CONDITION

Benzene poisoning

Learn how benzene exposure can affect the nervous system, blood, and bone marrow, and when testing, treatment, or emergency care may be needed.

WHAT IT IS
Toxic illness from harmful benzene exposure

BODY SYSTEM
Nervous system, blood and bone marrow

MAIN SYMPTOMS
Headache, dizziness, nausea, trouble breathing

WHAT CAUSES IT
Benzene exposure

HOW IT IS DIAGNOSED
Exposure history, examination, laboratory tests

MAIN TREATMENT
Supportive care and stopping exposure

CAN IT BE CURED?
No, no specific antidote exists

IS IT AN EMERGENCY?
Sometimes, with severe breathing difficulty

LONG-TERM OUTLOOK
Bone marrow damage, leukemia, or death can occur

Overview

Benzene is a colorless or pale-yellow, highly flammable chemical that evaporates quickly. It is used to make plastics, resins, synthetic fibers, rubber, dyes, detergents, pesticides, and some medicines. Benzene is also present in gasoline, vehicle exhaust, wildfire smoke, and tobacco smoke.

Benzene poisoning occurs when enough benzene enters the body to cause harm. Exposure may happen by breathing benzene vapor, swallowing a benzene-containing liquid, or getting it on the skin. Breathing is the most common route in workplaces and around spills because benzene easily becomes a vapor.

The health effects depend on how much benzene enters the body and how long the exposure lasts. A large exposure over a short time can quickly affect the brain, breathing, and heart.

Repeated exposure over months or years can damage bone marrow, the tissue inside bones that makes blood cells.

Long-term benzene exposure is also linked to cancer. The International Agency for Research on Cancer classifies benzene as carcinogenic to humans. The strongest evidence is for acute myeloid leukemia, a cancer of blood-forming cells.

The smell of benzene is not a dependable warning. Some people may not notice it, and the ability to smell it can fade during continued exposure. Suspected exposure should therefore be taken seriously even when there is little or no odor.

Symptoms

Symptoms vary according to the route, amount, and length of exposure. Some symptoms are not specific to benzene and can have many other causes.

A high-level exposure may cause symptoms within minutes or hours, including:

Swallowing benzene is especially dangerous if the liquid enters the lungs during swallowing or vomiting. This is called aspiration. It can cause coughing, choking, and chemical inflammation of the lungs.

Repeated exposure may damage bone marrow and reduce the production of blood cells. Possible symptoms include:

These symptoms often develop gradually. A person may also have abnormal blood test results before noticing symptoms.

Severe trouble breathing, collapse, a seizure, marked confusion, or loss of consciousness after a possible exposure requires emergency care. Move away from the source only if this can be done safely. Do not enter a contaminated area without appropriate protective equipment.

- Headache, dizziness, drowsiness, or confusion
- Irritation of the eyes, nose, throat, or skin
- Nausea, vomiting, or abdominal discomfort
- Poor coordination or difficulty walking
- Rapid or irregular heartbeat
- Coughing, chest discomfort, or trouble breathing
- Fainting, seizures, or loss of consciousness after severe exposure
- Unusual tiredness, weakness, or pale skin from too few red blood cells

- Frequent infections or fever from too few infection-fighting white blood cells
- Easy bruising, nosebleeds, bleeding gums, or small red or purple skin spots from too few platelets
- Menstrual bleeding that is heavier than usual

Causes and risk factors

Benzene poisoning may follow an industrial accident, chemical spill, fire, unsafe use of solvents, or repeated workplace exposure. The greatest risk generally comes from breathing concentrated vapor in an enclosed or poorly ventilated space.

Jobs that may involve benzene include petroleum refining, gasoline production and transport, chemical manufacturing, rubber production, laboratory work, coke and steel production, printing, and hazardous-waste work. Exposure risk depends on the task, ventilation, work practices, and use of suitable protective equipment-not simply the job title.

Gasoline contains benzene. Risks may increase when gasoline is used as a cleaner, siphoned by mouth, spilled in an enclosed area, or handled without proper controls. Running engines and gasoline-powered equipment in enclosed spaces can create several hazards, including exposure to benzene and carbon monoxide.

Tobacco smoke is an important nonoccupational source. People who smoke generally have more benzene exposure than nonsmokers, and secondhand smoke can also contribute. Traffic exhaust and some industrial emissions create lower-level environmental exposure.

Factors that may raise the likelihood of harmful exposure include:

Benzene can pass through the skin, particularly during prolonged or extensive contact. It can also remove natural oils from the skin, causing dryness, redness, or cracking. Contaminated clothing may continue exposing the skin until it is removed.

- Working around benzene without effective ventilation or required protective equipment
- Entering tanks, pits, or enclosed spaces where vapor has collected
- Living close to an uncontrolled spill or major industrial release
- Using gasoline or benzene-containing solvents in poorly ventilated areas
- Smoking or regularly breathing secondhand tobacco smoke
- Having repeated skin contact with benzene-containing liquids

Diagnosis

There is no single test that can confirm every case of benzene poisoning. Diagnosis is based on the exposure history, symptoms, physical examination, and laboratory findings.

A clinician may ask what substance was involved, how the exposure occurred, whether it happened indoors, how long it lasted, and whether other people became ill. Bringing the product label or safety data sheet can help, but the container should not be brought into a healthcare facility if it is leaking or contaminated.

Tests after a recent substantial exposure may include:

Specialized exposure tests have important limits. Benzene leaves the body relatively quickly, so testing is most useful soon after exposure. Some urine markers can also be affected by smoking, diet, or exposure to other chemicals. A result may show that exposure occurred but may not predict whether lasting illness will develop.

When long-term exposure is suspected, clinicians often focus on repeated complete blood counts and changes over time. Persistent abnormalities may require assessment by a hematologist, a doctor who specializes in blood disorders. In selected cases, a bone marrow test may be needed to investigate reduced blood cell production or possible blood cancer.

Workplace investigations may include personal air monitoring and review of ventilation, protective equipment, and job tasks. These measurements help identify and control the source but do not replace medical evaluation.

- A complete blood count to measure red blood cells, white blood cells, and platelets
- Blood chemistry tests to assess general health and organ function
- An electrocardiogram to check heart rhythm
- A chest X-ray or other lung assessment if aspiration or breathing problems are suspected
- Specialized blood, breath, or urine testing for benzene or its breakdown products

Treatment and management

There is no specific antidote for benzene poisoning. Treatment focuses on ending the exposure, preventing further absorption, and supporting breathing, circulation, and other body functions.

After breathing benzene vapor, the person should move to fresh air if this can be done without entering a dangerous area. Emergency responders may need specialized respiratory and fire-protective equipment because benzene vapor is toxic and highly flammable.

Contaminated clothing should be removed carefully and placed in a sealed container if emergency personnel advise doing so. Exposed skin and hair should be washed with lukewarm water and soap. Eyes exposed to liquid or vapor should be rinsed with clean water. Contact lenses should be removed if they come out easily.

If benzene has been swallowed, do not make the person vomit. Vomiting can draw the chemical into the lungs. Contact emergency services or a poison center promptly for instructions. In the United States, Poison Control can be reached at 1-800-222-1222.

Hospital care may include oxygen, airway support, intravenous fluids, heart monitoring, and treatment for seizures or abnormal heart rhythms. People with lung exposure may need observation because coughing and breathing problems can worsen after aspiration.

Long-term management centers on stopping further exposure. This may require changes in ventilation, work procedures, protective equipment, or job duties. Occupational health professionals can help assess whether returning to the same task is safe.

Blood cell shortages are managed according to their cause and severity. Care may involve a hematology evaluation, treatment of infections, or blood-product transfusions. People who develop a blood or bone marrow cancer need specialist treatment based on the exact diagnosis. Treatment decisions are individualized and cannot be determined from exposure history alone.

Complications

A severe short-term exposure can cause unconsciousness, seizures, abnormal heart rhythms, respiratory failure, or death. Swallowed benzene that enters the lungs may cause chemical pneumonitis, meaning lung inflammation caused by the chemical rather than an infection.

Repeated exposure can suppress bone marrow. This may lead to:

Low white blood cell levels may increase the risk of infection. Low platelets can increase bleeding, while anemia can cause weakness, shortness of breath, and reduced exercise tolerance.

Long-term benzene exposure increases the risk of leukemia, particularly acute myeloid leukemia. It is also associated with myelodysplastic syndromes, a group of disorders in which bone marrow makes abnormal blood cells. Cancer may develop years after exposure, but exposure does not mean that cancer will necessarily occur.

- Anemia, caused by too few red blood cells
- Leukopenia, caused by too few white blood cells

- Thrombocytopenia, caused by too few platelets
- Pancytopenia, when all three major blood cell types are reduced
- Aplastic anemia, a serious failure of bone marrow to make enough blood cells

Follow up

Follow-up depends on the amount and duration of exposure, symptoms, and initial test results. A brief, low-level exposure without symptoms may need only poison-center or clinician guidance. A significant exposure may require repeat examinations and blood counts, even if the person initially feels well.

Keep a record of the date, location, product, estimated duration, symptoms, and names of witnesses. Workplace air-monitoring results and safety data sheets may also be useful. Workers should report suspected exposure through their employer's safety or occupational health process.

Arrange routine medical follow-up if symptoms such as fatigue, easy bruising, recurrent infections, or skin irritation continue. Follow the recommended schedule for repeat blood tests rather than assuming that one normal result rules out all later effects.

Seek prompt medical care for fever, new unexplained bruising, ongoing nosebleeds, unusual weakness, or worsening cough after an exposure. These symptoms are not always caused by benzene, but they should be assessed.

Call emergency services for severe breathing difficulty, a seizure, collapse, loss of consciousness, or marked confusion. Do not attempt a rescue in an enclosed or contaminated space unless trained and properly equipped.

Sources

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