

Poison Facts:

Low Chemicals: Iron Pentacarbonyl

Properties of the Chemical

Iron carbonyl (pentacarbonyl iron), C_5FeO_5 , is a yellow, oily liquid. It is pyrophoric in air and burns to Fe_2O_3 (Iron[III] oxide) and decomposes by light to $\text{Fe}_2(\text{CO})_9$ and CO . It is practically insoluble in water, readily soluble in most organic solvents (ether, acetone, ethyl acetate) and slightly soluble in alcohol. The vapor is heavier than air and may travel along the ground. Distant ignition is possible, and it may explode on heating. It may also spontaneously ignite in contact with air. Iron pentacarbonyl is a strong reducing agent and reacts violently with oxidants.

Uses of the Chemical

Iron pentacarbonyl is prepared from iron (and iron compounds) and CO . It is used in the manufacture of powdered iron cores for high-frequency coils used in the radio and television industries. It is also used as an anti-knock agent in motor fuels and as a catalyst in organic reactions.

Absorption, Distribution, Metabolism and Excretion (ADME)

Iron pentacarbonyl can be absorbed into the body by inhalation of the vapor, through the skin or by ingestion. No other pharmacokinetic data is available.

Clinical Effects of Acute Exposure

- **Ocular exposures:** Iron pentacarbonyl is a local irritant and may cause irritation and injury to eyes.
- **Dermal exposures:** The chemical may irritate the skin and mucous membranes. It may be absorbed through the skin.
- **Inhalation exposures:** If inhaled, iron pentacarbonyl is a local irritant to the lungs and gastrointestinal tract. Symptoms of acute exposure to high concentrations resemble those of exposures to nickel carbonyl. These include immediate symptoms of headache, giddiness and dizziness, occasionally accompanied by dyspnea and vomiting. Removal from exposure reverses the symptoms, but dyspnea returns in 12 to 36 hours, accompanied by fever, cyanosis and cough. The primary effects are in the lungs, but degenerative effects of the central nervous system have also been reported. Death occurs 4 to 11 days after exposure to lethal concentrations of the chemical.
- **Ingestion exposures:** The risk of exposure is mainly for workers in the chemical industry, and ingestion is unlikely. As a lipid-soluble compound, it is rapidly absorbed and may decompose to iron and carbon monoxide. It is a local irritant and would cause irritation of the gastrointestinal tract. Iron overload may also occur.

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

- **Ocular exposures:** Remove contact lenses, and irrigate exposed eyes for 15 minutes with tepid water or saline.
- **Dermal exposures:** Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
- **Inhalation exposures:** Move the patient from the toxic environment to fresh air immediately. Establish a patent airway, and suction if necessary. Watch for signs of respiratory insufficiency, and assist ventilations if necessary. Administer oxygen by non-rebreather mask at 10 to 15 L/min.
- **Ingestion exposures:** If the victim is conscious and able to swallow, give 4 to 8 ounces of milk or water. Do not induce emesis. Do not administer activated charcoal.

Special note to first responders:

- Wear a positive-pressure Self-Contained Breathing Apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.

Treatment of Exposures in a Health Care Facility

- **Ocular exposures:** Continue irrigating eyes for at least 15 minutes. Examine eyes for corneal damage, and treat appropriately. Immediately consult an ophthalmologist for patients with corneal injuries.
- **Dermal exposures:** Remove any contaminated clothing, and wash thoroughly with soap and water. Treat dermal burns with standard therapy. Absorption through skin may result in systemic effects.
- **Inhalation exposures:** In acute intoxication, the treatment of pulmonary edema and shock is of primary importance. Maintain an open airway, and assist ventilation if necessary. Treat bronchospasm with inhaled beta₂ agonist and oral or parenteral corticosteroids. Medical observation is recommended for 24 to 48 hours after exposure, as pulmonary edema may be delayed. Early use of PEEP and mechanical ventilation may be needed. Monitor respiratory, renal and hepatic function and serum iron levels. For severe symptoms (shock, severe acidosis) and/or serum iron levels greater than 500 to 600 mcg/dL, administer deferoxamine.
- **Ingestion exposures:** Give 4 to 8 ounces of milk or water. Activated charcoal is not effective. Monitor respiratory, renal and hepatic function, and serum iron levels. For severe symptoms and/or serum iron levels greater than 500 to 600 mcg/dL, administer deferoxamine.

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

THE UNIVERSITY OF KANSAS HOSPITAL

KUMED
