and produce central nervous system effects such as muscle twitching, myoclonic jerking, and convulsive seizures. Prolonged or repeated exposures may cause *dermatitis* (inflammation of the skin) and *urticaria* (an allergic disorder marked by raised edematous patches of skin or mucous membrane and usually intense itching caused by a specific precipitating factor).

Ingestion of lindane may produce symptoms of malaise, faintness, dizziness, nausea, vomiting, muscle spasms, *ataxia* (the inability to coordinate voluntary muscular movements that is symptomatic of a nervous disorder), restlessness, tremor, *cyanosis* (a bluish discoloration of the skin due to deficient oxygenation of the blood), and *facial pallor* (deficiency of facial color) were reported in cases of accidental poisoning. Clonic and tonic (a prolonged muscular contraction) *convulsions* along with unconsciousness have been reported. *Postical coma* of variable duration leading to respiratory failure occurred in fatal cases. In some cases, *retrograde amnesia* (loss of memory immediately preceding the precipitating cause) was reported.

In a chronic exposure study using female rats fed daily doses of 0.5 mg/kg for a period of four months, disturbances of the *estrous cycle* (the correlated phenomena of the endocrine and generative systems of a female mammal at which time there is an increased state of sexual excitability during which most female mammals will conceive), decreased fertility, and lowered

embryo viability with delayed physical development was reported. An increased incidence of stillborn pups was observed in litters of female beagles fed lindane during pregnancy. Repeated feeding to rats of 800 ppm in the diet resulted in mild liver damage; kidney damage occurred at higher levels. Mice fed 400 ppm in the diet developed liver tumors and, in some cases lung *metastases* (transfer of a disease producing agency from the site of disease to another part of the body). This material may cross the placenta and be excreted in breast milk. It may also impair fertility. Stimulants such as epinephrine or ephedrine may induce *ventricular fibrillation* (a muscular twitching involving individual muscle fibers, acting without coordination, of the chamber of the heart which receives blood from a corresponding atrium and from which blood is forced into the arteries).

**Signs and Symptoms of Exposure:** Symptoms may include headache, nausea, vomiting, malaise, and dizziness. Abnormal EEG patterns may be observed; these changes may persist for weeks or months while no other observable signs of poisoning may exist. In prolonged cases of exposure, symptoms of depression, headache, vomiting, *asthenia* (loss of strength), *epileptiform attacks* (resembling that of epilepsy), sleeplessness, profuse perspiration, various abnormal reflexes and neurological signs were reported in one case of occupational exposure.

See Health Hazards (Acute and Chronic).

**Medical Conditions Generally Aggravated by Exposure:** Persons with liver, kidney and blood diseases.

**Listed as a Carcinogen/Potential Carcinogen:**

	<u>Yes</u>	<u>No</u>
In the National Toxicology Program (NTP) Report on Carcinogens	<u>X*</u>	—
In the International Agency for Research (IARC) Monographs	<u>X**</u>	—
By the Occupational Safety and Health Administration (OSHA)	—	<u>X</u>

\*Classified as an *anticipated human carcinogen* by NTP.

\*\*Classified as Group 2-B, *animal limited evidence* by IARC.

**Note:** Lindane produced benign and malignant liver tumors in mice after oral administration.

**EMERGENCY AND FIRST AID PROCEDURES:**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Contact medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Contact medical assistance if necessary.

**Inhalation:** If inhaled, remove the victim to fresh air. If breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration. Contact medical assistance if necessary.

**Ingestion:** If ingested, wash out mouth with water. If the person is conscious and not convulsing, induce vomiting by administering syrup of ipecac (when vomiting occurs, keep the head above below the hips to prevent aspiration). Medical personal can administer activated charcoal followed by gastric lavage. Follow with a saline cathartic. **DO NOT** give fats or oils. Intestinal lavage with 20% mannitol (200 mL) by stomach tube is also useful. Give artificial respiration with oxygen if respiration is depressed. Treat symptomatically and supportively.

**TARGET ORGAN(S) OF ATTACK:** The blood, liver and kidneys.

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## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

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**Steps to be taken in Case Material is Released or Spilled:** Notify safety personnel of major spills and/or leaks. Evacuate all nonessential personnel. Ventilate closed area before entering. Stop the leak if you can do so without risk. Use water spray to reduce vapors. Small spills can be absorbed with sand or other absorbent material and placed in containers for later disposal. Small dry spills can be recovered with a clean shovel and placed in covered containers. For larger spills, dike far ahead of the spill for later disposal.

**Note: Reportable Quantity (RQ): 1 Pound (4.536 Grams)**

The Superfund Amendments and Reauthorization Act (SARA) section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local Emergency Planning Committee and the State Emergency Response Commission (40 CFR 355.40). If the release of this substance is reportable under Cercla Section 103, The National Response Center must be notified immediately.

**Waste Disposal:** The regulatory level for lindane is 0.4 mg/L. Materials which contain the above substance at or above the regulatory level meet the EPA characteristic of toxicity, and must be disposed of in accordance with 40 CFR Part 262. Follow all Federal, state and local regulations.

**Handling and Storage:** Employees handling this material must wear protective clothing and gloves to prevent skin contact and splash-proof or dust-resistant safety goggles to prevent eye contact with this substance. Any chemical cartridge respirator with an organic vapor cartridge in combination with a dust and mist filter must be

worn to prevent inhalation. The specific respirator selected must be based on contamination levels found in the work place, must be based on the specific operation, must not exceed the working limits of the respirator and must be jointly approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA).

**Note:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the lab.

Provide local exhaust ventilation. Ventilation equipment must be explosion proof. Store material in accordance with 40 CFR 165 recommended procedures for the disposal and storage of pesticides and pesticide containers. Vials as received, should be kept tightly sealed, protected from light, and stored in a refrigerator or freezer. Emergency eye wash station must be available.

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## SECTION VIII. SOURCE DATA/ OTHER COMMENTS

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Sources: Occupational Health Services, MSDS *Lindane*, May 15, 1991.  
Hawley's Condensed Chemical Dictionary, 11th ed., 1987.  
The Merk Index, 11th ed., 1989.  
Webster's Ninth New Colligiate Dictionary, 1990.

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**Note:** Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references, however NIST does not certify the data on the MSDS. The certified values for this material are given only on the NIST Certificate of Analysis.