



# New Jersey Department of Health and Senior Services

## HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **NITROGEN DIOXIDE**

CAS Number: 10102-44-0  
 DOT Number: UN 1067

RTK Substance number: 1376  
 Date: May 1989 Revision: April 2000

### HAZARD SUMMARY

- \* **Nitrogen Dioxide** can affect you when breathed in.
- \* **Nitrogen Dioxide** may cause mutations. Handle with extreme caution.
- \* Contact can irritate and burn the skin and eyes with possible eye damage.
- \* Breathing **Nitrogen Dioxide** can irritate the nose and throat.
- \* Breathing **Nitrogen Dioxide** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- \* High levels can interfere with the ability of the blood to carry *Oxygen* causing headache, fatigue, dizziness, and a blue color to the skin and lips (*methemoglobinemia*). Higher levels can cause trouble breathing, collapse and even death.
- \* Repeated exposure to high levels may lead to permanent lung damage.

- \* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

### WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **5 ppm**, not to be exceeded at any time.

NIOSH: The recommended airborne exposure limit is **1 ppm**, which should not be exceeded at any time.

ACGIH: The recommended airborne exposure limit is **3 ppm** averaged over an 8-hour workshift and **5 ppm** as a STEL (short term exposure limit).

- \* **Nitrogen Dioxide** may cause mutations. All contact with this chemical should be reduced to the lowest possible level.

### IDENTIFICATION

**Nitrogen Dioxide** is a dark brown to yellowish liquid or reddish-brown gas with a strong odor. It is used to produce other chemicals, as a nitrating and oxidizing agent, in bleaching flour, and in rocket fuels and explosives.

### REASON FOR CITATION

- \* **Nitrogen Dioxide** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, HHAG, NFPA and EPA.
- \* Definitions are provided on page 5.

### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

### WAYS OF REDUCING EXPOSURE

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to **Nitrogen Dioxide**.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Nitrogen Dioxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

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## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Nitrogen Dioxide**:

- \* Contact can irritate and burn the skin and eyes with possible eye damage.
- \* Breathing **Nitrogen Dioxide** can irritate the nose and throat.
- \* Breathing **Nitrogen Dioxide** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- \* High levels can interfere with the ability of the blood to carry *Oxygen* causing headache, fatigue, dizziness, and a blue color to the skin and lips (*methemoglobinemia*). Higher levels can cause trouble breathing, collapse and even death.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Nitrogen Dioxide** and can last for months or years:

### Cancer Hazard

- \* **Nitrogen Dioxide** may cause mutations (genetic changes).
- \* There is no evidence that **Nitrogen Dioxide** causes cancer in animals. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies.

### Reproductive Hazard

- \* There is limited evidence that **Nitrogen Dioxide** may damage the developing fetus and decrease fertility in females.

### Other Long-Term Effects

- \* Repeated exposure to high levels may lead to permanent lung damage.

## MEDICAL

### Medical Testing

Before beginning employment and at regular times after that, the following are recommended:

- \* Lung function tests. These may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following are recommended:

- \* Consider chest x-ray after acute overexposure.
- \* Blood methemoglobin level.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

### Mixed Exposures

- \* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- \* Where possible, automatically transfer gaseous **Nitrogen Dioxide** or pump liquid **Nitrogen Dioxide** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by **Nitrogen Dioxide** should change into clean clothing promptly.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Nitrogen Dioxide**.
- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.

- \* On skin contact with **Nitrogen Dioxide**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Nitrogen Dioxide**, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where **Nitrogen Dioxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

## PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Clothing

- \* Avoid skin contact with **Nitrogen Dioxide**. Wear acid-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- \* Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- \* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- \* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

### Respiratory Protection

#### IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposure over **1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

- \* Exposure to **20 ppm** is immediately dangerous to life and health. If the possibility of exposure above **20 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

## HANDLING AND STORAGE

- \* Prior to working with **Nitrogen Dioxide** you should be trained on its proper handling and storage.
- \* **Nitrogen Dioxide** will react with WATER to form *Nitric Acid*.
- \* **Nitrogen Dioxide** may react explosively with TRIMETHYLITIN; TRIETHYLAMINE; AMMONIA; ALCOHOLS; ACETONITRILE; INDIUM; METHYL SULFOXIDE; HYDRAZINES; ALUMINUM POWDER; and CARBON DISULFIDE.
- \* **Nitrogen Dioxide** is not compatible with COMBUSTIBLE MATERIALS; CHLORINATED HYDROCARBONS; FORMALDEHYDE; FLUORINE; PETROLEUM; NITROBENZENE; COPPER; COPPER ALLOYS; and REDUCING MATERIALS.
- \* Store in tightly closed containers in a cool, dry, well-ventilated area.

## QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This

may be a problem for children or people who are already ill.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: What are the likely health problems from chemicals which cause mutations?

A: There are two primary health concerns associated with mutagens: (1) cancers can result from changes induced in cells and, (2) adverse reproductive and developmental outcomes can result from damage to the egg and sperm cells.

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The following information is available from:

New Jersey Department of Health and Senior Services  
Occupational Health Service  
PO Box 360  
Trenton, NJ 08625-0360  
(609) 984-1863  
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

### **Industrial Hygiene Information**

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

### **Medical Evaluation**

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

### **Public Presentations**

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

### **Right to Know Information Resources**

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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## DEFINITIONS

**ACGIH** is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**HHAG** is the Human Health Assessment Group of the federal EPA.

**IARC** is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

**MSHA** is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NAERG** is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

**NCI** is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**TLV** is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

