CONDITION

Malathion poisoning

Malathion poisoning happens when too much malathion insecticide disrupts the nerves that control breathing, muscles, and body secretions.

WHAT IT IS
Toxic nerve overstimulation caused by malathion exposure

BODY SYSTEM
Nervous system, lungs, heart, digestive system, and muscles

MAIN SYMPTOMS
Heavy secretions, breathing trouble, vomiting or diarrhoea, muscle weakness

WHAT CAUSES IT
Excess exposure to an organophosphate insecticide

HOW IT IS DIAGNOSED
Exposure history, examination, and blood cholinesterase tests

MAIN TREATMENT
Decontamination, breathing support, atropine, and sometimes pralidoxime

CAN IT BE CURED?
Yes - most recover as toxin clears

IS IT AN EMERGENCY?
Yes - suspected poisoning needs immediate assessment

LONG-TERM OUTLOOK
Often full recovery, but severe exposure can be fatal

Overview

Malathion is an insecticide used in agriculture, mosquito control, gardening, and some treatments for head lice. It belongs to a group called organophosphates . These chemicals affect an enzyme that nerves need to work normally.

Malathion poisoning happens when enough of the chemical enters the body through swallowing, breathing, skin contact, or the eyes. The liver can change malathion into a more toxic chemical called malaoxon.

Malathion and malaoxon block acetylcholinesterase , an enzyme that normally switches off nerve signals. Without it, a nerve messenger called acetylcholine builds up. This overstimulates glands, muscles, and parts of the brain.

As a result, the body may produce large amounts of saliva, tears, sweat, and mucus in the lungs. Muscles can twitch and then become weak. Severe poisoning can interfere with breathing, heart rhythm, or consciousness.

Products containing malathion can usually be used safely when their label directions are followed. Poisoning is more likely after swallowing a product, working with concentrated pesticide, using it incorrectly, or having prolonged exposure without suitable protection.

Suspected malathion poisoning is an emergency. Treatment should not wait for blood test results.

Symptoms

Symptoms may begin within minutes or several hours. Skin absorption can cause a slower onset, especially if contaminated clothing stays in place. A person may continue absorbing the pesticide until their skin and clothing have been cleaned.

Early symptoms can resemble a stomach illness, heat exhaustion, or another type of poisoning. A known or possible pesticide exposure is therefore important information.

Common effects include:

Severe poisoning can cause seizures, collapse, coma, or respiratory failure. Respiratory failure means the body cannot breathe well enough to maintain oxygen and remove carbon dioxide. It may result from fluid and mucus in the airways, tightening of the breathing tubes, weakness of the breathing muscles, or effects on the brain.

Not everyone develops every symptom. Pupil size and heart rate alone cannot confirm or rule out poisoning.

- Excessive saliva, tears, sweating, or a runny nose
- Nausea, vomiting, stomach cramps, or diarrhoea
- Frequent urination or loss of bladder control
- Small pupils, blurred vision, or eye pain
- Wheezing, coughing, chest tightness, or heavy airway secretions
- A slow or sometimes fast heartbeat
- Muscle twitching, cramps, weakness, or difficulty walking
- Headache, dizziness, anxiety, confusion, or unusual sleepiness

Causes and risk factors

Malathion poisoning results from more exposure than the body can safely break down. The amount absorbed matters, as do the product's concentration, route of exposure, and length of contact.

Possible situations include:

People who mix, load, or spray pesticides may have a higher risk of occupational exposure. Family members can also be exposed if contaminated boots, tools, or clothing are brought into the home.

Malathion poisoning is not contagious. Touching someone who is still covered in liquid pesticide could, however, expose another person. Emergency workers may use protective clothing and decontaminate the person before providing treatment in the main care area.

- Accidentally or intentionally swallowing malathion
- Mixing or applying concentrated pesticide without proper protection
- Spraying in an enclosed or poorly ventilated area
- Remaining in wet, contaminated clothing
- Entering a recently treated area against label instructions
- Storing pesticide in a drink bottle or food container
- Allowing children access to an unsecured product
- Using a medical or household product in a way not stated on its label

Diagnosis

Doctors usually make the initial diagnosis from the exposure history and a pattern of symptoms called a cholinergic toxidrome . This means a group of findings caused by too much acetylcholine, such as heavy secretions, small pupils, muscle twitching, and breathing problems.

If it is safe to do so, provide the product name, concentration, estimated amount, exposure route, and time of exposure. A photograph of the label may be useful. Do not bring a leaking or contaminated container into a vehicle or healthcare building.

Blood tests can measure cholinesterase activity. Two commonly measured forms are plasma cholinesterase and red blood cell acetylcholinesterase. Low activity supports organophosphate poisoning, but normal ranges differ between people and laboratories. Results may also take time, so emergency treatment is based mainly on symptoms and likely

exposure.

Other tests may assess oxygen levels, blood acidity, kidney and liver function, blood sugar, and electrolyte levels. An electrocardiogram checks the heart's rhythm. A chest X-ray may be needed if there are breathing problems or concern that vomit has entered the lungs.

Treatment and management

The first priorities are stopping further exposure and supporting breathing. Hospital care may involve a toxicology specialist or poison centre.

Contaminated clothing is removed and sealed appropriately. Skin is washed thoroughly with soap and water, and exposed eyes are rinsed with clean water. Staff take care not to contaminate themselves.

Oxygen, airway suction, and medicines that open the breathing tubes may be needed. Severe weakness or heavy lung secretions can require a breathing tube and mechanical ventilation.

Atropine blocks many of acetylcholine's effects. It is given until airway secretions and breathing improve. More than one dose may be needed because the pesticide can remain active longer than atropine.

Atropine does not directly reverse muscle weakness. Pralidoxime , also called 2-PAM, may be used to reactivate acetylcholinesterase, particularly when there is serious poisoning or muscle weakness. Its use and timing are decided by the treating team according to the exposure and clinical findings.

Seizures are treated with appropriate anti-seizure medicine, often a benzodiazepine like diazepam or lorazepam . Fluids, heart monitoring, temperature control, and treatment for complications may also be required.

Activated charcoal or other stomach decontamination is not suitable for every exposure. It can be dangerous if the person is vomiting, drowsy, or unable to protect their airway. Do not induce vomiting or give anything by mouth unless a poison centre or emergency professional directs you to do so.

Complications

The most serious immediate complication is respiratory failure. Vomiting can also lead to aspiration , meaning stomach contents enter the lungs. This can cause lung irritation or pneumonia.

Other possible complications include abnormal heart rhythms, seizures, low oxygen injury, and inflammation of the pancreas. Severe or prolonged poisoning can affect several organs.

Some people develop intermediate syndrome after the initial cholinergic symptoms improve. This usually appears within the next several days and causes weakness of the neck, shoulders, hips, or breathing muscles. Continued observation may be needed after a significant exposure because this weakness can develop after someone initially seems better.

Organophosphates can rarely cause delayed nerve injury one or more weeks later. Symptoms may include burning, tingling, leg weakness, poor balance, or difficulty walking. Recovery can take months and may be incomplete after severe injury.

A deliberate exposure also needs compassionate mental health assessment and follow-up once the immediate medical danger has passed.

Prevention

Most accidental malathion poisoning can be prevented. It is not an inherited condition.

Read and follow the full product label, including instructions about protective equipment, ventilation, mixing, application, and when it is safe to re-enter a treated area. Use only the amount and method stated on the label.

Keep malathion in its original, clearly labelled container. Never transfer it into a cup, soft-drink bottle, or food container. Store it locked away from children, food, medicines, and animal feed.

When handling pesticide products:

For head-lice products containing malathion, use the product only for the person and in the way described in its instructions. Do not swallow it or apply more than directed.

- Wear the protective clothing and equipment listed on the label
- Avoid eating, drinking, smoking, or touching your face
- Wash your hands and exposed skin after use
- Remove contaminated clothing before entering living areas
- Wash work clothing separately, following product instructions
- Avoid creating spray drift toward people, animals, or open windows

Living with it and what to expect

Malathion poisoning is usually a short-term condition rather than a lifelong illness. The course

depends on the amount absorbed, how quickly exposure is stopped, and whether breathing or the brain was affected.

Mild symptoms may settle after decontamination and observation. More significant poisoning can require several days in hospital, sometimes in intensive care. Treatment may continue after early improvement because symptoms can return while the body is still clearing the chemical.

Most people who receive timely treatment recover. Tiredness, weakness, sleep changes, or difficulty concentrating may continue for days or weeks. Blood cholinesterase levels can remain low after symptoms have resolved, so a test result does not always match how someone feels.

Follow-up is important after a serious exposure. New weakness, tingling, balance problems, breathing difficulty, or changes in memory or mood should be reported. People exposed at work may need occupational health advice before returning to pesticide handling.

Severe poisoning can cause lasting nerve or brain injury, particularly after prolonged low oxygen. It can also be fatal, but the outcome cannot be predicted from the product name alone.

When to get medical help

Call emergency services now after a suspected malathion ingestion or if exposure is followed by trouble breathing, heavy secretions, repeated vomiting, confusion, collapse, seizures, or muscle weakness. Do not wait for all symptoms to appear.

Move away from airborne pesticide only if this can be done safely. Do not enter a contaminated enclosed area without proper protective equipment. Remove contaminated clothing and wash exposed skin, while avoiding contact with the chemical yourself.

Contact a poison centre immediately for any suspected exposure, even if symptoms are mild or absent. In the United States, Poison Control is available at 1-800-222-1222 . Elsewhere, contact your local poison information centre or emergency service.

Routine follow-up is appropriate after discharge to review recovery, test results, work safety, and any continuing fatigue or weakness. Seek prompt reassessment if symptoms return or new muscle or nerve symptoms develop.

Common questions

How quickly does malathion poisoning start?

Symptoms may begin within minutes after swallowing or inhaling malathion. Skin exposure can take several hours to cause symptoms, especially if contaminated clothing is not removed.

Can malathion be absorbed through the skin?

Yes. Liquid malathion can pass through the skin. The risk rises with concentrated products, large exposed areas, prolonged contact, or wet clothing.

Does the smell show how dangerous the exposure was?

No. Odour does not reliably show how much pesticide entered the body. Some formulations also contain solvents that have their own strong smell.

Is malathion head-lice treatment likely to cause poisoning?

A regulated product has a much lower risk when used exactly as directed. Swallowing it, applying excessive amounts, or using it in an unintended way can cause harm and needs poison-centre advice.

How long does recovery take?

Acute symptoms often improve over hours to days with treatment. Fatigue or weakness can last longer. Delayed muscle or nerve problems may appear days or weeks after a severe exposure.

Can a blood test prove malathion poisoning?

Low cholinesterase activity can support the diagnosis. Treatment should not be delayed while waiting for the result, and a previous baseline test may be needed to interpret occupational exposures accurately.

Sources

- Centers for Disease Control and Prevention, NIOSH: Malathion Emergency Response Safety and Health Database
- Agency for Toxic Substances and Disease Registry: Toxicological Profile for Malathion
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