CONDITION

Chemical pneumonitis

Learn how inhaled or aspirated chemicals can inflame the lungs, including symptoms, diagnosis, treatment, complications, and when to seek urgent care.

WHAT IT IS
Lung inflammation from inhaled or aspirated chemicals

BODY SYSTEM
Respiratory system

MAIN SYMPTOMS
Cough, shortness of breath, chest tightness, wheezing

WHAT CAUSES IT
Inhaled or aspirated chemicals

HOW IT IS DIAGNOSED
Exposure history, chest X-ray or CT

MAIN TREATMENT
Supportive care and oxygen

CAN IT BE CURED?
Sometimes - mild exposures often fully resolve

IS IT AN EMERGENCY?
Sometimes - severe trouble breathing

LONG-TERM OUTLOOK
Mild cases improve but severe cases may cause lasting lung damage

Overview

Chemical pneumonitis is inflammation of the lungs caused by breathing in an irritating substance or accidentally drawing a substance into the airways. "Pneumonitis" means lung inflammation. Unlike pneumonia, chemical pneumonitis is not initially caused by bacteria, viruses, or other germs.

The injury can happen after inhaling gases, fumes, smoke, dust, or aerosolized chemicals. It can also occur when stomach contents, fuel, oil, or another liquid enters the lungs. This second process is called aspiration.

Chemical pneumonitis may develop after one major exposure or repeated lower-level exposures. Some chemicals irritate the nose and throat immediately. Others reach deep into the lungs and may cause symptoms several hours later.

Many mild exposures improve after the person moves away from the chemical and receives appropriate care. More serious exposures can interfere with oxygen exchange and lead to respiratory failure. The outcome depends on the substance, dose, length of exposure, ventilation in the area, and the person's underlying health.

Anyone with breathing difficulty after a chemical exposure should be assessed promptly. In the United States, Poison Control can also provide exposure-specific advice at 1-800-222-1222.

Symptoms

Symptoms vary with the chemical and the part of the respiratory system that was injured. Irritation of the upper airway may cause burning in the nose or throat, hoarseness, watery eyes, or coughing. Injury deeper in the lungs is more likely to cause shortness of breath and low oxygen levels.

Possible symptoms include:

Symptoms can begin within minutes. However, certain chemicals may cause delayed lung swelling. A person who initially feels well may develop cough or breathing difficulty over the next several hours.

Call emergency services for severe trouble breathing, confusion, fainting, blue or gray lips, coughing up pink or frothy fluid, or rapidly worsening symptoms. Significant exposure in an enclosed space also needs urgent assessment, especially if the chemical is unknown.

Do not enter a contaminated area to rescue someone unless trained responders say it is safe. This can expose the rescuer to the same substance.

- Cough, which may be dry or produce mucus
- Shortness of breath or rapid breathing
- Chest tightness, discomfort, or burning
- Wheezing or noisy breathing
- Hoarseness or throat irritation
- Headache, dizziness, or nausea after fume exposure
- Fever, which can result from inflammation and does not always mean infection
- Fatigue or reduced ability to exercise

Causes and risk factors

Chemical pneumonitis can result from inhalation, aspiration, or both.

Common inhaled irritants include chlorine, ammonia, acid fumes, nitrogen oxides, and smoke from fires. Chlorine-containing gas can be released when bleach is mixed with ammonia, acids, or certain other cleaning products. Industrial accidents may involve more concentrated chemicals than typical household exposures.

Smoke can contain particles and several toxic gases. A fire in an enclosed area may therefore cause chemical lung injury as well as carbon monoxide poisoning or heat injury to the airway.

Hydrocarbons are substances found in gasoline, kerosene, lighter fluid, paint thinner, and some solvents. If swallowed, they can enter the lungs during choking or vomiting. Even a small amount in the airways may cause substantial inflammation. For this reason, vomiting should not be induced after a suspected hydrocarbon ingestion unless a poison specialist specifically directs it.

Aspiration of acidic stomach contents may occur during vomiting or when protective airway reflexes are reduced. Situations that can raise aspiration risk include:

Oil-based substances can cause a less common form called lipoid pneumonia. This may follow aspiration of mineral oil, oil-based nasal products, or other fatty materials. Symptoms can develop gradually.

Workplace risk may be higher in agriculture, firefighting, manufacturing, cleaning, mining, welding, and chemical processing. Poor ventilation, confined spaces, inadequate protective equipment, and repeated exposure increase the chance of injury.

Asthma, chronic obstructive pulmonary disease, or another lung condition may make breathing symptoms more severe. Children and older adults may also have less respiratory reserve, but a major exposure can affect anyone.

- A seizure, loss of consciousness, or severe intoxication
- Anesthesia or heavy sedation
- A swallowing disorder caused by a stroke or neurologic condition
- Repeated vomiting
- Feeding-tube problems
- Conditions that affect the ability to cough or protect the airway

Diagnosis

Diagnosis begins with a detailed exposure history. A clinician may ask what substance was

involved, whether it was inhaled or swallowed, how long the exposure lasted, and whether it occurred indoors. Product labels, safety data sheets, or information from the workplace can help identify the chemical. Poison Control or a medical toxicologist may assist.

The examination usually includes listening to the lungs and measuring oxygen saturation with a sensor placed on a finger. The clinician also checks for burns around the mouth or nose, hoarseness, wheezing, and signs that breathing requires extra effort.

A chest X-ray may show inflammation, fluid, or areas where air spaces have filled. Early X-rays can be normal even when a lung injury is developing. A computed tomography, or CT, scan provides more detail and may be considered if symptoms and initial imaging do not match.

Blood tests may be used to assess oxygen, carbon dioxide, inflammation, organ function, or possible complications. An arterial blood gas measures oxygen and acid balance from an artery and is generally reserved for people with more significant breathing problems.

Bronchoscopy is not required for every case. During this procedure, a specialist passes a small camera into the airways. It may be used when an airway burn, blockage, particulate material, or another diagnosis is suspected.

Chemical pneumonitis can resemble asthma, heart-related fluid in the lungs, a blood clot, or infectious pneumonia. The timing of symptoms and the exposure history help clinicians distinguish among these conditions. Infection may develop later, but fever and an abnormal X-ray immediately after aspiration do not automatically mean bacterial pneumonia.

Treatment and management

The first step is to stop the exposure without putting anyone else at risk. A person exposed to fumes should move to fresh air if this can be done safely. Emergency responders may need protective equipment before entering a contaminated space.

If a chemical is on the skin or clothing, contaminated clothing may need to be removed and the skin rinsed. Decontamination depends on the substance, so instructions from emergency personnel or Poison Control should be followed. Chemicals should not be deliberately neutralized with another substance because the reaction may produce heat or toxic gas.

Treatment is based on symptoms and the severity of the lung injury. Mild cases may need observation, oxygen checks, rest, and supportive care. Symptoms can evolve, so clinicians may continue monitoring even when the first examination is reassuring.

Hospital treatment may include:

There is no single antidote for chemical pneumonitis as a whole. A few specific exposures have

specialized treatments, which is why identifying the substance is important.

Antibiotics like amoxicillin or doxycycline do not treat the initial chemical inflammation and are not routinely used simply because aspiration occurred. They may be started if clinical findings suggest that bacterial pneumonia has developed.

Corticosteroids like prednisone or hydrocortisone reduce inflammation in some medical conditions, but their benefit is not established for most chemical inhalation or aspiration injuries. They may be considered in selected circumstances by a clinician familiar with the substance and the pattern of lung injury. They should not be started without medical guidance.

After aspiration, airway suction or bronchoscopy may be appropriate in selected cases, particularly when solid material is blocking an airway. These procedures are not routinely needed for every liquid aspiration.

People recovering at home should avoid smoking, vaping, secondhand smoke, strong cleaning fumes, and strenuous activity until breathing has returned toward its usual level. A clinician can advise when work and exercise are safe to resume.

- Supplemental oxygen
- Inhaled medicine to relax narrowed airways when wheezing is present
- Fluids and other supportive care
- Positive-pressure breathing support
- Mechanical ventilation for respiratory failure

Complications

A severe exposure can cause pulmonary edema, meaning fluid collects in the lungs. It can also lead to acute respiratory distress syndrome, or ARDS, in which widespread inflammation makes it difficult for oxygen to pass into the blood. Both conditions require hospital care.

Other possible complications include:

Some people develop ongoing asthma-like symptoms after a single intense irritant exposure. This is sometimes called reactive airways dysfunction syndrome. It can cause cough, wheezing, or sensitivity to fumes and cold air.

The likelihood of complications depends on the chemical, exposure amount, initial illness severity, and existing lung or heart conditions. Mild irritation that resolves quickly is less likely to cause lasting damage than an exposure associated with low oxygen or extensive changes on chest imaging.

- Respiratory failure requiring breathing support
- Secondary bacterial pneumonia
- Persistent wheezing or increased airway sensitivity
- Scarring of lung tissue
- Narrowing of the small airways, called bronchiolitis obliterans
- Long-term inflammation after repeated occupational exposure
- Chronic lipoid pneumonia after oil aspiration

Follow up

Follow-up should be matched to the severity and type of exposure. A clinician may recommend another examination, repeat oxygen measurement, chest imaging, or lung function testing. These checks are more likely after a significant exposure, hospitalization, abnormal imaging, or symptoms that do not resolve.

Routine follow-up is appropriate for a cough, mild wheezing, reduced exercise tolerance, or chest discomfort that continues after the initial event. Fever, increasing mucus, or symptoms that improve and then worsen may suggest a secondary infection and should be reviewed promptly.

Seek urgent medical care for worsening shortness of breath, new difficulty speaking in full sentences, marked sleepiness, fainting, or blue or gray lips. Emergency evaluation is also appropriate for coughing up frothy fluid, severe chest pain, or a rapid decline after an inhalation or aspiration event.

People exposed at work should report the event through the appropriate workplace process. Occupational health staff may review ventilation, protective equipment, and whether temporary work restrictions are needed. Repeated symptoms around the same chemical should not be ignored, even if each episode seems mild.

Sources

- MedlinePlus Medical Encyclopedia: Chemical pneumonitis . U.S. National Library of Medicine. Accessed March 8, 2025.
- Irritant Gas Inhalation Injury . MSD Manual Professional Edition. Accessed March 8, 2025.

- Aspiration Pneumonitis and Pneumonia . MSD Manual Professional Edition. Accessed March 8, 2025.
- Medical Management Guidelines for Chlorine . Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention. Accessed March 8, 2025.
- Mandell LA, Niederman MS. Aspiration Pneumonia . New England Journal of Medicine . 2019;380:651-663.
- Raghavendran K, Nemzek J, Napolitano LM, Knight PR. Aspiration-Induced Lung Injury . Critical Care Medicine . 2011;39(4):818-826.