CONDITION

Adrenergic bronchodilator overdose

Learn how an overdose of albuterol or another adrenergic bronchodilator can affect the heart, muscles, and metabolism, and when to seek emergency help.

WHAT IT IS
Overdose of airway-opening adrenergic medicines

BODY SYSTEM
Breathing, heart and circulation, muscles and metabolism

MAIN SYMPTOMS
Shaking, racing heartbeat, muscle weakness, nausea

WHAT CAUSES IT
Too much adrenergic bronchodilator medicine

HOW IT IS DIAGNOSED
Exposure history, clinical findings, ECG, blood tests

MAIN TREATMENT
Supportive hospital care and monitoring

CAN IT BE CURED?
Sometimes, mild effects usually improve

IS IT AN EMERGENCY?
Sometimes, with chest pain or fainting

LONG-TERM OUTLOOK
Most mild effects improve as the medicine clears

Overview

Adrenergic bronchodilators like albuterol or salmeterol are medicines that open narrowed airways. They include short-acting medicines such as albuterol, also called salbutamol, and levalbuterol. Longer-acting medicines include salmeterol, formoterol, and related drugs. Some are inhaled alone, while others are combined with an inhaled corticosteroid or another medicine.

These bronchodilators stimulate receptors that relax the muscles around the airways. Most mainly target beta-2 receptors in the lungs. At high doses, however, their effects can spread beyond the lungs and affect the heart, muscles, blood sugar, and blood potassium level.

An overdose happens when someone receives more medicine than their body can safely handle. It may follow swallowing a medicine, taking repeated inhaler puffs or nebulizer

treatments, using the wrong amount of nebulizer solution, or combining products that contain similar drugs. The amount that causes serious effects varies with the medicine, how it entered the body, the person's age and health, and other substances taken at the same time.

Some overdose symptoms, such as shakiness or a fast heartbeat, can also occur as expected side effects at usual doses. The severity, persistence, and circumstances help clinicians judge the situation. A suspected overdose should not be assessed only by counting symptoms.

In the United States, contact Poison Help at 1-800-222-1222 promptly after a suspected medication error or overdose. Poison specialists can give advice based on the exact product and exposure. Do not wait for symptoms to appear. Call emergency services for severe symptoms, an intentional overdose, or if the person cannot be safely observed or transported.

Symptoms

Symptoms often reflect excess stimulation of the nervous system and heart. They may begin soon after a large inhaled dose, but timing can differ with long-acting products or swallowed medicine.

Possible symptoms include:

Adrenergic bronchodilators can move potassium from the blood into cells. This may cause a low blood potassium level, called hypokalemia. A person may have weakness, cramps, or an abnormal heart rhythm, although mild changes may cause no clear symptoms.

Large doses can also raise blood sugar and increase lactate, an acid produced during metabolism. A high lactate level may cause rapid breathing, nausea, or a sense of breathlessness. In someone being treated for asthma, this can be confusing because rapid breathing from excess medicine may resemble ongoing airway trouble.

Seek emergency help now if the person has:

Worsening asthma symptoms despite repeated rescue-inhaler use are also an emergency concern. This may represent a severe asthma attack, medication toxicity, or both.

- Shaking or tremor
- Nervousness, restlessness, or anxiety
- Headache or dizziness
- Nausea or vomiting
- Sweating
- Muscle cramps or weakness

- A pounding, racing, or irregular heartbeat
- Chest discomfort
- Unusual tiredness
- Trouble sleeping
- Severe or worsening difficulty breathing
- Chest pain
- Fainting or collapse
- A seizure
- Severe confusion, extreme agitation, or inability to stay awake
- A very fast or clearly irregular heartbeat with weakness, dizziness, or pain
- Blue, gray, or unusually pale lips or skin
- An intentional overdose or concern about self-harm

Causes and risk factors

Overdose may be accidental or intentional. Common circumstances include taking repeated doses because breathing has not improved, misunderstanding inhaler instructions, or putting too much concentrated medicine into a nebulizer. A child may swallow a liquid medicine or activate an inhaler that was left within reach.

Medication mix-ups can also occur. Someone may use more than one inhaler without realizing that both contain an adrenergic bronchodilator. Long-acting bronchodilators are not substitutes for a rescue inhaler unless a clinician has provided a specific treatment plan involving an appropriate combination product.

The route of exposure matters. Inhaled medicine is delivered mainly to the lungs, although some reaches the bloodstream or is swallowed. Swallowing a bronchodilator solution, tablet, or large amount of inhaler contents may produce broader and more prolonged effects. Injected or other systemic forms can also cause serious toxicity.

Factors that may increase concern include:

Using a rescue bronchodilator more often than directed may also mean that asthma or another breathing condition is not well controlled. That situation needs medical review even when no overdose occurs.

- A large or uncertain amount

- A long-acting product
- Accidental exposure in a young child
- Existing heart rhythm problems or significant heart disease
- A condition or medicine that already lowers potassium
- Use of stimulants or other drugs that raise heart rate
- Delayed access to medical assessment
- Repeated dosing while symptoms are getting worse

Diagnosis

There is no home test that can confirm or rule out an adrenergic bronchodilator overdose. Clinicians consider the product, estimated amount, route of exposure, timing, symptoms, and medical history.

If possible, bring the inhaler, vial, package, or a clear photograph of its label. The dose counter may be helpful, but it may not show exactly how much medicine entered the body. Tell the care team about all prescription medicines, nonprescription products, supplements, caffeine, nicotine, and recreational substances that may have been used.

The examination usually includes repeated checks of heart rate, blood pressure, breathing, temperature, alertness, and oxygen level. An electrocardiogram, or ECG, records the heart's electrical activity and can identify rhythm changes.

Blood tests may measure potassium, glucose, kidney function, and acid-base balance. A lactate test may be considered when there is unexplained rapid breathing or metabolic disturbance. Other tests depend on the symptoms and whether another medicine may have been taken.

A blood level of albuterol or a related drug is not usually needed. Diagnosis and treatment are generally based on the exposure history, clinical findings, ECG, and routine laboratory results.

Treatment and management

Call Poison Help or an appropriate local poison center after a suspected overdose. Do not make the person vomit. Do not give food, charcoal, or a home remedy unless a poison specialist or clinician specifically recommends it.

Move away from spilled nebulizer solution or aerosol if exposure is continuing. If medicine

entered the eyes or covered the skin, follow poison-center instructions for rinsing. Do not delay emergency care to clean up equipment or search for missing doses.

Hospital treatment is mainly supportive, meaning clinicians protect breathing and circulation while the body clears the medicine. Monitoring may be enough after a smaller exposure with mild symptoms, but significant symptoms can require an emergency department or hospital stay.

Treatment may include oxygen when needed, intravenous fluids, ECG monitoring, and repeat blood tests. Potassium may be replaced when the level is significantly low, but this must be done carefully. The low level often results from potassium shifting into cells rather than leaving the body, so it can rise again as the drug effect wears off.

Clinicians may treat seizures or severe agitation with medicines used in monitored settings. Serious abnormal heart rhythms are managed according to the person's ECG, blood pressure, breathing status, and electrolyte results.

A beta blocker like metoprolol or propranolol may sometimes be considered for severe cardiovascular effects because it opposes adrenergic stimulation. This decision requires specialist judgment. Beta blockers can narrow the airways, particularly in people with asthma, so they should not be taken at home to treat overdose symptoms.

Activated charcoal is not a routine home treatment. A medical toxicologist may consider it after certain recent swallowed exposures when the expected benefit is greater than the risk. It can enter the lungs if a person vomits or cannot protect their airway.

If repeated bronchodilator use occurred because of breathing difficulty, clinicians must treat the underlying airway problem while limiting further toxicity. This balance is one reason professional assessment is important.

Complications

Most mild effects improve as the medicine leaves the body. The expected duration depends on the specific drug, dose, formulation, and route.

Potential complications include a sustained abnormal heart rhythm, very high or low blood pressure, and reduced blood flow to the heart. These are more concerning in people with heart disease but can occur after a substantial exposure in someone without known heart problems.

Marked hypokalemia can contribute to weakness and heart rhythm changes. High blood sugar and lactic acidosis may also occur. Lactic acidosis can cause rapid breathing even after airway narrowing has improved, which may lead to additional bronchodilator use if the cause is not recognized.

Seizures, loss of consciousness, and cardiac arrest are possible in severe poisoning. These complications are not expected after every dosing error, but they explain why serious symptoms and intentional exposures require emergency care.

A separate complication is delayed treatment of severe asthma. A person may continue using a rescue inhaler when they need urgent treatment for airway inflammation or another cause of breathing difficulty.

Follow up

Follow the discharge instructions from the emergency department, poison center, or prescribing clinician. Keep any planned appointments for repeat testing, especially if potassium, blood sugar, lactate, or the ECG was abnormal.

Seek urgent reassessment if a racing or irregular heartbeat returns, weakness worsens, vomiting prevents fluid intake, or breathing symptoms come back. Call emergency services for chest pain, fainting, a seizure, severe breathing trouble, or reduced responsiveness.

Routine follow-up should review why the exposure happened. A clinician or pharmacist can check inhaler technique, nebulizer measurements, product labels, and the written action plan for asthma or another lung condition. If a rescue medicine is needed more often than expected, the long-term treatment plan may need review rather than repeated self-directed dosing.

Store medicines in their original packaging and out of children's sight and reach. Keep nebulizer concentrates separate from ready-to-use containers. A current medication list can help prevent accidental duplication.

After an intentional overdose, follow-up should include mental health care and a safety plan. Immediate crisis support is appropriate if thoughts of self-harm return.

Sources

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