CONDITION

Mercuric oxide poisoning

Mercuric oxide poisoning is harmful exposure to an inorganic mercury compound that can damage the kidneys, lungs, digestive tract, and nervous system.

WHAT IT IS
Poisoning from exposure to inorganic mercury oxide

BODY SYSTEM
Kidneys, digestive tract, lungs, and nervous system

MAIN SYMPTOMS
Abdominal pain, vomiting, cough, tremor

WHAT CAUSES IT
Swallowing or inhaling mercuric oxide dust or fumes

HOW IT IS DIAGNOSED
Exposure history plus blood and urine mercury tests

MAIN TREATMENT
Exposure removal, supportive care, and specialist chelation

CAN IT BE CURED?
Sometimes - early care may limit lasting injury

IS IT AN EMERGENCY?
Yes - after any suspected significant exposure

LONG-TERM OUTLOOK
Many recover, but kidney or nerve damage may persist

Overview

Mercuric oxide poisoning happens when mercury(II) oxide enters the body in a harmful amount. Mercuric oxide is a red or yellow inorganic mercury compound. It may be found in laboratories, industrial processes, some older batteries, and certain specialized electrical or chemical products.

This is different from exposure to liquid elemental mercury, such as mercury from an old thermometer, and from methylmercury in contaminated fish. The forms behave differently in the body. However, all mercury compounds can be harmful under certain exposure conditions.

Mercuric oxide can enter the body by being swallowed or by breathing its dust. Heating it can release highly toxic mercury-containing fumes. Contact may also irritate the eyes and skin, although intact skin usually absorbs less than the lungs or digestive tract.

A significant exposure needs prompt medical and poison-control advice. Early symptoms may involve the stomach, intestines, or lungs. Kidney injury can appear later, even after the first symptoms improve. Repeated lower-level exposure can affect mood, memory, movement, the mouth, and the kidneys.

Symptoms

Symptoms depend on how the exposure happened, how much entered the body, and whether it occurred once or repeatedly. They may begin within hours, but some effects take days or longer to appear.

Swallowing mercuric oxide may irritate or burn the digestive tract. Possible symptoms include:

Breathing dust or fumes may cause coughing, chest tightness, shortness of breath, or chest pain. Serious inhalation can inflame the lungs, a condition called chemical pneumonitis. Breathing problems may worsen over several hours.

Longer-term or repeated exposure to inorganic mercury can affect the nervous system. Possible symptoms include tremor, trouble sleeping, irritability, anxiety, headaches, poor concentration, memory problems, or tingling in the hands and feet.

The gums may become swollen or sore, and teeth can loosen after substantial ongoing exposure. Kidney effects may cause protein to leak into the urine, swelling in the legs or around the eyes, or high blood pressure.

Children can develop a rare mercury-related illness called acrodynia. It may cause painful pink or peeling hands and feet, sweating, irritability, weakness, and raised blood pressure.

- Burning pain in the mouth, throat, or abdomen
- Nausea, vomiting, or diarrhea
- A metallic taste or increased saliva
- Blood in vomit or stool after a severe exposure
- Reduced urination as kidney injury develops

Causes and risk factors

The direct cause is exposure to mercuric oxide. Situations that may create exposure include laboratory or industrial accidents, damaged containers, poor handling of chemical powders, and opening or crushing products that contain the compound.

Heating mercuric oxide is particularly hazardous because it can break down and release mercury vapor. Vapor is readily absorbed through the lungs.

Risk is higher when exposure occurs in an enclosed or poorly ventilated space. It also increases when suitable respiratory protection, ventilation, or containment is not used at work.

Children may be exposed after finding an incorrectly stored chemical or damaged older product. Their smaller body size can make a given amount more important. People with existing kidney disease may also be more vulnerable to complications.

Mercuric oxide exposure is not contagious. You cannot catch poisoning from someone who has been exposed. However, contaminated clothing, shoes, tools, or surfaces can carry powder into another area and expose other people.

Diagnosis

Diagnosis begins with finding out what substance was involved, how contact occurred, and when it happened. A product label, safety data sheet, photograph, or workplace record can help identify mercuric oxide. Do not carry a leaking or contaminated container into a healthcare setting unless emergency services say it is safe.

Blood and urine mercury tests can support the diagnosis. Blood testing may be more useful soon after a recent exposure. Urine testing is often important for inorganic mercury because the kidneys remove some of it from the body. A timed urine collection or a spot result adjusted for urine concentration may be used.

A mercury result must be interpreted alongside the timing, symptoms, and type of exposure. It does not show by itself how much organ damage has occurred. Testing too early may miss a later rise, while mercury can remain detectable after symptoms have improved.

Hair testing is mainly used in limited settings for methylmercury exposure. It is generally not a reliable way to confirm mercuric oxide poisoning and can be affected by external contamination.

Other tests may check kidney function, electrolytes, blood counts, urine protein, and liver function. People with breathing symptoms may need oxygen measurements and chest imaging. A heart tracing may be used if the exposure is severe or electrolyte levels are abnormal.

Treatment and management

The first step is to stop further exposure. Move away from dust or fumes without putting anyone else at risk. Do not touch spilled material with bare hands, sweep it, or use a household vacuum, because this can spread contaminated dust.

Remove contaminated clothing without pulling it over the face if possible. Place it in a sealed container or bag and wait for disposal instructions. If the chemical reaches the eyes or skin, rinse with clean lukewarm water while obtaining poison-control advice. Do not induce vomiting after swallowing it.

Treatment in hospital is based on the route and severity of exposure. It may include oxygen, breathing support, intravenous fluids, medicines for symptoms, and close monitoring of urine output and kidney function. A serious corrosive ingestion may require an examination of the digestive tract to look for burns.

Chelation may be considered for significant poisoning. Chelating medicines bind mercury so that more can leave the body in urine. Options used for inorganic mercury poisoning include medicines such as succimer or DMPS; other agents may be considered in selected severe cases.

Chelation is not suitable for every exposure or every raised test result. It can cause adverse effects and cannot reliably reverse kidney, lung, or nerve damage that has already occurred. The decision should be made by a medical toxicologist or poison specialist. Over-the-counter "detox" products are not a substitute and may cause harm.

Temporary dialysis may be needed if the kidneys cannot adequately control fluid, salts, or waste products. Dialysis supports the body during kidney failure, but it does not necessarily remove mercury stored in tissues effectively.

Follow-up testing may continue after discharge because kidney problems can emerge later. Occupational health staff may also need to investigate the exposure before a return to the same workplace.

Complications

A large swallowed amount can burn the mouth, throat, stomach, or intestines. Severe injury may cause bleeding, fluid loss, infection, or scarring that later makes swallowing or digestion difficult.

Acute kidney injury is an important complication. The kidneys may produce very little urine and may struggle to regulate fluid and mineral levels. Kidney function often improves with treatment, but some people are left with reduced function or ongoing protein loss in the urine.

Heavy inhalation can cause chemical pneumonitis and fluid buildup in the lungs. Severe cases

may require mechanical breathing support.

Neurological effects can include persistent tremor, altered sensation, poor coordination, sleep disturbance, and problems with memory or concentration. Recovery may be slow, especially after repeated exposure.

Severe poisoning can affect several organs and can be fatal. This is uncommon in promptly recognized, appropriately managed exposures, but it is why suspected significant exposure should not be watched at home without expert advice.

Prevention

Mercuric oxide poisoning is preventable by avoiding unprotected contact with the compound.

At work, mercuric oxide should be handled within appropriate ventilation or closed systems. Follow the product safety data sheet, workplace training, and requirements for protective clothing and respiratory protection. Do not eat, drink, smoke, or store food where mercury compounds are used.

Keep chemicals in their original, clearly labelled containers. Never place mercuric oxide in a food or drink container. Store it securely away from children and from heat.

Do not open, crush, or burn old batteries or specialized devices that may contain mercury compounds. Use an approved hazardous-waste or battery-recycling service.

A mercuric oxide spill should be handled using the site's chemical-spill procedure or by hazardous-material professionals. Avoid vacuuming, sweeping, or washing the powder down a drain. Keep other people and animals out of the area until it has been assessed.

Living with it and what to expect

The course depends on the amount and route of exposure and whether organ injury occurred. Mild irritation may settle after exposure stops, while significant poisoning can require hospital care and months of follow-up.

Digestive symptoms often appear early. Kidney injury may develop over the following days, so repeat blood and urine tests can be needed even if you feel better. Mercury may remain measurable for some time because inorganic mercury can be retained in the kidneys and other tissues.

Tremor, sleep problems, irritability, or concentration difficulties may gradually improve over weeks or months after exposure ends. Improvement is not guaranteed, and some neurological

effects can persist after heavy or prolonged exposure.

Kidney follow-up may include blood pressure checks, kidney-function tests, and urine tests for protein. Ongoing problems may require care from a kidney specialist. Rehabilitation can help with weakness, tremor, balance problems, or difficulty returning to usual activities.

After an occupational exposure, returning to the same task should wait until the source has been controlled. Occupational health services may arrange environmental testing or exposure monitoring. Most people who recover can return to everyday activities, although the timing is different when kidney, lung, or nerve injury remains.

When to get medical help

Call emergency services now if there is:

Get urgent poison-control or emergency medical advice after any suspected swallowing of mercuric oxide, meaningful inhalation of its dust, or exposure to fumes from heated material. Do this even if symptoms have not started.

Eye exposure, a large skin contamination, or an exposure involving a child also needs prompt advice. In the United States, Poison Control is available at 1-800-222-1222. Elsewhere, contact your local poison information service or emergency number.

Routine follow-up is important after confirmed poisoning. Arrange review if tremor, memory problems, mouth soreness, swelling, reduced urination, or breathing symptoms continue or return. Attend planned blood and urine testing even when you feel well.

- Severe trouble breathing, blue or grey lips, or intense chest pain
- Collapse, a seizure, severe confusion, or difficulty waking
- Repeated or bloody vomiting
- Severe abdominal pain
- Very little or no urine after a suspected exposure

Common questions

Is mercuric oxide the same as liquid mercury?

No. Mercuric oxide is a solid inorganic mercury compound. Liquid elemental mercury and organic forms such as methylmercury behave differently in the environment and body. The correct response to a spill or exposure therefore depends on the exact substance.

Can one exposure cause poisoning?

Yes, if enough is swallowed or inhaled. Heating the compound or creating airborne dust can make a single incident more serious. Brief contact with a small amount does not always cause poisoning, but a poison service should assess the actual circumstances.

What should I do immediately after exposure?

Leave the contaminated area and move into fresh air without spreading the material. Remove contaminated clothing and rinse exposed eyes or skin with water. Do not induce vomiting, vacuum powder, or try a home detox treatment. Contact a poison service promptly.

Will chelation remove all the mercury?

Not necessarily. Chelation can increase mercury removal in selected cases, but it may not remove mercury from every tissue or reverse established organ damage. Specialists consider the exposure, symptoms, test results, and treatment risks together.

Can I test for mercuric oxide poisoning at home?

Home hair, saliva, or "heavy metal" tests cannot reliably diagnose this condition. Medical blood and urine tests need to be chosen and interpreted according to when and how the exposure occurred.

How long does recovery take?

Digestive irritation may improve within days, while kidney or nervous-system effects can take weeks or months. Some people have lasting problems after severe or repeated exposure. Follow-up tests help show whether organ function is recovering.

Sources

- Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury . US Department of Health and Human Services; 1999.
- World Health Organization. Environmental Health Criteria 118: Inorganic Mercury . International Programme on Chemical Safety; 1991.
- National Institute for Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards: Mercury compounds . Centers for Disease Control and Prevention.
- Kosnett MJ. The role of chelation in the treatment of arsenic and mercury poisoning. Journal of Medical Toxicology . 2013;9(4):347-354.
- Clarkson TW, Magos L, Myers GJ. The toxicology of mercury-current exposures and clinical manifestations. New England Journal of Medicine . 2003;349:1731-1737.

- National Library of Medicine. PubChem Compound Summary: Mercury(II) oxide .