

Poison Facts:

Low Chemicals: Tetramethyllead

Properties of the Chemical

Tetramethyllead is an oily, colorless liquid with a characteristic musty, fruity, even pleasant odor. It releases a poisonous, flammable vapor. The product burns with an orange-colored flame with green margins.

Uses of the Chemical

Tetramethyllead has been used since 1923 as a petroleum octane booster and “anti-knock” agent in both automotive and aviation fuels. In 1978, the United States placed a gradual ban on the chemical’s use in automotive fuels. By the end of 1995, the chemical was totally replaced in automotive fuels by methyl-tert-butyl ether. However, tetramethyllead is still allowed in aviation fuels. A typical aviation mix includes up to 62 percent tetramethyllead.

Absorption, Distribution, Metabolism and Excretion (ADME)

Tetramethyllead is well-absorbed by all routes of exposure. It is an organic lead that is distributed throughout the brain and lipid-rich organs. It is rapidly metabolized to trimethyllead and an ionized form of lead which is attracted to the calcium salts of the bones and blood. It also interferes with the heme synthesis by taking the place of iron atoms. There is a slow conversion of the subsequent trimethyllead to the inorganic lead that deposits in the bones and blood to cause elevated lead levels. Trimethyllead is slowly (from weeks to months) metabolized into an inorganic lead. Once deposited in the bones, the inorganic leads tend to remain stable. The inorganic leads are gradually excreted by the kidneys.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Eye exposure produces pain, itching, conjunctivitis, blurred vision and burns.
- **Dermal exposures:** Tetramethyllead is readily absorbed through intact skin. It is absorbed less rapidly than tetraethyllead. It produces itching, burning and transient redness. On occasion, skin may begin to look pale.
- **Inhalation exposures:** Inhalation is the major route of exposure; however, symptoms of tetramethyllead exposure cannot be separated from the also-toxic solvent mixture it is associated with. Early inhalation effects include sneezing, irritation of the upper respiratory tract and mild systemic effects.
 - Mild systemic effects include anxiety, lethargy, irritability, nausea, vomiting, headache, tremors, slurred speech and euphoria.
 - Moderate effects include disorientation, hyperreflexia, spasmodic muscular contractions, spasticity, extreme fatigue, bradycardia, hypotension and nystagmus.

- Severe systemic effects include complete disorientation with hallucinations, facial contortions, mania, psychotic behavior, violent seizures which terminate in coma, and death.
- **Ingestion exposures:** Poisonings from ingestions are rare. Nausea, vomiting and diarrhea would be expected. It would be reasonable to conclude that the symptoms noted in the inhalation exposures section would occur from ingestion. Increased intracranial pressure and pulmonary edema also have been reported.

In-Field Treatment Prior to Arrival at a Health Care Facility

- **Ocular exposures:** Irrigate the eyes with copious amounts of lukewarm, low-pressure water for 10 to 15 minutes.
- **Dermal exposures:** Flood skin with water for an initial rinse of the chemical. Since the product is an oily substance, soap and water washings are necessary to totally remove the product from the skin.
- **Inhalation exposures:** Move the patient to fresh air. Administer oxygen if it is available and if the patient exhibits signs of labored breathing. CPR may be required.
- **Ingestion exposures:** Give the patient a very small amount of fluids – 240 ml or 1 cup for adults and 120ml or 1/2 cup for children. Administer fluids slowly. Larger quantities of fluids may cause emesis and lead to aspiration.

Special note to first responders:

Tetramethyllead may dissolve some types of rubber.

- Wear a positive-pressure Self-Contained Breathing Apparatus (SCBA).
- Ventilate the area.
- Wear safety glasses.
- Wear chemical protective clothing that is specifically recommended by the manufacturer.

Treatment of Exposures in a Health Care Facility

- **Ocular exposures:** Irrigate exposed eyes with lukewarm, low-pressure water or room-temperature 0.9 percent saline solution. Obtain an ophthalmic exam after irrigation.
- **Dermal exposures:** First, flood the skin with water. Mandatory soap and water washings will be necessary to remove the chemical completely from the skin. Due to the rapid absorption of this chemical through intact skin, patients may require chelation therapy for increasing blood lead levels.
- **Inhalation exposures:** Maintain the patient's airway. Ventilation may be required. Bronchospasms may be treated with beta2 agonists. Chelation therapy will be required for patients with blood lead levels greater than 45 mcg/dl. Treat seizures first with the benzodiazepines. If not controlled by the benzodiazepines, second-line therapy is phenobarbital.

- **Ingestion exposures:** If a large ingestion has occurred, stomach decontamination should be considered. These ingestions must be treated as an ingestion of organic solvents, and pulmonary aspiration may occur. The airway must be protected. Aspiration must be avoided. Emesis is not recommended. Whole bowel irrigation should be considered. Chelation therapy will be required for patients with blood lead levels greater than 45 mcg/dl. Chelation therapy is controversial, as alkylleads are not chelatable, and the therapy probably does not influence central nervous system symptoms.

Special note to treating physicians:

Due to the absorption, distribution and metabolism of this chemical, immediate blood lead levels will not be indicative of the need to chelate the patient at a later time. The time of exposure to the onset of symptoms correlates with the outcome of treatment. Symptoms that begin within 24 hours usually indicate a poor prognosis. Most early symptoms are due to the hydrocarbon vehicle rather than the tetramethyllead. Delayed onset symptoms – 24 hours to 5 days later – usually have a better prognosis. Symptoms may last for days or months, with patients experiencing frequent relapse. Loss of body weight is common.

For more poison prevention and first aid information, call the

Poison Control Center
Serving the Residents of Kansas

Toll-free Hotline
1-800-222-1222

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