BASF Chemical Emergency Medical Guidelines

Nitrogen dioxide (NO_2) A 1

Information and recommendations for first responders

- **Patients whose clothing or skin is contaminated with nitrogen dioxide can cause secondary contamination of rescue and medical personnel by direct contact or through evaporation of nitrogen dioxide.**
- **Nitrogen dioxide and its vapor are rapidly corrosive when they come in contact with tissues such as the eyes, skin, and upper respiratory tract causing irritation, burns, coughing, chest pain and dyspnea. Swelling of the throat and accumulation of fluid in the lungs (shortness of breath, cyanosis, expectoration) may occur.**
- **Ingestion of nitrogen dioxide can cause severe corrosive injury to the lips, mouth, throat, esophagus, and stomach.**
- **There is no antidote to be administered to counteract the effects of nitrogen dioxide. Treatment consists of supportive measures.**

1. Substance information

Nitrogen dioxide (NO_2), CAS 10102-44-0
Synonyms: dinitrogen tetroxide, nitrogen peroxide and NTO.
Nitrogen dioxide is a colorless to yellow liquid at room temperature. Above 21°C (70°F) it is a gas. The concentrated gas has a dark violet to black color; when rarefied it becomes reddish-brown to yellow. Nitrogen dioxide has an irritating sharp odor at concentrations of 1-5 ppm. Upon contact with water it forms nitric acid. Nitrogen dioxide itself is nonflammable, but it can increase the flammability or cause the spontaneous combustion of other materials.
Nitrogen dioxide is formed naturally when fossil fuels like coal, oil or gas are burned and when stored grain ferments in storage silos. It is also part of airborne smog. Nitrogen dioxide is released in the reaction between nitric acid and any organic material. It is also formed whenever nitric acid acts upon metals, as in bright dipping, pickling, and etching.

2. Routes of exposure

Inhalation

Nitrogen dioxide's odor and irritant properties generally provide adequate warning of acutely hazardous concentrations.

Skin/eye contact

Direct contact with liquid nitrogen dioxide or concentrated vapor on wet or moist skin causes severe chemical burns. Nitrogen dioxide is poorly absorbed through the skin.

Ingestion

Ingestion of nitrogen dioxide can cause severe corrosive injury to the lips, mouth, throat, esophagus, and stomach.

3. Acute health effects

Respiratory

Nitrogen dioxide exposure usually causes dryness of the nose and throat, and coughing. Inhalation of very high concentrations may result in swelling of the throat and eventually in obstruction of the airways and death. Development of respiratory distress with chest pain, dyspnea and accumulation of fluid in the lungs (shortness of breath, cyanosis, expectoration) may occur as late as 24 hours after exposure.

Skin contact

Deep burns of the skin and mucous membranes may be caused by contact with concentrated nitrogen dioxide; sometimes yellowing of the skin results. Contact with less concentrated nitrogen dioxide vapor can cause burning pain, redness, and inflammation

Eye contact	Severe eye burns with clouding of the surface, perforation of the globe, and ensuing blindness may occur from exposure to liquid nitrogen dioxide. Low concentrations of vapor cause burning discomfort, spasmodic blinking or involuntary closing of the eyelids, redness, and tearing.

4. Actions

Rescuer self-protection	**If the zone which has to be entered by the rescuer is suspected of containing nitrogen dioxide, pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn; do not use equipment that is contaminated itself.** Patients whose clothing or skin is contaminated with nitrogen dioxide may secondarily contaminate rescue and medical personnel by direct contact or nitrogen dioxide vapor.
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 a foreign body) **B) Breathing** (check to see if the patient is breathing, provide ventilation 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 nitrogen dioxide vapor 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 involved liquid nitrogen dioxide and if clothing is contaminated, remove and double-bag the clothing. **Irrigate exposed or irritated eyes with plain water or saline for at least 20 minutes**. Remove contact lenses if present and easily removable without additional trauma to the eye. Continue other basic care during flushing. **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.
Further actions	In case of ingestion of nitrogen dioxide, **do not induce emesis. Each potentially exposed person should seek immediate medical advice and treatment.**

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