

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Inhalation, skin contact and eye contact.

General Acute Exposure: Nitric acid can be corrosive to the skin, eyes, nose, mucous membranes, respiratory and gastrointestinal tracts, or any tissue with which it comes in contact. Severe burns can occur with necrosis and scarring. Milder exposures can cause irritation of the skin, mucous membranes, respiratory and digestive tracts. Sudden circulatory collapse can occur from acute exposure.

Inhalation

Acute Exposure: Respiratory tract irritation, delayed effects, pulmonary function changes, chemical pneumonitis, pulmonary edema, and dyspnea may occur. **ADDITIONAL MEDICAL INFORMATION:** Inhalation of vapor or mist can produce coughing, dyspnea (breathing difficulty), chest pain, and pulmonary edema (water on the lungs), with these effects often delayed in onset up to 30 hours. Severity of symptoms may be no different between mild cases and those that will later show sudden circulatory collapse.

Chronic Exposure: Chronic bronchitis, chemical pneumonitis, pulmonary fibrosis, and changes in pulmonary function may occur with overt symptoms resembling acute viral respiratory tract infection.

Skin

Acute Contact: Severe burns, ulceration, scarring, dermatitis, and yellow staining of the skin may be observed. Causes second and third degree burns on short contact.

Eye

Acute Contact: Vapor and/or liquid contact may cause severe damage to the eyes. **ADDITIONAL MEDICAL INFORMATION:** Eye exposure may result in conjunctivitis, corneal ulcers, necrosis, and/or corneal opacity.

Neurologic

Acute Exposure: Headache, methemoglobinemia, vertigo, loss of coordination and mental facilities, and weakness can occur.

Gastrointestinal

Acute Exposure: Gastritis, hemorrhagic gastritis, esophageal and gastric burns have been observed. Ingestion of nitric acid can cause epigastric pain, nausea, and vomiting of mucoid and "coffee ground" material. Ingestion may produce esophageal corrosion or stricture, necrosis and perforation of the stomach, especially at the pylorus, and occasionally injury to the small bowel.

Hepatic

Acute Exposure: Ischemic lesions may occur in the liver after several hours of uncorrected circulatory collapse.

Genitourinary

Acute Exposure: Renal failure has been observed. Kidney failure and decreased urine output can occur after several hours of uncorrected circulatory collapse.

Dental

Chronic Exposure: Discoloration and erosion of dental enamel can occur.

Cardiovascular

Acute Effects: Sudden circulatory collapse can occur with respiratory symptoms no more severe than in mild cases. Ischemic lesions in the heart may occur after several hours of uncorrected circulatory collapse.

Hematologic

Acute Exposure: Methemoglobinemia, hemolysis, and/or leukocytosis may occur.

Acute Effects: If nitric acid has been in contact with organic materials or in other conditions likely to release nitric oxide, methemoglobin may be formed, producing symptoms of hypoxia including cyanosis, headache, dizziness, vomiting, weakness, loss of coordination and mental facilities, drowsiness, and death from respiratory arrest.

Genotoxicity

Nitric acid and related compounds can react chemically with other substances to form mutagenic products.

Carcinogenicity:

NTP:..... Not Listed

IARC:..... Not Listed

OSHA:..... Not Regulated

Medical Conditions Aggravated by Exposure: Persons with skin, eye, or respiratory conditions may be more sensitive to the irritative effects of nitric acid. Persons with disorders of the blood which result in lessened oxygen-carrying capacity, such as anemia, and those with liver or kidney disorders may be more sensitive to the effects of methemoglobinemia.

4. FIRST AID MEASURES

First Aid for Eyes: Immediately flush eyes with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, excessive tearing, or light sensitivity persists, the patient should be seen in a health care facility and referral to an ophthalmologist considered.

First Aid for Skin: Immediately flush exposed area with copious amounts of tepid water for at least 15 minutes followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists. Treat dermal irritation or burns with standard topical therapy. Patients developing dermal hypersensitivity reactions may require treatment with systemic or topical corticosteroids or antihistamines.

First Aid for Inhalation: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. If trained to do so administer supplemental oxygen with assisted ventilation as required. Administer artificial respiration if patient is not breathing.

First Aid for Ingestion: Call a physician. If conscious, give the patient 4 to 8 ounces of milk or water to drink immediately. Do not induce vomiting. Observe patient for possible development of esophageal or gastrointestinal tract irritation or burns.

5. FIRE FIGHTING MEASURES

Flash Point: Not Flammable
Lower Flammable Limit: Not Flammable
Upper Flammable Limit: Not Flammable
Autoignition Temperature: Not Flammable

NOTE: Nitric acid itself is not combustible, but it can cause ignition of other combustible materials (wood, paper, oil, etc.) and it may produce flammable gases when contacting other materials.

Extinguishing Media:

Small Fire: Water, dry chemical, soda ash.
Large Fire: Flood fire area with water.

Special Fire Fighting Procedures:

- a. Do not get water inside container. Mixing of water and nitric acid will generate heat and vapor.
- b. Move container from fire area if you can do it without risk.
- c. Apply cooling water to sides of containers that are exposed to flames until well after fire is out.
- d. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
- e. Use water spray to control vapors.
- f. Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
- g. Chemical protective clothing, which is safe for use with nitric acid, involved in a fire, should be worn.

CAUTION:

- a. Structural firefighters protective clothing is not effective.
- b. Runoff from fire control or dilution water may cause pollution.
- c. Do not touch or walk through spilled material.
- d. Remove and isolate contaminated clothing and shoes at the site.
- e. Reaction with fuels may be violent.
- f. Flammable / poisonous gases may accumulate in tanks and hopper cars.
- g. Runoff to sewer may create fire or explosion hazard.

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Measures: As an immediate precautionary measure, isolate spill or leak area in all directions for at least 150 feet for liquids and at least 75 feet for solids. Stop leak if you can do it without risk. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Evaluate the affected area to determine whether to evacuate or shelter-in-place by taping windows and doors, shutting off outside air intake (attic fans, etc.), and placing a wet towel or cloth over the face (if needed). Fully encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to control vapors. Mixing of water and nitric acid will generate heat and vapor.

Determining Spill Size: Generally, a small spill is one that involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small (non-continuing) leak from a large container.

Small Spill:

- a. Flush area with flooding amounts of water.
- b. Small amounts of spilled material can be covered with sodium bicarbonate or an equal mixture of slaked lime and soda ash. Water may then be added to form a slurry, and the resultant solution can be discharged into a sink lined with chipped marble and a protective matting with a large quantity of water (ITI, 1985).

Large Spill:

- a. Dike far ahead of liquid spill for later disposal.
- b. Follow local emergency protocol for handling.
- c. Land Spills
 1. Holding areas for large amounts of spilled liquid may be constructed by digging pits, ponds, or lagoons.
 2. Surface flow may be diked with foamed cement, foamed polyurethane, soil, or sand bags.
 3. Bulk liquid can be neutralized with sodium bicarbonate, agricultural lime, or crushed limestone.
 4. Bulk liquid may be adsorbed with cement powder or fly ash.

7. HANDLING AND STORAGE

Segregate from metallic powders, carbides, hydrogen sulfide, turpentine, organic acids, and all combustible, organic or other readily oxidizable materials. Provide good ventilation.

Handling Precautions: Use proper personal protective equipment when working with or around nitric acid. Safety showers and eye wash stations should be located in acid handling areas.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection Requirements:

- | | |
|-------------|--|
| <2 ppm: | No protection required. |
| 2 to 4 ppm: | Protection required if exposed for more than 15 minutes (must be fresh air supply system – see below). |
| >4 ppm: | A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus). |

NOTE: Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal.

Skin Protection Requirements: Prevent Skin Contact! Skin protection is required for exposure to liquid and / or mist. Neoprene or Viton gauntlet-type gloves, rain suits, aprons, boots, etc.

Eye Protection Requirements: Prevent Eye Contact! Use chemical (indirectly vented) goggles when there is a potential for contact with liquid or mist. A full-face shield may be worn over goggles for additional protection, but not as a substitute for goggles.

Other Protective Equipment: Safety shower and eyewash fountain should be provided in the nitric acid handling area.

Engineering Controls: Adequate ventilation to keep vapor / fume concentrations below applicable standards.

NOTE: See Section 2 for regulatory exposure guidelines.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: Liquid
Color: Colorless to slightly yellow
Odor: Choking odor.
Boiling Point: 181-245° F
Melting point: -50° F
pH: <1 (Strong, monobasic acid)
Solubility: Soluble in all proportions in water
Specific Gravity: 1.4 (@ 60° F)
Vapor Density: 3.2 (@ 60° F)
Vapor Pressure: 42 mm Hg (@ 60° F)
% Volatile by Volume: 100
Molecular Weight: 63.01
Density: 11.67 lb. per gallon (@ 60° F)
Critical Temperature: No test results
Critical Pressure: No test results

10. REACTIVITY

Stability: This is a stable material.

Hazardous Polymerization: Will not occur.

Decomposition: Nitric acid releases oxides of nitrogen, i.e. NO, NO₂, NO_x.

Incompatibilities:

- a. Nitric acid itself is nonflammable, but in concentrated form it is a powerful oxidizer. It can increase the flammability of organic materials and can cause spontaneous combustion of some materials.
- b. Nitric acid can react explosively with metallic powders; carbides; hydrogen sulfide and turpentine, and can react violently with alcohol.
- c. Nitric acid can react violently or is incompatible with the following; Acetic acid, Acetylene, Ammonia, Arsine, Bismuth, Boron, Carbon, Cresol, Cyanides, Ethanol, Ethylenediamine, Germanium, Hydrogen Peroxide, Hydrogen Sulfide, Lithium, Magnesium, Phosphorus, Sodium, Titanium, Vinyl Acetate, Zinc.

NOTE: The incompatibilities above are a partial list taken from two books by Sax & Lewis: "Dangerous Properties of Industrial Materials", 7th. ed., 1989 and "Hawley's Condensed Chemical Dictionary", 11th. ed. 1987, both published by Van Nostrand Reinhold Company, New York. It is recommended that if additional information is needed, the reader should refer to these and other published information.

11. TOXICOLOGICAL INFORMATION

LDLo	Human:	5000 ppm for 5 minutes
LCL	Human:	150 ppm (NO ₂)
LC ₅₀	Mouse:	67 ppm for 4 hours
LC ₅₀	Rat:	65 ppm (NO ₂) for 4 hours
LCL	Goldfish:	750 ppm 5 hours
LCL	Fathead Minnow:	1000 ppm for 7 hours

12. ECOLOGICAL INFORMATION

- Nitric acid is harmful to aquatic life in very low concentrations.
- May be dangerous if it enters water intakes. Notify operators of nearby water intakes.
- Notify local health and wildlife officials.

13. DISPOSAL CONSIDERATIONS

Waste must be disposed of in accordance with federal, state, and local environmental control regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and Canadian TDG Act

Shipping Name:..... Nitric Acid, (*other than red fuming, with not more than 70 percent nitric acid*)

Hazard Class: Corrosive, class: 8

Product Identification Number (PIN): UN2031

DOT Placard: Corrosive, color: white/black

OSHA Label Required: Yes

RQ (Reportable Quantity): 1000 pounds (as 100% HNO₃)

STCC Number: 4930223

15. REGULATORY INFORMATION

Controlled Products Regulations Classification: C: Oxidizer; D-1B: Toxic (acute lethality); E: Corrosive

OSHA: This product is considered a hazardous material under criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

SARA TITLE III:

- a. EHS (Extremely Hazardous Substances) List: Listed (EPA, 1992a)
- b. EHS RQ (Reportable Quantity): 1000 pounds (as 100% HNO₃)
- c. TPQ (Threshold Planning Quantity): 1000 pounds (as 100% HNO₃)
- d. Regulation: "Emergency Planning and Notification" - 40 CFR Part 355 (Appendices A and B).
- e. Section 313: "Specific Toxic Chemical Listings" - 40 CFR Part 372
Nitric acid is subject to the reporting requirements of Section 313 and 40 CFR Part 372. Terra is required by 40 CFR 372.45 to notify certain customers as to which of its mixture or trade name products contain those chemicals. The purpose of that notification is to ensure that facilities that may be subject to reporting requirements of Section 313 and that use products of unknown formulation will have knowledge that they are receiving products that contain chemicals subject to those reporting requirements.

CERCLA Hazardous Substances List:

- a. CERCLA RQ (Reportable Quantity): 1000 pounds (as 100% HNO₃)
- b. Regulation: "Designation, Reportable Quantities, Notification" - 40 CFR 302

TSCA Inventory:

- a. Listed (RTECS)

16. OTHER INFORMATION

Nov. 5, 1996: The MSDS was rewritten to comply with ANSI Standard Z400.1-1993.

Feb. 6, 2005: Revised and updated.

Dec. 7, 2006: Revised and updated.

The information and recommendations herein are taken from data contained in independent, industry-recognized references including but not limited to NIOSH, OSHA, NFPA, D.O.T. ERG, MEDITEXT, HAZARDTEXT, CHRIS, and SAX's Dangerous Properties of Industrial Materials - ninth edition. Terra Industries Inc. makes no guarantee, warranty or other representation concerning this substance, since conditions of its use are beyond the control of the company. Terra Industries Inc. disclaims any liability for loss or damage incurred in connection with the use of this substance.