

Public Health Officer Alert- Emergency Rooms

Possible Nitrogen Dioxide Toxicity

On Tuesday, August 20th at 1:00 p.m., the City of Oxnard Certified Unified Program Agencies (CUPA), also known as the Hazardous Materials Program, was advised of a potential health concern secondary to a Hazmat incident that occurred at Alliance Finishing at 1721 Ives Ave. in the city of Oxnard. On August 15, six days ago, at that location, there was a potential nitrogen dioxide exposure to as many as 22 employees within the facility.

Utilizing video footage obtained by CUPA investigators it was determined through consultation with the UCSB Lab Safety Department that a gas released by employees who were attempting to neutralize an ammonium bifluoride/ nitric acid reaction with 35% hydrogen peroxide created a nitrogen dioxide and nitrous oxide gas release. **Nitrogen dioxide can be very toxic.** Several employees were seen in the video with either no or inadequate respiratory protection. On scene of the response, 2 patients were evaluated by Gold Coast Ambulance medics for a respiratory exposure but refused to go to the hospital.

Two emergency responders momentarily entered the affected area with no respiratory protection and immediately retreated upon seeing the situation. Both individuals are asymptomatic but are being seen by occupational health for baseline testing as a precaution. The physician there has been advised of the unique circumstances and will test pulmonary function and pull the necessary blood labs.

We have requested the names and contact information of the employees who were working that day from the company. They have advised that they will pull the information from their time clock software and send it to Oxnard officials. The company involved has also advised that a large number of their workforce is non-English speaking.

We are sending out this information so that providers in Emergency Departments are aware of this potential health threat and will consider nitrogen dioxide exposure when they are evaluating patients with respiratory distress or pulmonary effusions. Please report these cases to Public Health at 805-981-5201.

Information about nitrogen dioxide follows.

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Health Officer



Nitrogen Oxides toxicity

Compiled by CDPH E&O Emergency Preparedness Team • eo.ept@cdph.ca.gov • 24/7 CDPH Duty Officer 916-328-3605

Sources: *OEHHA RELs, WebWISER, NIOSH IDLH, eMedicine Medical Guidelines, ATSDR Medical Guidelines*

Summary:

- Nitrogen oxides are irritating to the upper respiratory tract and lungs even at low concentrations.
- Only one or two breaths of a very high concentration can cause severe toxicity.
- Odor is generally an adequate warning property for acute exposures.
- Nitrogen dioxide is heavier than air, such that exposure in poorly ventilated, enclosed, or low-lying areas can result in asphyxiation.
- Exposure to relatively high air concentrations can produce eye irritation and inflammation.

Sources: *ATSDR Medical Guidelines*

Properties:

- Immediately Dangerous to Life and Health: 20 ppm
- American Industrial Hygiene Association Emergency Exposure Limits (EELs):
 - 5-minute EEL: 35 ppm
 - 15-minute EEL: 25 ppm
- Odor threshold 0.11-0.22 ppm
- Odor is similar to that of bleach, could be described as acrid, sweetish, pungent

Sources: *OEHHA RELs, WebWISER, NIOSH IDLH*

Symptoms:

- Nitrogen dioxide forms nitric acid upon contact with water. It is more acutely toxic than nitric oxide. It is difficult to discriminate nitric oxide effects from nitrogen dioxide.
- Exposure to nitrogen oxides results in acute and chronic changes of the pulmonary system including pulmonary edema, pneumonitis, bronchitis, bronchiolitis, emphysema and possibly methemoglobinemia.
- Usually, no symptoms occur, except a slight cough, fatigue, and nausea.
- However, potentially fatal pulmonary edema can occur following minimal early symptoms.
 - Acute effects may or may not develop within one to two hours after exposure, and include tachypnea, tachycardia, fine crackles and wheezing, and cyanosis. Another acute scenario involves dyspnea and coughing which subside over two to three weeks.
 - The second stage involves abrupt development of fever and chills, more severe dyspnea, cyanosis, and pulmonary edema. There is no correlation between severity of the first and second stages.
 - Recovery may be either complete or may involve some degree of impairment of pulmonary function

Source: *WebWISER*

- Once inhaled, NO₂ reaches the lower respiratory tract, affecting mainly the bronchioles and the adjacent alveolar spaces, where it may produce pulmonary edema within hours.
- Short exposures to 100-500 ppm (190-900 mg/m³) NO₂ may lead to sudden death.
- More characteristic is insidious, delayed pulmonary edema within hours.
- Delayed inflammatory changes may lead to death hours or days after exposure.
- Persons with asthma and other preexisting pulmonary diseases, especially RADS, may be more sensitive to the effects of NO₂

Source: *OEHHA RELs*

- Absorption of nitrogen oxides can lead to a weak rapid pulse, dilated heart, chest congestion, and circulatory collapse.

Source: *ATSDR Medical Guidelines*

- Following a delay of 2-48 hours, patients exposed to NO₂ may develop the following symptoms:
 - Dyspnea
 - Cough
 - Chest pain
 - Clinical manifestations of noncardiogenic pulmonary edema
- The following may develop 2-6 weeks after initial exposure:
 - Bronchiolitis obliterans, manifested as fever, cough, and dyspnea
 - Diffuse reticulonodular or miliary pattern on chest radiography
- Suspect methemoglobinemia in patients exposed to NO₂ who exhibit cyanosis or dyspnea.
- Victims of inhalation exposure may suffer reactive airways dysfunction syndrome (RADS) after a single acute, high-dose exposure.
- Pulmonary symptoms are the most common manifestation of NO₂ toxicity. These include the following:
 - Cough
 - Dyspnea
 - Chest tightness
 - Choking
 - Wheezing
 - Chest pain
 - Rales
 - Rhonchi
 - Decreased breath sounds
 - Stridor
- Other acute symptoms include the following:
 - Light-headedness
 - Loss of consciousness
 - Restlessness
 - Agitation
 - Confusion
 - Irritation of mucous membranes, including the eyes
 - Conjunctival infection
 - Weakness
 - Fatigue
 - Nausea
 - Abdominal pain
 - Skin burns, in cases of liquid N₂O₄ exposure
- Delayed symptoms include the following:
 - Tachypnea
 - Headache
 - Fever, chills
 - Insomnia
 - Myalgias
 - Hemoptysis
 - Palpitations
 - Cyanosis

Source: eMedicine Medical Guidelines