



Swedish Civil
Contingencies
Agency

EOD Medical Pocket Guide to Chemical Hazards

A pocket guide for medical personal to Chemical
Hazards within Explosive Ordnance Disposal



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Foreword

This handbok is primarily compiled with the purpose of being used as an advisory guide for the EOD medics working in MSB missions. In case of any uncertainty regarding contamination or suspected contamination; always seek medical attention without delay.

While every effort has been made to include as much information as possible in this pocket guide, the list of items contained herein should not be considered complete.

Past conflicts have seen a significant escalation in the use of liquid propellant fuelled system. They potentially pose a significant hazard to the local population and the teams working with safe clearance and disposal. In this document the most common fuels and oxidizers likely to be encountered in UXO or storage are addressed.

Common fuels likely to be encountered in UXO and storage are:

- Unsymmetrical dimethylhydrazine (UDMH)
- Mono Methyl Hydrazine (MMH) used with Dinitrogen Tetroxide
- Triethylamine/Xylidene, commonly referred to as TONKA fuel

Common oxidisers likely to be encountered in UXO and storage are:

- Red fuming nitric acid (RFNA), Inhibited red fuming nitric acid (IRFNA)
- Dinitrogen Tetroxide

This guide has been compiled by the medical coordinator at MSB with the assistance of an EOD technical expert within the MSB roster.

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Cloroacetophenone

$C_6H_5COCH_2Cl$, CN, Tear gas

Can occur in/as: Hand grenades.

Incompatibilities and reactivities: Combustible, gives off irritating toxic fumes.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin respiratory and gastrointestinal system.

Symptoms

Eyes: Redness, painful, blurred and partial loss of vision.

Skin: Redness, painful.

Respiratory system: Burning sensation, cough, sore throat, nausea, dyspnea.

Gastro intestinal: Burning sensation.

Treatment

Eyes: Remove the person from exposure and rinse with plenty of water for 15-30 minutes, remove contact lenses.

Skin: Remove contaminated clothes. Rinse and then wash skin with water and soap.

Respiratory system: Fresh air, rest, semi upright position. Assisted respiration may be needed.

Gastro intestinal: Rinse mouth. Give one or two glasses of water to drink with activated charcoal (if possible).

Clorobenzylidene Malononitrile

$\text{ClC}_6\text{H}_4\text{CH}=\text{C}(\text{CN})_2$, CS, OCBM

Can occur in/as: Strong oxidizers. Riot control agent, a tear gas that is stronger than CN gas but wears off faster; can be deployed by hand grenades, rifle launched anti riot grenades and rockets.

Incompatibilities and reactivities: CS gas is an aerosol of a volatile solvent.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin, respiratory system.

Symptoms

Eyes: Lacrimation, conjunctivitis, pain, burn eyes and involuntary closing of the eyelids.

Skin: Erythema, vesiculation, burns.

Respiratory system: Irritation, cough, tightness in the chest, pulmonary oedema.

Treatment

Eyes: Irrigate immediately.

Skin: Soap wash immediately.

Respiratory system: Fresh air, respiratory support.

Depleted Uranium

Can occur in/as: Military applications such as armor plates used as reinforcement in tank armour and armour piercing projectiles (20-30mm and 100-120mm rounds).

Depleted Uranium (DU) was heavily used in the 1991 Gulf War. Almost one million Depleted Uranium rounds were fired equaling 340 tons; in the Balkans an estimated 11 tons were fired in the late 1990s.

Incompatibilities and reactivities: NA.

Exposure Routes: Depleted uranium can be inhaled, swallowed or enter the body through cuts and abrasions. As long as depleted uranium remains outside the human body, experts consider that it is of negligible harm.

The burning of depleted uranium produces dust and oxide aerosols which can be inhaled directly or ingested in contaminated food, drinking water or soil. For depleted uranium intake, inhalation is the dominant route of short term or acute exposure in occupational settings. Ingestion is the major source of long term or chronic intake to the general public.

Target organs: Kidney

Symptoms

Elevated levels of protein. Damage - long term.

Treatment

Cover your mouth and leave the area. Wash your hands and face with soap and water and wash your clothes.

Depleted uranium is about 40% less radioactive than natural uranium.

Dimethylhydrazine

$(\text{CH}_3)_2\text{NNH}_2$, UDMH, Unsymmetrical dimethylhydrazine

Can occur in/as: Liquid fuel in missiles and rockets.

Incompatibilities and reactivities: It is hypergolic; the propellants spontaneously ignite when they come into contact with each other. The two propellant components usually consist of a fuel and an oxidizer. Although hypergolic propellants tend to be difficult to handle because of their extreme toxicity and/or corrosiveness. Boiling point is 63° Celcius.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Central nervous system, gastrointestinal tract (may cause severe and permanent damage to the digestive tract as it causes gastrointestinal tract burns), respiratory system, liver, blood, eyes, and skin. It is considered a carcinogenic substance.

Symptoms

Eyes: Burns may result in corneal injury.

Skin: Burns, may be harmful if absorbed through the skin.

Respiratory system: Causes chemical burns to the respiratory tract. Exposure produces central nervous system depression. Vapors affect the transfer of oxygen at a cellular level, reducing the capacity to pick up as well as store oxygen in the blood. This can lead to dizziness or suffocation. Gastro intestinal: Nausea, vomiting abdominal pain.

Treatment

Eyes: Remove contact lenses. Get medical aid immediately. Do not allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required minimum 30 minutes.

Skin: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Respiratory system: Remove from exposure and move to fresh air immediately and if breathing is difficult, give oxygen. If not breathing, give artificial respiration (do NOT use mouth-to-mouth resuscitation).

Gastro intestinal: Do not induce vomiting. If victim is conscious and alert give 2-4 glasses water and if possible charcoal. Avoid fat.

Ethylene Oxide

C_2H_4O , dimethylene oxide

Can occur in/as: Fuel air explosives, FAE. Enhanced blast weapons. Thermobaric rockets, thermobaric warheads, rocket warheads, aerial bombs.

A colorless liquid with an ammonia and/or fish like odor.

Incompatibilities and reactivities: At high temperatures and fire it creates highly toxic gases/vapors.

Exposure Routes: Inhalation, ingestion, skin and/or eye contact.

Target organs: Eyes, skin, respiratory system, central nervous system.

Symptoms

Eyes: Irritation, lacrimation and intensive pain. Symptoms might be delayed.

Skin: Pain, irritation and blisters. Risk for corrosive damage or frostbite.

Respiratory system: Dyspnea, cyanosis and pulmonary edema (delayed up to 48 hours).

Gastro intestinal: Nausea, vomiting, abdominal pain and bleeding.

Central nervous system: Drowsiness, lassitude, convulsion.

Treatment

Eyes: Remove contact lenses. Irrigate open eyes with water minimum 15 minutes.

Skin: Remove contaminated clothes. Flush with a large amount of water for a prolonged time.

Respiratory system: Fresh air and oxygen, respiratory support.

Gastro intestinal: Do not induce vomiting, flush the mouth and give something to drink.

Hydrogen Peroxide

H₂O₂, High-strength hydrogen peroxide, Hydrogen dioxide, Hydrogen peroxide, Hydroperoxide, Peroxide

Can occur in/as: A powerful oxidizer used in rocket liquid propellant fuelled systems.

Incompatibilities and reactivities: Noncombustible liquid but a powerful oxidizer. Contact with combustible material may result in spontaneous combustion.

Exposure Routes: Prevent generation of mists. Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin, respiratory system.

Symptoms

Eyes: Redness, blurred vision, severe burns.

Skin: Transient white spots, redness, burns.

Respiratory system: Sore throat, cough, dyspnea.

Gastro intestinal: Sore throat, abdominal pain, nausea, vomiting, abdominal distension.

Treatment

Eyes: Rinse with plenty of water for several minutes, remove contact lenses.

Skin: Rinse with plenty of water (soap) for minimum 15 min.

Respiratory system: Fresh air, semi sitting position, assist with breathing if needed but avoid mouth to mouth since it might be hazardous to the person giving it.

Gastro intestinal: Rinse mouth. Do NOT induce vomiting.

Isopropyl Acetat



Can occur in/as: Liquid fuel in missiles, aerial bombs, thermobaric rockets.

Incompatibilities and reactivities: Flammable liquid, keep away from heat and sources of ignition.

Exposure Routes: Inhalation, ingestion, skin and eye contact.

Target organs: Eyes, skin, respiratory system and central nervous system.

Symptoms

Eyes: Irritation and pain.

Skin: Irritation, dermatitis.

Respiratory system: Irritation, coughing and respiratory obstruction.

Gastro intestinal: Corrosive, nausea, vomiting and stomach pain.

Central nervous system: Drowsy, dizziness.

Treatment

Eyes: Flush with water for min 15 min.

Skin: Flush with water and soap.

Respiratory system: Rest in a well-ventilated area and if breathing problem, loosen all tight clothes and administer oxygen. There is a risk for pulmonary edema up to 48 hrs after contamination.

Gastro intestinal: Do not induce vomiting, flush the mouth and give some water.

Methyl Hydrazine

$\text{CH}_6\text{NH}_2/\text{CH}_3\text{NHNH}_2$, Monomethylhydrazine

Can occur in/as: Rocket liquid propellant in bipropellant rocket engines. Liquid fuel in missiles, hypergolic.

Incompatibilities and reactivities: Highly flammable, many reactions may cause fire or explosion. Gives off irritating toxic fumes.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin, respiratory system, central nervous system and the gastro intestinal system.

Symptoms

Eyes: Redness, burn, pain.

Skin: MAY BE ABSORBED! Redness, burns and pain.

Respiratory system: Burning sensation, cough, blue lips, fingernails and skin. Dyspnea. Symptoms may be delayed.

Gastro intestinal: Nausea, vomiting, abdominal cramps, burning sensation.

CNS: Headache, dizziness, convulsion. Shock or collapse.

Treatment

Eyes: Rinse with plenty of water for several minutes, remove contact lenses.

Skin: Rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.

Respiratory system: Fresh air, assisted breathing might be needed. Refer for medical attention.

Gastro intestinal: Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink.

Nitric Acid

HNO_3 , Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA), Inhibited red fuming nitric acid (IRFNA)

Can occur in/as: Rocket fuel, liquid fuel in missiles.

Inhibited red fuming nitric acid-IRFNA contains mostly of nitric acid and an inhibitor (an additive which prevents the acid from eating through its metal storage tank).

Incompatibilities and reactivities: Reacts with water or steam to produce heat. Contact of concentrated nitric acid with combusted material may increase the hazard of fire and lead to an explosion.

Exposure Routes: Gives off irritating toxic fumes in a fire. Inhalation, ingestion, skin and/or eye contact.

Target organs: Eyes, skin, respiratory system, teeth.

Symptoms

Eyes: Irritation, redness.

Skin: Burns.

Respiratory system: Symptoms may be delayed. Pulmonary edema, pneumonitis, bronchitis.

Gastro intestinal: Difficulties to swallow. A burning sensation in the throat and chest. Nausea/vomiting and stomach pain. Dental erosion.

Treatment

Eyes: Remove contact lenses. Irrigate immediately with water minimum 15 min keeping eyelids open.

Skin: Remove contaminated clothes, jewelry, watches. Flush immediately with plenty of water.

Respiratory system: Respiratory support, move to fresh air and support with oxygen if needed.

Gastro intestinal: Do NOT induce vomiting, flush the mouth and give a glass of water.

Nitrogen

Nitrogen dioxide NO_2 , Dinitrogen tetroxide N_2O_4

Can occur in/as: Liquid fuel in missiles. It is hypergolic and often occurs in combination with hydrazine based rocket fuel.

Incompatibilities and reactivities: Noncombustible liquid/gas. Reacts with water to form nitric acid.

Exposure Routes: Inhalation, ingestion, skin and eye contact. Prompt medical attention in all cases of overexposure of nitrogen dioxide. Contact with the liquid causes a corrosive or chemical etching action on the skin and/or eyes.

Target organs: Eyes, respiratory system and cardiovascular system.

Symptoms

Eyes: Irritation.

Skin: Irritation.

Respiratory system: Vapors are a strong irritant to the pulmonary tract. Tachypnea, dyspnea and decreased pulmonary function. Severe symptoms may be delayed including cyanosis irregular respiration and pulmonary edema.

Cardiovascular system: Tachycardia, chest pain.

Treatment

Conscious persons should be carried (not assisted) to an uncontaminated area and breath fresh air supplemented with oxygen. Keep the patient under medical observation until the danger of delayed pulmonary edema has passed (min 72 hrs).

Eyes: Remove contact lenses. Flush with water min 15 min.

Skin: Remove clothing and flush with copious quantities of water. Treat as for thermal burn.

Respiratory system: Oxygen, bed rest and no physical activity whatsoever.

Gastro intestinal: Seek medical attention.

Phosphorus Yellow/White, Phosphorus Red

WP, P₄

Can occur in/as: Smoke, illumination and incendiary munitions. Example of ammunition *which might* be filled with white phosphorus: shells, mortar bombs, hand grenades, aerial bombs, rifle grenades, rockets, cluster munitions and vehicle-launched smoke grenades. White phosphorus burst into burning flakes of phosphorus upon impact.

Red phosphorus is more stable and does not spontaneously ignite in air and does not catch fire in air at temperatures below 240°C whereas white phosphorus ignites at about 30°C.

Incompatibilities and reactivities: WP - ignites spontaneously in air. And continues to burn unless deprived of oxygen or until it is completely consumed.

Exposure Routes: Inhalation, ingestion, skin and/or eye contact.

Target organs: Eyes, skin, respiratory system, circulation.

Symptoms

Eyes: Burning sensation, intensive pain and lacrimation.

Skin: Deep second and third degree burns. WP has a tendency to stick to the skin.

Respiratory system: Irritation, and dyspnea. Risk for respiratory obstruction and edema. White phosphorus smoke irritates the mucous membranes of the nose, and respiratory tract in moderate concentrations, while higher concentrations may produce severe burns.

Gastro intestinal: Burning pain and corrosive damage. Stomach pain, hematemesis.

CNS: Seizures and unconsciousness. Risk for shock.

Treatment

Eyes: Remove contact lenses. Keep the eyes open and flush with water min. 15 min.

Skin: Remove contaminated clothes, flush with water.

Respiratory system: Fresh air, oxygen and rest. If possible, Inhalation Terbutalin (0,5mg/dose) 2-3 doses, Inhalation Budesonid (400mg/dose).

Circulation: Rest, Vapors affect the transfer of oxygen, reducing the capacity to pick up as well as store oxygen in the blood.

Gastro intestinal: Do not vomit, flush the mouth and give a small amount of fluid, water. Avoid fat (do not give milk) and if possible give charcoal.

CNS: Treat seizures with Benzodiazepine.

Propylene Oxide

C_3H_6O , 1,2-Epoxy propane, Methyl ethylene oxide

Can occur in/as: FAE fuel air weapons, thermobaric weapons.

Incompatibilities and reactivities: It is an extremely volatile liquid, easily vaporized and very flammable. It is highly dangerous when exposed to flame or heat. It can have a violent reaction in combination with various other chemical substances and metals. Avoid temperatures above 50° C.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin, respiratory system.

Symptoms

Eyes: Severe irritation and redness with corneal injury, impaired vision. Chemical burns may occur.

Skin: Irritation, burns, blisters.

Respiratory system: Vapor inhalation may cause irritation to the upper respiratory tract. Excessive vapor inhalation can cause unconsciousness or death due to cyanosis and possibly anesthesia and narcosis.

Gastro intestinal: Severe burns, sore throat, vomiting and diarrhea. May cause depression of the CNS.

Treatment

Eyes: Irrigate immediately for min. 15 min.

Skin: Water flush immediately for min. 15 min.

Respiratory system: Remove to fresh air, oxygen and be prepared for respiratory support.

Gastro intestinal: Do not induce vomiting, give large quantities of water.

Triethylamine

(C₂H₅)₃N, TEA (this abbreviation must be used carefully to avoid confusion with triethanolamine)

Can occur in/as: A catalytic solvent in chemical syntheses. Liquid fuel in missiles.

It possesses a strong fishy odour reminiscent of ammonia.

Incompatibilities and reactivities: It is a flammable/combustible compound that may be ignited by heat, sparks or flames. Vapors are heavier than air and form explosive mixtures with air. Vigorous reaction happens in contact with strong acids.

Exposure Routes: Inhalation, skin and eye contact, ingestion.

Target organs: Eyes, skin, gastro intestinal, Respiratory and cardiovascular system.

Symptoms

Eyes: Pain, blurred vision. May cause 'blue haze' or 'halo vision'.

Skin: Redness, burns.

Respiratory system: Coughing, dyspnea, pulmonary edema, headache and dizziness. Symptoms may be delayed.

Gastro intestinal: Nausea, vomiting, diarrhea.

Treatment

Eyes: Flush with plenty of water for min. 15 minutes .

Skin: Wash thoroughly with soap and water, remove jewelry and clothes.

Respiratory system: Half-upright position, assist to an uncontaminated area for fresh air, rest. Oxygen and artificial breathing if needed.

Gastro intestinal: Do not induce vomiting, give some water to drink.

Xylidine

$(\text{CH}_3)_2\text{C}_6\text{H}_3\text{NH}_2$, Aminodimethylbenzene,
Aminoxylene, Dimethylaminobenzene,
Dimethylaniline, Xylidine isomers

Can occur in/as: In missile liquid propellant fuelled system.

Incompatibilities and reactivities: Strong oxidizers, hypochlorite salts.

Exposure Routes: Inhalation, skin absorption, ingestion and eye contact.

Target organs: Respiratory system, blood, liver, kidneys and cardiovascular system.

Symptoms

Eyes: Tearing, conjunctival redness.

Skin: Irritation, entry into the blood stream through cuts, abrasions may produce systemic injury with harmful effects.

Respiratory system: Cyanosis.

Cardiovascular system: Anoxia, methemoglobinemia.

Treatment

Eyes: Irrigate immediately.

Skin: Wash with water and soap immediately.

Respiratory system: Remove from contaminated area, respiratory support.

Gastro intestinal: Give some water.

Reference

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MSB/Farligt Gods

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Notes

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