CONDITION

Calcium hydroxide poisoning

Learn how calcium hydroxide exposure can injure the eyes, skin, lungs, and digestive tract, and when emergency evaluation is needed.

WHAT IT IS
Corrosive injury from calcium hydroxide exposure

BODY SYSTEM
Digestive system, lungs, eyes and skin

MAIN SYMPTOMS
Burning pain, difficulty swallowing, coughing, eye pain

WHAT CAUSES IT
Swallowing, inhalation, eye or skin contact

HOW IT IS DIAGNOSED
Exposure history, examination, endoscopy, CT or fluorescein testing

MAIN TREATMENT
Immediate decontamination and supportive care

CAN IT BE CURED?
Sometimes - minor exposures may resolve

IS IT AN EMERGENCY?
Sometimes - breathing difficulty or inability to swallow saliva

LONG-TERM OUTLOOK
Ranges from complete resolution to lasting scarring or vision loss

Overview

Calcium hydroxide is a strongly alkaline, or high-pH, chemical. It is also called hydrated lime or slaked lime. It is used in products and processes such as cement and mortar, water treatment, food preparation, dental work, and some industrial cleaners.

Poisoning occurs when calcium hydroxide is swallowed, inhaled, or allowed to contact the eyes or skin. The main danger is not usually whole-body poisoning. Instead, the chemical can cause corrosive injury , meaning it damages tissue through a chemical burn.

Alkaline chemicals can penetrate tissue and continue causing damage after the first contact. A person may have serious injury even if there is no obvious burn around the mouth. The severity depends on the product's concentration, the amount involved, the route of exposure, and how long it remained in contact with tissue.

Swallowing concentrated calcium hydroxide can burn the mouth, throat, esophagus, and stomach. The esophagus is the tube that carries food from the mouth to the stomach. Eye exposure may threaten vision, while skin exposure can cause deep burns. Inhaled dust or mist can irritate or injure the airways.

Suspected swallowing, significant eye exposure, breathing problems, or extensive skin exposure requires immediate guidance from a poison center or medical professional. In the United States, Poison Control can be reached at 1-800-222-1222 . Call emergency services for breathing difficulty, collapse, seizures, severe chest or abdominal pain, or an inability to swallow saliva.

Do not make the person vomit. Do not try to neutralize the chemical with vinegar, lemon juice, or another acid. Neutralization may produce heat and worsen the injury.

Symptoms

Symptoms vary according to how the exposure occurred. They may begin immediately, but the full depth of a chemical burn can become clearer over time.

After swallowing calcium hydroxide, symptoms may include:

A person who has swallowed a corrosive substance may have internal injury without severe mouth pain or visible mouth burns. Symptoms alone cannot reliably show how deeply the esophagus or stomach has been injured.

Breathing calcium hydroxide dust or mist may cause coughing, throat irritation, chest tightness, wheezing, or shortness of breath. Heavy exposure may lead to swelling in the upper airway or inflammation within the lungs.

Eye exposure can cause intense pain, redness, tearing, sensitivity to light, blurred vision, or difficulty opening the eye. Alkaline material can damage the clear front surface of the eye, called the cornea. Prompt irrigation is important even when the amount seems small.

Skin contact may cause redness, burning, pain, blistering, or areas of pale or damaged skin. Calcium hydroxide can remain trapped in wet clothing, work gloves, shoes, or boots. Prolonged contact may cause a deeper burn than is first apparent.

Emergency symptoms include:

- Burning pain in the mouth, throat, chest, or upper abdomen
- Drooling or difficulty swallowing
- Pain with swallowing

- Nausea, vomiting, or vomiting blood
- Hoarseness, coughing, or noisy breathing
- Swelling of the lips, tongue, or throat
- Chest or abdominal tenderness
- Trouble breathing, blue or gray lips, or severe wheezing
- Throat swelling, severe hoarseness, or noisy breathing
- Inability to swallow saliva or persistent drooling
- Vomiting blood
- Severe or worsening chest or abdominal pain
- Confusion, fainting, seizures, or signs of shock
- Sudden severe eye pain or loss of vision

Causes and risk factors

Exposure may occur at work, during home repairs, through improper storage, or when a product is mistaken for food or medicine. Calcium hydroxide may be present in powdered lime, plaster, mortar, cement-related materials, industrial solutions, and certain food-processing products.

Risk is higher when the product is concentrated or when contact lasts for a long time. Dust can settle under contact lenses or inside clothing. Wet material may stay against the skin, especially inside boots or gloves.

Other factors that may increase the chance or severity of injury include:

Young children may be exposed through exploratory swallowing. Adults may be exposed accidentally, at work, or during intentional self-harm. Intentional ingestion requires both urgent medical treatment and compassionate mental health support.

The label and safety data sheet can help identify the product's concentration and other ingredients. Some commercial products contain several chemicals, so the risks may not come from calcium hydroxide alone.

- Working without suitable eye, face, skin, or breathing protection
- Handling powder in an enclosed or poorly ventilated area
- Mixing or transferring chemicals into unlabeled containers

- Storing products where children can reach them
- Delayed washing after eye or skin contact
- Swallowing a large amount or a concentrated preparation
- Existing swallowing, lung, or eye problems that may complicate evaluation

Diagnosis

Diagnosis begins with the exposure history. Clinicians may ask for the product name, concentration, amount, route of exposure, time of exposure, symptoms, and first-aid steps already taken. The container or a photograph of its label may be useful if it can be brought safely.

Medical staff assess breathing, circulation, swallowing, voice changes, pain, and visible burns. They may examine the mouth, skin, or eyes. A normal-looking mouth does not rule out injury farther down the digestive tract.

After eye exposure, clinicians may check visual sharpness and measure the eye's surface pH. They may use a dye called fluorescein to show areas of corneal damage. Repeated irrigation may be needed until particles are removed and the eye's pH remains in a safe range.

Blood tests may be used after significant ingestion to look for dehydration, blood loss, acid-base changes, kidney problems, or evidence of severe tissue injury. These tests support the assessment but cannot by themselves determine the depth of a digestive-tract burn.

Imaging may be needed when there is concern about a hole, or perforation , in the esophagus or stomach. Chest or abdominal imaging can also look for air where it should not be, lung complications, or extensive tissue damage.

Upper endoscopy may be considered after a significant ingestion. During this procedure, a specialist uses a flexible camera to examine the esophagus and stomach. The timing and safety of endoscopy depend on the person's condition and whether perforation is suspected. Computed tomography, or CT, may also help assess deep injury and guide surgical decisions.

Treatment and management

Immediate first aid depends on the route of exposure. Contact a poison center promptly for instructions tailored to the specific product and situation.

For an eye exposure, start flushing the eye immediately with clean, lukewarm water or saline. Remove contact lenses if this can be done easily, but do not delay irrigation. Keep the eyelids

open and continue rinsing while arranging urgent medical evaluation. Do not put neutralizing chemicals or unapproved drops into the eye.

For skin exposure, remove contaminated clothing, shoes, and jewelry. Avoid spreading dry material to unaffected skin. Gently remove visible dry particles when this can be done safely, then rinse the skin thoroughly with running water. Do not scrub or apply acids, ointments, or household remedies unless a clinician recommends them.

After inhalation, move away from the source and into fresh air without entering an unsafe area. Breathing symptoms require prompt assessment. Rescuers should not enter a contaminated space without appropriate protective equipment.

After swallowing, do not induce vomiting. Vomiting exposes the esophagus and mouth to the corrosive material again. Do not attempt to neutralize the alkali or give activated charcoal. Charcoal does not reliably bind corrosive chemicals and can interfere with evaluation. Do not give food, drink, or medicine unless a poison specialist or clinician advises it.

Hospital care focuses first on protecting the airway and supporting breathing and circulation. Treatment may include oxygen, pain control, intravenous fluids, close observation, and specialist evaluation. Early placement of a breathing tube may be necessary if throat swelling threatens the airway.

Clinicians may involve medical toxicology, gastroenterology, ophthalmology, burn specialists, or surgery depending on the exposure. Antibiotics like amoxicillin or doxycycline , corticosteroids like prednisone or hydrocortisone , acid-suppressing medicines, and feeding support are considered case by case. These treatments are not appropriate for every corrosive exposure, and evidence for preventing later narrowing of the esophagus is limited.

A person with severe digestive-tract injury may need nutrition delivered through a tube or vein while tissues heal. Surgery may be required if there is perforation, dead tissue, uncontrolled bleeding, or infection in the chest or abdomen.

Complications

Complications depend on the affected area and the depth of injury. Some appear within hours, while others develop during healing.

A severe throat injury can cause airway swelling. Inhalation or vomiting may allow material to enter the lungs, leading to chemical inflammation, breathing failure, or pneumonia.

Deep injury to the esophagus or stomach may cause bleeding or perforation. A perforation can allow digestive contents to leak into the chest or abdomen and cause a serious infection. This is a medical emergency.

As an esophageal burn heals, scar tissue may tighten the esophagus. This narrowing is called a stricture . It can cause food to stick, painful swallowing, vomiting after meals, weight loss, or dehydration. Some strictures require repeated procedures to widen the esophagus.

Eye complications include corneal ulcers, scarring, glaucoma, and lasting loss of vision. Skin burns may become infected or heal with scars and reduced movement near a joint.

People who have had major caustic injury to the esophagus may have long-term health risks that require specialist follow-up. The follow-up plan depends on the original injury and ongoing symptoms.

Follow up

Follow-up is based on the route and severity of exposure. A minor skin exposure that resolves completely may need only routine wound monitoring. Eye burns usually require ophthalmology follow-up because damage can evolve after the initial irrigation. Significant ingestion may require follow-up with a gastroenterologist, dietitian, or surgeon.

Keep follow-up appointments even if pain has improved. Healing scar tissue can narrow the esophagus over the following weeks. Tell the care team about new difficulty swallowing, food sticking, reduced eating, or unintended weight loss.

At home, follow wound, eye-care, and diet instructions from the treating team. Do not restart work with calcium hydroxide until protective measures and safe handling procedures have been reviewed.

Seek urgent medical advice for increasing pain, repeated vomiting, fever, worsening redness or drainage from a skin burn, new trouble swallowing, or changes in vision.

Call emergency services for breathing difficulty, inability to swallow saliva, vomiting blood, severe chest or abdominal pain, fainting, confusion, or rapidly worsening symptoms. These are not routine follow-up concerns.

Sources

- Agency for Toxic Substances and Disease Registry. Medical Management Guidelines for Calcium Hydroxide . U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
- National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards: Calcium Hydroxide . Centers for Disease Control and Prevention.

- National Library of Medicine. Calcium Hydroxide Poisoning . MedlinePlus Medical Encyclopedia.
- Chirica M, Kelly MD, Siboni S, et al. Esophageal emergencies: WSES guidelines. World Journal of Emergency Surgery . 2019;14:26.
- Hoffman RS, Burns MM, Gosselin S, eds. Goldfrank's Clinical Toxicology . 11th ed. McGraw Hill; 2019. Chapter on caustics.
- Merck Manual Professional Edition. Caustic Ingestion . Merck & Co., Inc.