
Information and recommendations for first responders

- These guidelines are based on information about the metal carbonyls nickel tetracarbonyl and iron pentacarbonyl. Recommendations for other metal carbonyls might be similar. However, these guidelines do not cover special features potentially related to other metal carbonyls.
 - Before approaching the patient, the first responder must make sure that he does not risk exposing himself to metal carbonyls.
 - Patients exposed only to vapor of metal carbonyls do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid metal carbonyls or solvents containing metal carbonyls can secondarily contaminate rescue and medical personnel by direct contact or through evaporation of metal carbonyls.
 - Metal carbonyls are irritating to all tissues, in particular to the respiratory tract. Exposure may result in eye and skin irritation, coughing, chest pain, dyspnea. Swelling of the throat and signs of accumulation of fluid in the lungs (shortness of breath, cyanosis, expectoration, cough) may occur.
 - There is no antidote to be administered to counteract the effects of metal carbonyls. Treatment consists of supportive measures.
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1. Substance information

Metal carbonyls: nickel tetracarbonyl – Ni(CO)₄, CAS 13463-39-3; iron pentacarbonyl – Fe(CO)₅, CAS 13463-40-6.

Synonyms: nickel carbonyl, tetracarbonyl nickel; iron carbonyl, pentacarbonyl iron;

At room temperature nickel tetracarbonyl and iron pentacarbonyl are colorless to yellow liquids. Metal carbonyls have a musty odor. When heated to decomposition, they emit toxic fumes of metal oxides and carbon monoxide.

Nickel tetracarbonyl is used in the refining of nickel and as a catalyst for organic synthesis. Iron pentacarbonyl has been used as an antiknock agent in gasoline.

2. Routes of exposure

Inhalation

Inhalation is the major route of metal carbonyl exposure. The odor does not provide adequate warning of hazardous metal carbonyl concentrations. Irritation of the respiratory tract, including pulmonary edema, cyanosis, headache and dizziness may occur.

Skin/eye contact

Direct contact with metal carbonyl liquids and vapor can cause irritation to skin or eyes.

Ingestion

Involuntary ingestion of metal carbonyls is unlikely but could cause irritation of the mouth, throat, esophagus, and stomach.

3. Acute health effects

Metal carbonyl exposure may cause irritation of all tissues. However, often throat and lung irritation are predominant and may lead to chest tightness, coughing, shortness of breath, blood-streaked sputum. Inflammation and severe damage of the lungs can occur. Toxic pneumonitis as well as pulmonary edema may develop and may be delayed up to 24 hours after a severe exposure.

Dizziness, headache, and muscle weakness can occur after inhalation exposure.

Skin contact with metal carbonyls can cause irritation and redness and inflammation.

Eye contact may result in irritation with pain, lacrimation, swelling of the lids, and clouding of the eye surface.

4. Actions

Rescuer self-protection

If the zone which has to be entered by the rescuer is suspected of containing metal carbonyls, pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn; do not use equipment that is contaminated itself.

Patients exposed only to metal carbonyl vapors do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid metal carbonyls or solvents containing metal carbonyls can secondarily contaminate other people by direct contact or through evaporation of metal carbonyls.

Patient recovery

Patients should be removed from the contaminated zone immediately. Patients who are unable to walk may be removed on backboards or stretchers; if these are not available, carefully remove/transport patients with appropriate action to a safe zone, taking into account your self-protection.

Immediate priorities must follow the "A, B, C's" of resuscitation:

- A) Airway** (make sure the airway is not blocked by the tongue or by a foreign body)
- B) Breathing** (check to see if the patient is breathing, provide ventilations with use of appropriate barrier devices, e.g. with a pocket face mask, if breathing is absent)
- C) Circulation** (start CPR in any unresponsive person with absent or abnormal breathing)

Decontamination

Patients exposed only to metal carbonyl vapors who have no evidence of skin or eye irritation do not need decontamination. All others require decontamination.

Patients who are able and cooperative may assist with their own decontamination. If the exposure involves liquid metal carbonyls or solvents containing metal carbonyls and if clothing is contaminated, remove and double-bag the clothing.

Flush exposed skin and hair with plain water for at least 15 minutes. Protect eyes during flushing of skin and hair. Continue other basic care during flushing.

Irrigate exposed or irritated eyes with plain water or saline for at least 15 minutes. Remove contact lenses if present and easily removable without additional trauma to the eye. Continue other basic care during flushing.

Further actions

Each potentially exposed person should seek immediate medical advice and treatment.

In this document BASF has made a diligent effort to ensure the accuracy and currency of the information presented but makes no claim that the document comprehensively addresses all possible situations related to this topic. This document is intended as an additional resource for first responders in assessing the condition and managing the treatment of patients exposed to Metal carbonyls. It is not, however, a substitute for the judgment of a first responder and must be interpreted in the light of specific information regarding the patient available to such a first responder and in conjunction with other sources of authority.

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