CONDITION

Cobalt poisoning

Learn how excessive cobalt exposure can affect the heart, thyroid, nerves, hearing, vision, and lungs, and how cobalt poisoning is evaluated and managed.

WHAT IT IS
Poisoning caused by excessive cobalt exposure

BODY SYSTEM
Heart, thyroid, nerves, senses, blood and lungs

MAIN SYMPTOMS
Fatigue, shortness of breath, numbness or tingling, hearing or vision changes

WHAT CAUSES IT
Excessive cobalt exposure

HOW IT IS DIAGNOSED
Exposure history, cobalt measurements, organ testing

MAIN TREATMENT
Stopping or reducing cobalt exposure

CAN IT BE CURED?
Sometimes - organ recovery may be incomplete

IS IT AN EMERGENCY?
Sometimes - with severe breathing difficulty

LONG-TERM OUTLOOK
Recovery varies and organ or sensory damage may persist

Overview

Cobalt poisoning, also called cobalt toxicity, occurs when excessive cobalt enters the body and causes harm. Cobalt is a naturally occurring metal used in alloys, batteries, pigments, cutting tools, and some medical implants.

A small amount of cobalt is part of vitamin B12 and is essential for health. Cobalt in food and standard vitamin B12 products does not usually cause poisoning. Toxicity is more often associated with workplace exposure, poorly regulated cobalt-containing products, or metal released from certain joint implants.

Exposure may occur by breathing dust or fumes, swallowing cobalt, or having metal debris released inside the body. Effects depend on the amount, route, and duration of exposure. Cobalt can affect the heart, thyroid, nerves, hearing, vision, blood, and lungs.

People with metal-on-metal hip implants may have elevated blood cobalt without systemic poisoning. Results must be interpreted alongside symptoms, implant function, imaging, laboratory methods, and changes over time.

Symptoms

Symptoms vary and may initially be nonspecific, such as fatigue, weakness, or shortness of breath.

Heart effects may include reduced exercise tolerance, leg swelling, a fast or irregular heartbeat, or difficulty breathing while lying down. These can occur if cobalt weakens the heart muscle, causing cardiomyopathy.

Nervous system and sensory effects may include:

Cobalt may reduce thyroid hormone production. Symptoms of an underactive thyroid include tiredness, feeling unusually cold, constipation, dry skin, weight changes, slowed thinking, and muscle weakness.

Excess cobalt can also cause the body to produce too many red blood cells, called polycythemia. This may cause headache, dizziness, blurred vision, or flushing, but it can also be found without symptoms during a blood count.

Inhaled cobalt dust or fumes may cause coughing, wheezing, chest tightness, or shortness of breath. Repeated occupational exposure can lead to asthma or inflammatory and scarring lung disease, particularly from "hard metal" dust containing cobalt and tungsten carbide.

Someone with a cobalt-containing hip implant may first develop local symptoms, including new or worsening hip pain, swelling, clicking, weakness, reduced movement, or difficulty walking.

Seek emergency care for severe breathing difficulty, chest pain, fainting, sudden confusion, a seizure, severe weakness, or signs of a serious heart rhythm problem. These symptoms are not specific to cobalt poisoning but require immediate assessment.

- Numbness or tingling
- Poor balance or tremor
- Memory or concentration problems
- Hearing loss or ringing in the ears
- Changes in vision

Causes and risk factors

Workplace exposure is an important cause. Higher-risk activities include hard-metal tool production, grinding, polishing, mining, smelting, alloy manufacturing, battery production, and cobalt pigment processing. Risk increases when ventilation, dust control, or respiratory protection is inadequate.

Some older metal-on-metal hip replacements and other joint components contain cobalt-chromium alloys. Wear, corrosion, loosening, or contact between components may release metal particles and ions. Local tissue damage is more common than systemic poisoning, but high exposure can affect other organs.

Implant-related risk may be greater when an implant is damaged, poorly positioned, or combined with failing or incompatible components. Kidney impairment may reduce cobalt clearance, although cobalt levels alone do not predict who will become ill.

Swallowing cobalt salts or using cobalt-containing products without medical oversight can also cause toxicity. Cobalt has been included in some supplements marketed for energy, endurance, or blood production, and product labels may not accurately describe exposure.

Key risk situations include:

- Regular work with cobalt dust, fumes, batteries, alloys, or hard-metal tools
- A cobalt-containing implant with pain, reduced function, or evidence of wear
- Use of cobalt salts or poorly regulated supplements
- Kidney impairment combined with a substantial ongoing cobalt source
- Inadequate workplace ventilation or protective controls

Diagnosis

No single symptom or test result proves cobalt poisoning. Diagnosis begins with a detailed history of current and past jobs, hobbies, supplements, implanted devices, symptom timing, and whether coworkers have similar symptoms.

The examination may focus on the heart, lungs, nervous system, hearing, vision, thyroid, and any implanted joint. Clinicians must also evaluate more common causes of the symptoms.

Cobalt may be measured in whole blood, serum, plasma, or urine, but these results are not interchangeable. Sample type, collection technique, laboratory method, recent exposure, kidney function, and metal implants can affect the result. Testing should use a laboratory experienced in trace-metal analysis because contamination during collection may produce

misleading findings.

A level above the laboratory reference range indicates increased exposure but does not necessarily mean that organ damage is present. No single blood cobalt level reliably predicts systemic illness in every person. Changes over time are often more useful than one result.

Depending on symptoms and the suspected source, evaluation may include:

Metal artifact reduction sequence MRI, sometimes called MARS MRI, or ultrasound may identify fluid collections, muscle damage, or abnormal tissue reactions around an implant. A medical toxicologist, occupational medicine specialist, orthopedic surgeon, cardiologist, or other specialist may help interpret complex findings.

- A complete blood count
- Thyroid, kidney, and liver tests
- An electrocardiogram and possibly an echocardiogram
- Hearing, vision, balance, or nerve testing
- Chest imaging or lung function tests after inhalation exposure
- X-rays or specialized imaging of a symptomatic joint implant

Treatment and management

The main treatment is to stop or reduce cobalt exposure. The safest approach depends on whether the source is occupational, swallowed, inhaled, or implant-related.

For workplace exposure, management may involve temporarily leaving the affected area, improving ventilation, containing dust, changing work practices, and using correctly selected protective equipment. Occupational health and workplace safety professionals should guide these measures. Respirators are not substitutes for effective engineering controls.

Anyone using a cobalt-containing supplement or nonprescription product should stop using it and contact a clinician or poison center. Keep the container or photograph the label to help identify its ingredients. Do not induce vomiting unless a poison specialist specifically advises it.

A cobalt-containing implant should not be removed solely because of one cobalt result. Orthopedic assessment considers symptoms, examination and imaging findings, implant type and function, metal levels, and trends over time.

Revision surgery may be considered if an implant is failing or causing substantial tissue damage or systemic effects. Surgery has risks, so the decision must be individualized. Cobalt levels often fall after the source is removed, but organ recovery may take longer and may be

incomplete.

Treatment may also address complications such as heart failure, abnormal rhythms, thyroid dysfunction, or lung inflammation.

Chelating medicines bind metals and increase their removal, but evidence for chelation in cobalt poisoning is limited, especially while an implant continues releasing cobalt. Chelation can cause serious adverse effects and should be used only under medical toxicology supervision. It is not a home treatment.

In the United States, Poison Control provides case-specific guidance at 1-800-222-1222. Other countries have their own poison information services.

Complications

Severe or prolonged exposure may cause cardiomyopathy, heart failure, or abnormal rhythms. Heart function may improve after exposure ends, but recovery varies.

Hearing loss, tinnitus, vision problems, numbness, poor coordination, and cognitive changes may improve slowly or persist. Thyroid dysfunction and excess red blood cell production can place additional strain on the body. Repeated inhalation may cause chronic asthma or lung scarring.

Metal debris around a joint can damage muscles, tendons, bone, and other tissues. Delayed treatment of significant local damage may complicate revision surgery and affect long-term joint function.

Complications are not inevitable when cobalt levels are elevated. Risk depends on the source, exposure duration, organ findings, and how quickly exposure is controlled.

Follow up

Follow-up depends on the exposure source and affected organs. Clinicians may repeat cobalt measurements using the same sample type and, when possible, the same laboratory. Repeat heart, thyroid, blood count, hearing, vision, lung, or nerve tests may be needed after abnormal results.

People with metal-on-metal hip implants should follow their orthopedic team's or national implant safety program's monitoring plan. Recommendations vary by implant and country. Routine implant monitoring is different from urgent assessment for new symptoms.

Arrange prompt clinical review for new or worsening hip pain, swelling, difficulty walking,

reduced exercise tolerance, persistent cough, numbness, hearing or vision changes, or symptoms of an underactive thyroid.

Seek urgent or emergency care for severe shortness of breath, chest pain, fainting, a sustained rapid or irregular heartbeat, sudden major vision loss, severe confusion, a seizure, or rapidly worsening weakness.

Sources

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