CONDITION

Ammonia poisoning

Learn how ammonia exposure can affect the eyes, skin, lungs, and digestive tract, and when to seek emergency care.

WHAT IT IS
Caustic tissue injury from ammonia exposure

BODY SYSTEM
Eyes, skin, breathing and digestive systems

MAIN SYMPTOMS
Burning, coughing, shortness of breath, trouble swallowing

WHAT CAUSES IT
Exposure to ammonia gas or liquid

HOW IT IS DIAGNOSED
Exposure history and physical examination

MAIN TREATMENT
Decontamination and supportive medical care

CAN IT BE CURED?
Sometimes - minor exposures improve fully

IS IT AN EMERGENCY?
Sometimes - difficulty breathing or severe eye pain

LONG-TERM OUTLOOK
Minor exposures usually improve, severe injuries may cause lasting damage

Overview

Ammonia is a colorless gas with a strong, sharp odor. It is used in agriculture, refrigeration, manufacturing, and some household and commercial cleaning products. Household ammonia is usually dissolved in water. Industrial sites may use concentrated solutions or pressurized, water-free ammonia called anhydrous ammonia.

Ammonia poisoning occurs when exposure damages the body. Ammonia dissolves quickly in moisture and forms a strongly alkaline, or caustic, substance. This can burn wet tissues such as the eyes, mouth, throat, airways, skin, and digestive tract.

The effects depend on the concentration, length of exposure, route of contact, and how quickly the person reaches fresh air or begins rinsing. A brief exposure to a low concentration may cause temporary irritation. Concentrated gas, liquid ammonia, or prolonged exposure can

cause deep burns, severe breathing problems, or lasting tissue damage.

Ammonia has a noticeable odor at relatively low levels, but smell is not a reliable way to judge whether an area is safe. Do not enter or re-enter a contaminated space without direction from emergency personnel.

There is no specific antidote for ammonia poisoning. Immediate removal from exposure, thorough decontamination, and supportive medical care are the main treatments.

Symptoms

Symptoms often begin during or soon after exposure. Significant inhalation injuries can worsen over several hours, even after the person has moved into fresh air.

Breathing-related symptoms may include:

Severe exposure may cause swelling around the vocal cords or fluid in the lungs. Fluid in the lungs is called pulmonary edema. Either problem can make breathing difficult.

Eye exposure can cause intense burning, redness, tearing, sensitivity to light, blurred vision, or eyelid swelling. Concentrated ammonia may damage the cornea, the clear front surface of the eye. Serious injury is possible even when the outside of the eye does not look badly burned.

Skin contact may cause pain, redness, blistering, or chemical burns. Liquefied anhydrous ammonia is extremely cold as it expands and can cause both a chemical burn and a freezing injury.

Swallowing ammonia solution can burn the lips, mouth, throat, esophagus, and stomach. Possible symptoms include drooling, trouble swallowing, chest or abdominal pain, vomiting, or blood in vomit. Swelling may threaten the airway.

Call emergency services immediately for difficulty breathing, blue or gray lips, collapse, confusion, seizures, severe eye pain or vision changes, extensive burns, or swallowing a concentrated ammonia product. Do not wait for symptoms to become severe.

If exposure has just occurred, move to fresh air only if this can be done safely. Do not enter a contaminated area to rescue someone unless trained responders say it is safe. Rinse exposed eyes or skin promptly with plenty of lukewarm water. Contact a poison center for case-specific instructions. In the United States, Poison Control is available at 1-800-222-1222.

- Burning in the nose or throat
- Coughing, choking, or chest tightness
- Hoarseness or trouble speaking

- Wheezing or shortness of breath
- Excess mucus or coughing up pink, foamy fluid
- A feeling that the throat is closing

Causes and risk factors

Ammonia exposure can occur through inhalation, skin or eye contact, or swallowing. Inhalation is a major concern because ammonia gas can spread rapidly, especially after a pressurized release.

Possible situations include:

Mixing household ammonia with bleach can release toxic chloramine gases. These gases are not the same as ammonia, but they can also irritate and injure the lungs. Cleaning products should be used only as directed and should never be mixed unless the label specifically says it is safe.

The risk of serious injury is greater with concentrated products, enclosed-space exposure, prolonged contact, or delay in rinsing. People with asthma or other lung disease may develop more noticeable breathing symptoms after an irritant exposure. Children may be at particular risk in a contaminated area because they have smaller airways and may not be able to leave without help.

Workers who handle ammonia need appropriate training, ventilation, protective equipment, and emergency plans. An ordinary dust mask does not protect against ammonia gas. Respiratory protection for hazardous concentrations requires properly selected and fitted equipment.

- Leaks from industrial refrigeration equipment
- Releases during fertilizer production, transport, or farm use
- Work involving anhydrous ammonia tanks, hoses, or valves
- Cleaning in a small or poorly ventilated room
- Accidental splashing of concentrated cleaning products
- Improper storage in an unmarked container
- Intentional or accidental swallowing

Diagnosis

Ammonia poisoning is usually diagnosed from the exposure history, symptoms, and physical examination. Clinicians may ask what product was involved, whether it was a gas or liquid, how concentrated it was, where the exposure happened, and how long it lasted. Bringing the product label or safety data sheet can help, but no one should return to a hazardous area to retrieve it.

The medical team will assess breathing, oxygen level, heart rate, blood pressure, mental alertness, and visible burns. Because airway swelling can progress, repeated examinations may be necessary.

Tests depend on the route and severity of exposure. They may include a chest X-ray, blood tests, an electrocardiogram, or an arterial blood gas to evaluate oxygen, carbon dioxide, and acid balance. A normal early chest X-ray does not always exclude developing lung injury.

A clinician may examine the throat or airways with a flexible camera if there is hoarseness, noisy breathing, facial burning, or concern about internal injury. Bronchoscopy uses a camera to inspect the larger breathing tubes. An eye specialist may use dye and magnification to look for corneal damage.

After swallowing a caustic ammonia solution, specialists may recommend endoscopy, in which a flexible camera examines the esophagus and stomach. This is based on the product, symptoms, and clinical findings.

A routine blood ammonia level does not diagnose ammonia gas or cleaning-product poisoning. That test is mainly used to investigate ammonia produced inside the body, often in connection with liver disease or certain metabolic conditions.

Treatment and management

The first priority is to stop exposure without placing anyone else at risk. People exposed to gas should leave the area and reach fresh air. Emergency responders may need protective clothing and specialized breathing equipment.

Contaminated clothing should be removed carefully and placed away from other people. Clothing that must be pulled over the head may need to be cut off. Dry material should be brushed away before rinsing, when applicable.

Exposed skin and eyes should be rinsed immediately with large amounts of lukewarm water. Contact lenses may be removed if they come out easily, but rinsing should not be delayed. Do not scrub the skin, apply neutralizing chemicals, or place ointments in the eyes unless a clinician directs it. Chemical neutralization can produce heat and worsen a burn.

After swallowing ammonia, do not induce vomiting. Vomiting exposes the digestive tract to

the caustic substance again and may allow it to enter the lungs. Activated charcoal does not reliably bind caustic chemicals and can interfere with examination. A poison center or emergency clinician should provide instructions about anything taken by mouth.

Hospital treatment is supportive and tailored to the injured tissues. It may involve:

There is no proven antidote that reverses ammonia's caustic effects. Corticosteroids like prednisone or hydrocortisone , antibiotics like amoxicillin or doxycycline , and other treatments are not automatically needed for every exposure. Clinicians decide whether they are appropriate based on the person's findings and complications.

People with mild irritation that clears promptly may only need observation and poison-center guidance. Significant inhalation, persistent symptoms, eye injury, concentrated skin exposure, or any caustic ingestion generally requires in-person medical assessment.

- Supplemental oxygen and close airway monitoring
- Inhaled medicine to relax narrowed airways
- Early placement of a breathing tube if airway swelling is developing
- Mechanical ventilation for severe lung injury
- Continued irrigation and specialist treatment for eye burns
- Wound care and pain control for skin burns
- Evaluation by digestive-tract specialists after significant ingestion

Complications

Most minor exposures improve after the person leaves the area and the affected tissues are rinsed. More serious exposure can damage several organs.

Severe airway swelling may obstruct breathing. Chemical inflammation can also injure the smaller airways or air sacs, causing respiratory failure or pulmonary edema. Secondary lung infection may occur during recovery, although antibiotics are not routinely used solely to prevent it.

Some people develop lasting airway sensitivity after a major irritant exposure. This can cause cough, wheezing, or shortness of breath triggered by exercise, cold air, smoke, or strong odors. Severe injuries may lead to airway scarring, narrowed breathing passages, or chronic lung problems.

Deep eye burns can result in corneal scarring, infection, increased pressure inside the eye, or vision loss. Skin burns may cause infection, scarring, or limited movement if they cross a joint.

After caustic ingestion, complications can include bleeding, a hole in the esophagus or stomach, or infection in surrounding tissues. Scar tissue may later narrow the esophagus, causing food to stick or making swallowing difficult.

Follow up

Follow-up depends on the exposure and the organs affected. Someone treated for a significant inhalation injury may need review of breathing symptoms and, in some cases, lung-function testing. Persistent cough, wheezing, chest tightness, reduced exercise tolerance, or shortness of breath should be discussed with a clinician.

Eye injuries require follow-up as directed by an ophthalmologist, even if pain improves. Some complications can develop after the initial injury. Skin burns may need wound or burn-clinic care.

After swallowing ammonia, report new or worsening pain, fever, vomiting, trouble swallowing, or the sensation that food is sticking. Follow-up may be needed to check for delayed narrowing of the esophagus.

Seek urgent or emergency care after discharge for worsening breathing, noisy breathing, fainting, confusion, blue or gray lips, coughing up pink or bloody fluid, severe chest pain, new vision loss, or signs of a deep digestive-tract injury.

Routine follow-up is appropriate when symptoms are stable but have not fully resolved, when a specialist requested reassessment, or when documentation is needed for a workplace exposure. Workers should follow occupational-health guidance before returning to a job involving ammonia.

Sources

- Agency for Toxic Substances and Disease Registry. Medical Management Guidelines for Ammonia (NH3). Toxic Substances Portal, Centers for Disease Control and Prevention.
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