CONDITION

Ethylene glycol poisoning

Ethylene glycol poisoning is a medical emergency caused by exposure to a toxic chemical found in some antifreeze and industrial products.

WHAT IT IS
Toxic injury after ethylene glycol exposure

BODY SYSTEM
Brain, kidneys, heart and circulation

MAIN SYMPTOMS
Drunken appearance, vomiting, fast breathing, reduced urination

WHAT CAUSES IT
Usually swallowing ethylene glycol-containing liquid

HOW IT IS DIAGNOSED
Blood ethylene glycol level and acid-base tests

MAIN TREATMENT
Antidote, supportive care, and sometimes dialysis

CAN IT BE CURED?
Yes - early treatment can prevent lasting injury

IS IT AN EMERGENCY?
Yes - after any suspected swallowing

LONG-TERM OUTLOOK
Often full recovery after early treatment

Overview

Ethylene glycol is a toxic alcohol used in some antifreeze, de-icing fluids, brake fluids, and industrial products. It may look like a clear liquid and can be mistaken for a drink if stored in an unlabelled container.

Swallowing ethylene glycol is a medical emergency. The body changes it into acidic chemicals that can damage the brain, heart, lungs, and kidneys. These toxic chemicals may also disturb calcium levels and the body's normal acid balance.

A person may initially appear drunk or sleepy. Serious internal injury can then develop even if they seem to improve for a short time. Treatment works best when started before much ethylene glycol has been broken down.

Skin contact or breathing in small amounts is less likely to cause severe whole-body poisoning than swallowing it. However, large or prolonged exposures still require advice from a poison centre or healthcare professional.

Symptoms

Symptoms can change over several hours or days. The timing is not exact, and treatment can alter the pattern.

Early symptoms may resemble alcohol intoxication:

As acidic chemicals build up, breathing may become fast and deep. The heart may beat quickly, and blood pressure can fall. Severe poisoning may cause seizures, loss of consciousness, or coma.

Kidney injury often becomes clearer later. Signs may include pain in the side or back, much less urine than usual, swelling, nausea, or worsening tiredness. Some people develop muscle cramps, tingling, or abnormal heart rhythms because of a low calcium level.

Symptoms cannot reliably show how serious the exposure is. A person can have few early symptoms while toxic breakdown products are forming. Do not wait for symptoms after a suspected ingestion.

- Dizziness, poor coordination, or slurred speech
- Sleepiness, confusion, or unusual behaviour
- Headache, nausea, vomiting, or stomach pain

Causes and risk factors

Poisoning usually happens when someone swallows a product containing ethylene glycol. Antifreeze is a well-known source, but product ingredients differ. Not every antifreeze contains ethylene glycol, and the concentration can vary.

Exposure may be accidental, such as when a chemical has been poured into a water or soft-drink bottle. Young children may drink from an open container or spill. Adults may be exposed while handling automotive or industrial products.

Some ingestions are intentional during a mental health crisis. This requires both emergency poisoning treatment and compassionate mental health support.

Workplace exposure is possible where ethylene glycol is manufactured or used. Following the

product's safety information, ventilation requirements, and protective equipment instructions lowers this risk.

Ethylene glycol does not usually build up in the body through ordinary everyday contact. Severe poisoning is mainly linked to swallowing it or to an unusual, substantial exposure.

Diagnosis

Doctors do not wait for every test result when the history strongly suggests poisoning. Delaying the antidote can allow more toxic chemicals to form.

A blood ethylene glycol level can confirm the exposure, but this test may not be immediately available. Blood tests also check the body's acid balance, salts, calcium, blood sugar, and kidney function. Repeated tests show whether the poisoning is progressing or responding to treatment.

Doctors may calculate an osmolar gap , which can suggest that an unusual alcohol is present in the blood. They may also calculate an anion gap , which can indicate a build-up of acids. Neither result can confirm or exclude poisoning by itself. The osmolar gap may be higher early, while the anion gap may become more noticeable later.

Urine may be checked for calcium oxalate crystals, which can form when ethylene glycol is broken down. These crystals support the diagnosis but are not present in every case.

Other tests may include an electrocardiogram, or ECG, to check the heart rhythm. Imaging or additional blood tests may be needed if there are breathing problems, seizures, or uncertainty about what was swallowed.

Treatment and management

Treatment takes place in an emergency department, often with advice from a medical toxicologist or poison centre. Breathing, circulation, consciousness, and blood chemistry are monitored closely.

The main antidote is usually fomepizole . It blocks the enzyme that turns ethylene glycol into its most harmful breakdown products. Ethanol can block the same enzyme and may be used in some settings when fomepizole is unavailable, but it requires careful hospital monitoring.

These antidotes prevent further toxic breakdown. They cannot immediately reverse kidney or other organ injury that has already occurred.

Other treatment may include:

Haemodialysis may be needed in severe poisoning. This treatment passes blood through a machine to remove ethylene glycol and its toxic products. It can also correct dangerous acid and salt disturbances. The decision is based on findings such as the blood level, degree of acid build-up, symptoms, and kidney function.

Activated charcoal does not bind ethylene glycol well and is not routinely useful. Do not try to make someone vomit or give alcohol as a home treatment.

- Intravenous fluids and correction of severe acid imbalance
- Treatment for seizures, low calcium, or breathing problems
- Vitamins that may help the body process some breakdown products
- Close monitoring of urine output, kidney function, and blood chemistry

Complications

The kidneys are especially vulnerable because calcium oxalate crystals and toxic chemicals can damage kidney tissue. Acute kidney injury may reduce or stop urine production. Some people need dialysis while their kidneys recover.

Other possible complications include:

Severe untreated poisoning can be fatal. The likelihood of complications is strongly influenced by the amount swallowed, how much time passed before treatment, and whether serious acid imbalance or organ injury developed.

- Severe acid build-up in the blood
- Seizures, coma, or swelling of the brain
- Abnormal heart rhythms or circulation problems
- Lung injury or breathing failure
- Low calcium levels
- Delayed weakness or problems with certain facial nerves

Prevention

Ethylene glycol poisoning is usually preventable by controlling access to products that contain it.

Keep automotive and industrial chemicals in their original, clearly labelled containers. Never

transfer them into drink bottles, cups, or food containers. Close containers immediately after use and store them where children cannot reach or see them.

Clean spills promptly and keep children and animals away during cleanup. Follow the product label for safe handling and disposal. Do not siphon automotive fluid by mouth.

At work, follow the product's safety data sheet and workplace procedures. Use the recommended gloves, eye protection, and ventilation.

Some products use propylene glycol instead of ethylene glycol and may be less toxic if swallowed, but they are not drinks and should still be stored safely.

Living with it and what to expect

Ethylene glycol poisoning is usually a single, acute event rather than a lifelong condition. Many people treated early recover without lasting problems. Recovery is less predictable when severe acid imbalance, coma, or kidney injury was already present before treatment began.

Hospital monitoring continues until the toxic alcohol has been cleared, the acid balance is stable, and organ function is safe. A short admission may be enough after early treatment, while severe poisoning can require intensive care and dialysis.

Kidney function may improve over days to weeks. Some people need temporary dialysis after the ethylene glycol itself is gone. Recovery can take longer when kidney injury is extensive, and a smaller number of people develop lasting kidney impairment.

After discharge, follow-up may include blood and urine tests to confirm that kidney function and body salts are returning to normal. New weakness, facial movement problems, hearing changes, or reduced urination should be reported because delayed nerve or kidney effects can occasionally occur.

If the poisoning happened during a mental health crisis, ongoing emotional support is an important part of recovery. This may include a safety plan, counselling, and follow-up with mental health services. Seeking this support is part of treating the whole event, not a punishment.

When to get medical help

Any suspected swallowing of ethylene glycol is an emergency, even if there are no symptoms. Contact emergency services and a poison centre immediately. In the United States, Poison Help can be reached at 1-800-222-1222 . Elsewhere, use your local poison information service.

Do not wait to see whether the person becomes ill. Do not make them vomit, and do not give food, alcohol, or another home remedy unless a poison specialist specifically instructs you to do so. Take the product container or a clear photograph of its label to the hospital if this can be done safely.

Call emergency services immediately if the person is confused, very sleepy, having a seizure, breathing abnormally, collapsing, or difficult to wake. If the ingestion may have been intentional, do not leave the person alone while help is being arranged.

For skin or eye contact, remove contaminated clothing and rinse the affected area with plenty of lukewarm water. Contact a poison centre for advice based on the product and length of exposure. Breathing symptoms after a significant vapour or mist exposure also need urgent assessment.

Routine follow-up is different from emergency care. After hospital discharge, attend planned blood tests and kidney checks. Seek earlier review if urination decreases, swelling develops, vomiting returns, or new nerve symptoms appear.

Common questions

Is ethylene glycol poisoning the same as antifreeze poisoning?

Ethylene glycol is an ingredient in some, but not all, antifreeze. Other formulations may contain different chemicals. The product label and container can help poison specialists identify the risk, but suspected antifreeze ingestion still needs immediate advice.

How much ethylene glycol is dangerous?

There is no amount that is safe to test at home. Risk is affected by the product concentration, amount swallowed, body size, and treatment delay. Even an apparently small amount may cause serious poisoning, so do not estimate risk from symptoms or the size of a sip.

How quickly do symptoms start?

Drunken behaviour, vomiting, or sleepiness can begin within hours. Acid imbalance and breathing changes may follow, while kidney injury may become clearer over the next few days. These stages overlap, and some people have a symptom-free period.

Can I use drinking alcohol as an antidote?

No. Although ethanol can block ethylene glycol breakdown, using it as a medical antidote requires controlled dosing and frequent hospital tests. Giving alcohol at home can delay proper care, worsen sleepiness, and create additional risks.

Can a home test detect ethylene glycol?

No reliable home test can rule it in or out. Diagnosis requires clinical assessment and laboratory testing. Urine appearance, smell, a black light, or the absence of symptoms cannot show that someone is safe.

Can someone fully recover from ethylene glycol poisoning?

Yes. Full recovery is common when treatment begins early. Recovery may take longer if kidney, brain, heart, or lung injury has developed, and some people need temporary dialysis or longer-term follow-up.

Sources

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