CONDITION

Nitric acid poisoning

Nitric acid poisoning is corrosive injury caused by swallowing, breathing, or touching nitric acid.

WHAT IT IS
Corrosive injury from exposure to nitric acid

BODY SYSTEM
Airways, lungs, digestive tract, skin, and eyes

MAIN SYMPTOMS
Burning pain, coughing, breathing trouble, yellow-stained burns

WHAT CAUSES IT
Exposure to concentrated nitric acid or its fumes

HOW IT IS DIAGNOSED
Exposure history, examination, imaging, and sometimes endoscopy

MAIN TREATMENT
Immediate decontamination and hospital supportive care

CAN IT BE CURED?
Sometimes - mild injuries heal; severe damage may persist

IS IT AN EMERGENCY?
Yes - swallowing, eye exposure, or breathing symptoms

LONG-TERM OUTLOOK
Mild injuries often heal; severe burns can cause lasting damage

Overview

Nitric acid is a highly corrosive liquid used in laboratories, metal processing, manufacturing, and some specialist cleaning or engraving work. "Corrosive" means it can chemically burn and destroy body tissue.

Poisoning can happen if nitric acid is swallowed, splashed onto the skin or eyes, or breathed in as mist or fumes. When nitric acid reacts with metals or other materials, it may release nitrogen oxides. These toxic gases can seriously irritate the airways and lungs.

The effects depend on the concentration, amount, route of exposure, and how quickly the acid is removed. A small, brief skin exposure may cause a local burn. Swallowing concentrated acid or breathing substantial fumes can be life-threatening.

Some lung problems do not appear immediately. A person may initially feel better after leaving the area but develop coughing or shortness of breath several hours later. Suspected significant exposure needs prompt advice from emergency services or a poison centre, even if symptoms seem mild.

Symptoms

Symptoms often begin where the acid touched the body. The severity cannot always be judged from pain alone because deep tissue injury may be present beneath the surface.

Skin exposure may cause:

Eye exposure can cause intense pain, watering, redness, eyelid swelling, blurred vision, or loss of vision. Even a small splash may damage the clear front surface of the eye, called the cornea.

Breathing nitric acid mist or nitrogen oxide fumes may cause throat irritation, coughing, chest tightness, wheezing, headache, or shortness of breath. Severe exposure can cause fluid to collect in the lungs, known as pulmonary oedema. This may develop after a symptom-free period.

Swallowing nitric acid can cause burning in the mouth, throat, chest, or upper abdomen. Other possible symptoms include drooling, trouble swallowing, vomiting, blood in vomit, abdominal pain, or a hoarse voice. Burns around the mouth do not reliably show how much internal injury has occurred.

Severe poisoning may cause confusion, weakness, collapse, or blue-grey skin and lips. These are emergency symptoms.

- Immediate burning, pain, redness, or blisters
- Yellow or yellow-brown staining of the skin
- Open wounds or areas of dead tissue after a severe burn

Causes and risk factors

Nitric acid poisoning is caused by direct contact with the acid or by breathing gases released from it. It is not contagious and does not develop without an exposure.

Workplace incidents are an important cause because nitric acid is used in fertiliser production, metal treatment, explosives manufacturing, laboratories, and electronics. Accidents may happen during transfer, storage, cleaning, spill response, or maintenance.

Risk is higher when nitric acid is used:

Heating nitric acid or allowing it to react with metals can produce nitrogen dioxide, a reddish-brown gas. Dangerous concentrations may still be present even when the gas is not clearly visible.

- In a poorly ventilated or enclosed space
- Without suitable eye, face, skin, and breathing protection
- Near metals, fuels, organic materials, or incompatible chemicals
- In an unlabelled or unsuitable container
- By someone without chemical-safety training

Diagnosis

Diagnosis starts with what happened. Healthcare professionals will need to know the product name, concentration if available, amount, route of exposure, and approximate time of the incident. A product label or safety data sheet can help, but you should not return to an unsafe area to collect one.

An examination checks the mouth, eyes, skin, breathing, circulation, and level of alertness. Oxygen levels are monitored, although additional blood testing may be needed if the reading does not match the symptoms.

After inhalation, tests may include a chest X-ray, blood tests, or measurement of blood gases. An early chest X-ray can be normal even when lung injury later develops. People with continuing or significant symptoms may therefore need observation and repeat assessment.

After swallowing nitric acid, a flexible camera test called endoscopy may be used to examine the oesophagus and stomach. This helps show the depth and extent of internal burns. CT imaging may be used when deeper injury or a hole in the digestive tract is suspected.

Eye exposure requires careful examination, often including checks of vision and the cornea. Skin burns are assessed for their depth and total area.

Treatment and management

There is no general antidote that reverses nitric acid burns. Treatment begins by stopping exposure, removing acid from the body, and supporting breathing and circulation.

Do not enter an area containing fumes unless trained and equipped to do so. After inhalation,

move into fresh air only if this can be done safely. Call emergency services if there is coughing, chest tightness, breathing difficulty, confusion, or collapse.

For skin exposure, remove contaminated clothing and jewellery while avoiding contact with the chemical. Brush away any dry contamination if present, then rinse the affected skin with plenty of running water. Do not scrub the skin or apply neutralising chemicals. Chemical reactions intended to neutralise an acid may create heat and worsen the burn.

For an eye splash, begin gentle rinsing immediately with clean, lukewarm water. Remove contact lenses if they come out easily, but do not delay rinsing. Keep rinsing while urgent medical help is arranged.

If nitric acid has been swallowed, do not cause vomiting. Do not try to neutralise it with baking soda, alkali, or another chemical. Rinse the mouth carefully and contact emergency services or a poison centre immediately. Do not give food, drink, activated charcoal, or medication unless a poison specialist or emergency professional advises it.

Hospital treatment may include oxygen, breathing support, pain relief, intravenous fluids, and careful monitoring. Serious swelling around the airway may require a breathing tube. Lung symptoms may be treated with respiratory support and medicines that open narrowed airways.

Eye and deep skin injuries may need specialist treatment. Surgery can be necessary for extensive burns, dead tissue, a perforation, or later scar-related narrowing of the digestive tract.

Complications

Possible complications depend on where the acid made contact and how deeply it injured the tissue.

After inhalation, lung inflammation or pulmonary oedema can develop within hours. Severe injury may lead to respiratory failure. Less commonly, inflammation and scarring can narrow the smallest airways over the following weeks.

Deep skin burns can become infected or heal with scars. Burns over joints may restrict movement. Eye damage can cause corneal scarring, sensitivity to light, or lasting loss of vision.

Internal burns from swallowing nitric acid may cause bleeding or a hole in the oesophagus or stomach. During healing, scar tissue may narrow the oesophagus. This is called a stricture and can cause food to stick, painful swallowing, weight loss, or repeated vomiting.

A frightening chemical exposure may also affect sleep, mood, or confidence about returning to

work. These effects deserve support alongside treatment of the physical injury.

Prevention

Most accidental nitric acid exposures can be prevented. The acid should only be used with training, suitable ventilation, and protective equipment chosen for that specific concentration and task.

At work, follow the safety data sheet and local chemical-handling procedures. Use the required goggles or face protection, chemical-resistant gloves and clothing, and approved respiratory protection where a risk assessment requires it.

Keep nitric acid in its original, clearly labelled, compatible container. Store it away from incompatible materials, including bases, many metals, fuels, and organic substances. Never transfer it into a food or drink container.

Do not mix nitric acid with another substance unless the process has been professionally assessed. Use a fume cupboard or other suitable extraction system when required. Spill response should be carried out only by people with the right equipment and training.

Living with it and what to expect

Recovery is shaped by the depth and location of the injury. Mild surface irritation may settle over days, while deeper skin or eye burns can take weeks or longer to heal. Scars may continue changing for months.

After a significant fume exposure, monitoring may continue even when early tests are reassuring because breathing problems can be delayed. A persistent cough, wheezing, or reduced exercise tolerance may lead to lung-function testing and specialist follow-up.

People who have swallowed nitric acid may need follow-up over weeks or months. Painful swallowing or difficulty moving food into the stomach can appear as scar tissue forms. Nutrition support, repeat endoscopy, or procedures to widen a narrowed oesophagus may be needed.

Many people with limited exposure recover without lasting effects. Severe burns can leave long-term breathing, swallowing, skin, or vision problems. Follow-up is tailored to the organs affected rather than to the name of the chemical alone.

When to get medical help

Treat suspected swallowing, eye exposure, or significant inhalation as urgent. Contact emergency services or a poison centre immediately. Do not wait for symptoms to develop after a substantial fume exposure.

Call emergency services now for:

Begin water rinsing immediately after skin or eye contact while help is being arranged. Do not delay rinsing to make a phone call.

Routine follow-up is different from emergency care. Arrange follow-up if a treated burn is not healing, redness or swelling is increasing, or you develop a continuing cough, breathlessness with activity, painful swallowing, food sticking, repeated vomiting, or unintended weight loss.

- Trouble breathing, severe coughing, wheezing, or chest tightness
- Blue-grey lips or skin, confusion, fainting, or collapse
- Severe throat swelling, drooling, or inability to swallow
- Vomiting blood or severe chest or abdominal pain
- Any nitric acid swallowed
- Any splash into the eye
- A large, deep, or very painful skin burn

Common questions

What should I do if nitric acid gets on my skin?

Move away from the source, remove contaminated clothing and jewellery, and rinse the skin with plenty of running water. Do not scrub or try to neutralise the acid. Large, deep, blistering, discoloured, or very painful burns need emergency assessment.

Why does nitric acid turn skin yellow?

Nitric acid can react with proteins in the skin and produce yellow staining. This colour change is associated with chemical injury, but the colour alone does not show how deep the burn is.

Can nitric acid fumes harm me after I feel better?

Yes. Nitrogen oxide fumes can cause delayed lung inflammation and fluid build-up. Coughing, chest tightness, or breathlessness may begin several hours after exposure. Significant inhalation needs prompt poison-centre or medical advice even if early symptoms improve.

Should I make myself vomit after swallowing nitric acid?

No. Vomiting exposes the mouth and oesophagus to the acid again and may allow it to enter the lungs. Do not use a home neutralising remedy. Contact emergency services or a poison centre immediately.

Is there an antidote for nitric acid poisoning?

There is no general antidote for its corrosive effects. Treatment removes contamination, protects breathing and circulation, manages pain, and treats injuries or complications. A specialist may use additional treatment if testing identifies a particular blood or lung problem.

Can nitric acid poisoning cause permanent damage?

It can, especially after deep burns or substantial inhalation. Possible lasting effects include skin scars, reduced vision, narrowed airways, ongoing breathing problems, or difficulty swallowing from an oesophageal stricture. Limited exposures may heal without long-term damage.

Sources

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