CONDITION

Cardiac glycoside overdose

Learn how digoxin and other cardiac glycosides can cause poisoning, which symptoms need emergency care, and how overdose is diagnosed and treated.

WHAT IT IS
Poisoning from harmful cardiac glycoside levels

BODY SYSTEM
Heart and circulation

MAIN SYMPTOMS
Nausea or vomiting, visual changes, confusion, abnormal heartbeat

WHAT CAUSES IT
Overdose, gradual medicine buildup, toxic plant ingestion

HOW IT IS DIAGNOSED
Exposure history, ECG, blood digoxin level

MAIN TREATMENT
Supportive care, heart monitoring, antidote

CAN IT BE CURED?
Yes, most recover with prompt treatment

IS IT AN EMERGENCY?
Sometimes, fainting or markedly abnormal heartbeat

LONG-TERM OUTLOOK
Usually recovery, but severe cases may cause cardiac arrest

Overview

Cardiac glycosides are substances that affect the strength and electrical activity of the heart. Digoxin is the cardiac glycoside most often used as a prescription medicine. It may be prescribed for certain people with heart failure or an irregular heart rhythm called atrial fibrillation.

A cardiac glycoside overdose happens when the amount in the body becomes harmful. This may follow a single large exposure, called acute poisoning. It can also develop gradually when a prescribed dose builds up over days or weeks, called chronic toxicity. Gradual buildup is more common when kidney function changes, dehydration occurs, or another medicine affects digoxin levels.

Some plants contain related chemicals. These include foxglove, oleander, yellow oleander, and

lily of the valley. Swallowing any part of these plants, drinking plant-based preparations, or using unregulated remedies made from them can cause poisoning.

Cardiac glycoside toxicity matters because it can disturb the heart's electrical signals. It may cause a heart rate that is too slow, too fast, or irregular. Digestive, visual, and nervous system symptoms may appear before a serious heart rhythm problem develops.

Suspected overdose requires prompt professional advice even if the person feels well. In the United States, call Poison Control at 1-800-222-1222. Elsewhere, contact the local poison center or emergency service. Do not wait for symptoms and do not make the person vomit.

Symptoms

Symptoms vary according to the substance, amount, timing, kidney function, and whether the exposure was sudden or gradual. The symptoms can resemble those of other illnesses, so they cannot confirm poisoning on their own.

Digestive symptoms are common and may include:

Effects on the brain and senses may include unusual tiredness, weakness, headache, dizziness, confusion, or drowsiness. Some people notice blurred vision, flashing lights, or changes in how colors appear. Yellow or green vision is traditionally associated with digoxin toxicity, but it does not occur in everyone.

Heart-related symptoms may include palpitations, a very slow pulse, an irregular pulse, lightheadedness, or fainting. Almost any type of abnormal heart rhythm can occur. Older adults and people with gradual toxicity may have subtle symptoms, such as reduced appetite, new confusion, or declining energy.

Get emergency help now for:

If an extra dose may have been taken, a child may have swallowed medicine, or a toxic plant was eaten, contact a poison center immediately. This is appropriate even when there are no symptoms. Keep the medicine container, plant sample, or product label available if it can be handled safely.

- Loss of appetite
- Nausea or vomiting
- Abdominal pain
- Diarrhea
- Collapse, fainting, or inability to wake the person

- Trouble breathing
- A seizure
- Chest pressure or severe chest discomfort
- A very slow, very fast, or markedly irregular heartbeat with weakness or dizziness
- Sudden severe confusion
- Signs of shock, such as cold or clammy skin with extreme weakness

Causes and risk factors

An acute overdose may happen through a medication error, accidental ingestion, or intentional self-harm. Plant poisoning can occur when a toxic plant is mistaken for an edible plant or is used in homemade tea, supplements, or traditional remedies.

Chronic toxicity can develop even when someone is taking the dose printed on the prescription. Digoxin is mainly removed from the body through the kidneys. If kidney function declines, the medicine may remain in the bloodstream longer. Dehydration from vomiting, diarrhea, fever, or poor fluid intake can also contribute.

Factors that may increase the risk of toxicity include:

Some medicines can raise digoxin levels or increase its effects. Examples include certain heart rhythm medicines, calcium channel blockers like amlodipine or diltiazem , antibiotics like amoxicillin or doxycycline , and other drugs that affect kidney transport or heart rate. Diuretics like furosemide or hydrochlorothiazide , sometimes called water pills, may lower potassium or magnesium and make the heart more sensitive to digoxin. An interaction is not automatic proof of toxicity, but it may lead a clinician to review the dose and monitoring plan.

People taking digoxin should tell each prescriber and pharmacist about all prescription medicines, over-the-counter products, and supplements they use. A medicine should not be stopped or changed without professional guidance unless emergency personnel instruct otherwise.

- Reduced kidney function
- Older age, low body weight, or frailty
- Dehydration or a recent acute illness
- Taking the wrong strength or taking a dose twice
- Changes in medicines that interact with digoxin

- Low potassium or magnesium levels
- Certain heart conditions that already affect electrical conduction

Diagnosis

Clinicians diagnose cardiac glycoside poisoning by combining the exposure history, symptoms, examination findings, heart tracing, and laboratory results. No single test gives the full answer.

An electrocardiogram, or ECG, records the heart's electrical activity. It can show a slow heart rate, blocked electrical signals, extra beats, or other abnormal rhythms. Continuous heart monitoring is often used because the rhythm can change over time.

Blood tests commonly measure potassium, magnesium, calcium, and kidney function. Potassium may become dangerously high after a large, sudden digoxin overdose. In gradual toxicity, potassium may be normal or low, especially if the person takes a diuretic.

A blood digoxin level can support the diagnosis, but its meaning depends on when the sample was collected. Soon after a dose or overdose, digoxin has not yet fully moved from the blood into body tissues. A level drawn too early may therefore appear high without showing the final severity of poisoning. Clinicians interpret the number alongside symptoms, kidney function, medication timing, and the ECG.

A level within a laboratory's usual range does not always rule out chronic toxicity. Some people develop harmful effects at lower measured levels because of illness, electrolyte changes, or increased sensitivity.

Standard digoxin tests may also detect chemicals from related plants. The result may confirm exposure but may not accurately measure how much plant glycoside is present. After treatment with digoxin-specific antibody fragments, routine digoxin levels can be misleading because many tests measure both bound and unbound drug.

Treatment and management

Treatment depends on the substance involved, the symptoms, ECG findings, laboratory results, and whether the exposure was acute or chronic. Management is usually coordinated with a poison center or medical toxicologist.

The first steps are to support breathing and circulation and to monitor the heart. Clinicians establish intravenous access and repeat ECGs and blood tests as needed. Fluids, oxygen, and medicines for symptoms may be used according to the person's condition.

Activated charcoal may be considered soon after some ingestions because it can bind the substance in the digestive tract. It is not appropriate for every patient, especially if there is a risk of choking or an unprotected airway. It should only be given under professional direction. Vomiting should not be induced.

Digoxin immune Fab, also called digoxin-specific antibody fragments, is the main antidote for severe digoxin poisoning. It binds digoxin so that the body can remove it. Clinicians may use it for life-threatening heart rhythm problems, cardiac arrest, significant potassium elevation related to acute poisoning, or other evidence of severe toxicity. It can also bind some plant-derived cardiac glycosides, although the response and amount needed may be less predictable.

The antidote can act quickly, but monitoring remains important. Potassium may fall after treatment, and symptoms can occasionally return if the amount of antibody was insufficient or kidney function is poor. In people who rely on digoxin for heart failure or rhythm control, removing its effect may allow the original heart condition to worsen temporarily.

Other treatments may include careful correction of potassium or magnesium abnormalities. Atropine may be used for some symptomatic slow heart rhythms. Specialists may choose particular antiarrhythmic medicines for dangerous fast rhythms. Electrical pacing or cardioversion is sometimes needed, but these procedures require careful specialist judgment because an irritable heart may respond unpredictably.

Standard dialysis does not remove digoxin effectively because much of the drug is distributed into body tissues. Dialysis may still be used for a separate medical reason, such as severe kidney failure, but it is not a replacement for the antidote when the antidote is indicated.

People with mild or uncertain exposure may still need several hours of observation, repeat testing, and heart monitoring. Decisions about discharge depend on the exposure, symptoms, ECG, kidney function, and test trends rather than on a single digoxin level.

Complications

The main complications are abnormal heart rhythms and impaired circulation. A rhythm that is too slow or too fast can reduce blood flow to the brain and other organs. This may cause fainting, low blood pressure, confusion, kidney injury, or, in the most severe cases, cardiac arrest.

Severe vomiting or diarrhea can worsen dehydration and electrolyte disturbances. Reduced alertness can increase the risk of inhaling vomit into the lungs.

High potassium is an important complication of major acute poisoning. Low potassium or

magnesium can increase the heart's sensitivity to cardiac glycosides, particularly in gradual toxicity. Potassium may also drop after successful antidote treatment, so repeat blood tests are needed.

Most people can recover when poisoning is recognized and treated promptly. The expected course depends on the amount and type of glycoside, kidney function, underlying heart disease, and the severity of rhythm disturbances.

Follow up

After discharge, follow-up may include a review of kidney function, electrolytes, heart rhythm, and all medicines. If digoxin is still needed, the prescribing clinician will decide when or whether to restart it and what monitoring is appropriate. Patients should not restart a held medicine on their own.

A medication review can identify duplicate prescriptions, interacting drugs, confusing tablet strengths, or problems using pill organizers. It may help to keep an updated medicine list, use one pharmacy when possible, and ask before starting supplements or over-the-counter products.

Routine follow-up is appropriate for discussing ongoing fatigue, medication questions, dose organization, or planned laboratory monitoring when symptoms are stable. Contact a clinician promptly for new nausea, loss of appetite, visual changes, unusual weakness, confusion, or palpitations.

Fainting, severe breathing difficulty, collapse, a seizure, or a markedly abnormal heartbeat with dizziness requires emergency care rather than a routine appointment.

If the overdose was intentional or connected with thoughts of self-harm, the treatment plan should also include compassionate mental health assessment and support. Immediate crisis or emergency services are appropriate if there is a current risk of self-harm.

Sources

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