CONDITION

Chlorine poisoning

Learn how chlorine gas and chlorine-containing products can injure the lungs, eyes, skin, and digestive tract, including symptoms, first aid, treatment, and follow-up.

WHAT IT IS
Illness or tissue injury from chlorine exposure

BODY SYSTEM
Lungs, eyes, skin and digestive system

MAIN SYMPTOMS
Coughing, shortness of breath, eye pain, skin burns

WHAT CAUSES IT
Chlorine chemical exposure

HOW IT IS DIAGNOSED
Exposure history and clinical assessment

MAIN TREATMENT
Decontamination and supportive care

CAN IT BE CURED?
Sometimes - mild brief exposures recover fully

IS IT AN EMERGENCY?
Sometimes - severe or rapidly worsening breathing difficulty

LONG-TERM OUTLOOK
Mild exposures often resolve but severe injuries may persist

Overview

Chlorine poisoning is illness or tissue injury caused by exposure to chlorine gas or a chlorine-containing chemical. The lungs, eyes, skin, and digestive tract are most often affected.

Chlorine is a yellow-green gas used in manufacturing, water treatment, and some industrial processes. Household bleach and pool products contain chlorine compounds rather than pure chlorine gas. These products can still cause chemical burns, and dangerous gases may form if they are mixed with other cleaners.

When chlorine gas contacts moisture in the eyes, throat, or lungs, it forms irritating acids and other chemicals. These can damage the moist surfaces lining the airways. A larger dose can cause swelling and fluid buildup in the lungs.

Most accidental household exposures are mild, especially when a person quickly reaches fresh air. However, concentrated gas, an enclosed space, prolonged exposure, or swallowing a strong chlorine product can cause serious injury. Some breathing problems may worsen over several hours, so symptoms after leaving the area should not be ignored.

There is no specific antidote that reverses chlorine exposure. Treatment focuses on ending the exposure, washing chemicals from the body, supporting breathing, and treating chemical burns.

Symptoms

Symptoms depend on the chemical, its concentration, the route of exposure, and how long contact lasted. Chlorine gas usually causes symptoms quickly, but lung injury can continue to develop after the exposure ends.

Breathing-related symptoms may include:

The eyes may become red, watery, painful, or sensitive to light. Blurred vision can occur if the surface of the eye is injured.

Liquid chlorine products can irritate or burn the skin. Possible signs include pain, redness, swelling, blisters, or pale areas of damaged skin. Concentrated pool chemicals may cause deeper burns than ordinary diluted household bleach.

Swallowing a chlorine-containing product may cause burning of the mouth, throat, chest, or stomach. Other symptoms can include drooling, trouble swallowing, vomiting, abdominal pain, coughing, or breathing difficulty. Vomiting may expose the mouth and esophagus to the chemical a second time.

Severe exposure can lead to low oxygen levels, confusion, collapse, or loss of consciousness. These are emergency symptoms.

- Burning in the nose or throat
- Coughing, choking, or a hoarse voice
- Chest tightness or chest pain
- Wheezing
- Shortness of breath
- Rapid or difficult breathing
- Nausea or vomiting after heavy exposure

- White or pink, foamy sputum in severe lung injury

Causes and risk factors

A common cause of chlorine gas exposure is mixing bleach with an acidic cleaner. Acids may be found in some toilet-bowl cleaners, rust removers, and products used to remove mineral deposits. This mixture can release chlorine gas.

Mixing bleach with ammonia can produce chloramine gases, which also strongly irritate the lungs. Ammonia may be present in glass cleaners, other cleaning products, and urine. Bleach should not be mixed with any cleaner unless the product label specifically says that doing so is safe.

Other possible exposures include:

Risk of serious injury rises with higher concentrations, longer exposure, and poor ventilation. People close to the source of an industrial release may receive a larger dose. Chlorine gas is heavier than air and can collect in low-lying or enclosed spaces.

People with asthma or another chronic lung condition may develop more pronounced symptoms after an irritant exposure. Older adults, young children, and people with heart or lung disease may have less reserve if breathing becomes difficult. A previous lung condition does not determine the outcome, however; the amount and duration of exposure remain important.

A chlorine-like odor can be an early warning, but smell is not a reliable measure of safety. A person should not stay in the area to judge the concentration.

- Spills or leaks at water-treatment, manufacturing, or transportation sites
- Incorrect handling of pool chemicals
- Entering a recently treated or poorly ventilated space
- Using strong cleaning products in a small bathroom or other enclosed area
- Swallowing bleach or a concentrated pool product
- Splashing a product into the eyes or onto the skin

Diagnosis

Clinicians usually diagnose chlorine-related injury from the exposure history and the person's symptoms. There is no routine blood test that proves chlorine poisoning.

Important details include the product involved, whether chemicals were mixed, where the exposure occurred, how long it lasted, and whether symptoms started immediately. Bringing the product label or a photograph of it can help, but no one should return to a contaminated area to retrieve a container.

The examination may include checking oxygen saturation, breathing rate, heart rate, lung sounds, the eyes, and exposed skin. The mouth and throat may be examined after a swallowed exposure.

People with significant breathing symptoms may need a chest X-ray and blood tests. An arterial blood gas can show how well the lungs are moving oxygen into the blood and removing carbon dioxide. A chest X-ray can be normal early in an exposure, so clinicians may repeat the examination or testing if symptoms change.

Breathing tests, also called pulmonary function tests, are more often used during follow-up than during an acute emergency. They can help assess persistent wheezing, cough, or shortness of breath.

After swallowing a concentrated product, specialists may consider endoscopy. This procedure uses a flexible camera to look for burns in the esophagus and stomach. It is not necessary after every small or symptom-free exposure.

Treatment and management

The first step is to stop the exposure without putting anyone else at risk. Leave the contaminated area and move to fresh air. If the release is outdoors, move away from the source and avoid low-lying areas when this can be done safely. Do not re-enter a contaminated building.

Do not attempt a rescue without suitable protective equipment. Chlorine gas can quickly affect rescuers.

If liquid chemical is on clothing or skin, remove contaminated clothing. Avoid pulling it over the head if that would spread the chemical to the face. Rinse exposed skin with plenty of lukewarm water. Mild soap may be used, but the skin should not be scrubbed harshly.

For an eye exposure, remove contact lenses if they come out easily and rinse the eye with clean, lukewarm water for at least 10 to 15 minutes. Do not place neutralizing chemicals or unprescribed drops in the eye. Ongoing pain, light sensitivity, or vision changes need prompt medical assessment.

If a chlorine product was swallowed, do not induce vomiting. Do not try to neutralize it with another chemical. Rinse the mouth, then contact a poison center or emergency service for

instructions. Whether it is appropriate to drink anything depends on the product, symptoms, and ability to swallow safely.

In the United States, Poison Help is available at 1-800-222-1222 . Elsewhere, contact the local poison information service. A poison specialist can assess the exact product and help determine whether home observation or emergency evaluation is appropriate.

Medical treatment is supportive and may include:

Some hospitals have used nebulized sodium bicarbonate or corticosteroids like prednisone or hydrocortisone in selected inhalation injuries. Evidence for these treatments is limited, and they are not a substitute for oxygen, airway care, and monitoring. Their use depends on clinical findings and specialist judgment.

Antibiotics like amoxicillin or doxycycline do not treat chlorine injury itself. They are generally considered only if there is evidence of a bacterial infection.

- Supplemental oxygen
- Inhaled medicines that open narrowed airways
- Careful monitoring for delayed lung swelling
- Pain control and treatment of eye or skin burns
- Breathing support, including a ventilator, in severe cases

Complications

A major complication is chemical pneumonitis, meaning inflammation and injury within the lungs. Fluid may collect in the air spaces, a condition called pulmonary edema. Severe injury can progress to acute respiratory distress syndrome, in which the lungs cannot provide enough oxygen without intensive support.

Some people develop persistent airway sensitivity after a major exposure. This may cause cough, wheezing, or shortness of breath triggered by exercise, cold air, smoke, or strong odors. When asthma-like symptoms begin after a single high-level irritant exposure, clinicians may call the condition reactive airways dysfunction syndrome.

Deep eye injuries can affect the cornea, the clear surface at the front of the eye. Concentrated liquid products can also leave skin scars. Swallowed caustic products may cause burns and later narrowing of the esophagus, although this is uncommon after small exposures to diluted household bleach.

The chance of lasting problems generally relates to the severity of the initial injury. Many

people with mild, brief exposure recover fully.

Follow up

Follow the discharge instructions given by the emergency department, poison center, or treating clinician. Rest and avoid smoke, vaping, aerosol sprays, and strong chemical fumes while breathing symptoms are settling.

Routine medical follow-up is appropriate if cough, wheezing, chest tightness, unusual tiredness, or reduced exercise tolerance continues after the exposure. A clinician may check lung function and decide whether further testing or respiratory treatment is needed. Eye or skin burns may require follow-up with an eye specialist or burn-care team.

Seek prompt medical assessment after an exposure if symptoms are new, persistent, or worsening. This includes repeated coughing, wheezing, chest discomfort, vomiting, trouble swallowing, significant eye pain, or blurred vision.

Call emergency services immediately for:

Do not drive yourself if breathing is difficult, vision is affected, or you feel faint. Symptoms can worsen during travel.

- Severe or rapidly worsening breathing difficulty
- Blue or gray lips or skin
- Confusion, fainting, or inability to stay awake
- Foamy or pink sputum
- Collapse or loss of consciousness
- A major industrial or enclosed-space exposure
- Serious symptoms after swallowing a concentrated product

Sources

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