State University of Medicine and Pharmacy "Nicolae Testemitanu"
Department of Internal Medicine

Poisoning with benzene and its homologues.

Doina Barba, MD, PhD,
associate professor

Description

- Benzene is a chemical that is a colorless or light yellow liquid at room temperature. It has a sweet odor and is highly flammable.
- Benzene evaporates into the air very quickly. Its vapor is heavier than air and may sink into low-lying areas.
- Benzene dissolves only slightly in water and will float on top of water.

Sources of benzene

- Benzene is formed from both natural processes and human activities.
- Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.
- Some industries use benzene to make other chemicals that are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of lubricants, rubbers, dyes, detergents, drugs, and pesticides.

Exposure to benzene

- Outdoor air contains low levels of benzene from tobacco smoke, gas stations, motor vehicle exhaust, and industrial emissions.
- Indoor air generally contains levels of benzene higher than those in outdoor air. The benzene in indoor air comes from products that contain benzene such as glues, paints, furniture wax, and detergents.
- The air around hazardous waste sites or gas stations can contain higher levels of benzene than in other areas.

Exposure to benzene

- Benzene leaks from underground storage tanks or from hazardous waste sites containing benzene can contaminate well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposure is tobacco smoke.

High-risk Benzene Exposure Jobs

- Adhesive production
- Aircraft engine and fuel workers
- Automotive mechanics
- Barge / tug workers
- Boat and vessel seamen
- Brake technicians
- Chemical plant workers
- Dock workers
- Engine and turbine workers
- Gasoline distribution workers
- House painters
- Industrial plant workers (solvents)
- Maritime workers
- Newspaper press workers

High-risk Benzene Exposure Jobs

- Painters (marine, industrial and auto)
- Paper and pulp
- Pesticide manufacturing
- Pipefitters
- Printers and print shop employees
- Railroad workers
- Refinery workers
- Rubber workers
- Shoe / leather workers
- Solvent workers
- Synthetic rubber production
- Tankermen
- Truck drivers

Highest exposures to benzene

- **Highest exposures occur in the petroleum industry: oilfields, refineries, pipelines, service stations, etc.**
- **Rubber workers have a very high incidence of AML. Tire builders washed tires with Benzene. Vinyl chloride occurs in high concentrations in rubber compounds. Vinyl chloride causes brain cancers, liver cancers (angiosarcoma) and AML.**

Highest exposures to benzene

- **Other workers in the plastics industry experience more exposure to Benzene that leads to death.**
- **Environmental Health Perspectives, Dec. 1996, reported pilofilm workers had "a significant occurance of acute myelocytic or acute monocytic Leukemia (AML, AMLL) diseases. According to the study, AML results when workers breathe air with 1.0 parts per million of Benzene. This is dose dependent-the more Benzene, the more the Leukemia.**
- **Plywood and furniture workers have unexpected high exposure levels.**

Mechanism of toxicity

- Following exposure, about 10 % of inhaled benzene is excreted unchanged in the breath.
- The remainder is metabolized by hepatic mixed function oxidize enzymes, found predominantly in the liver, but also in the bone marrow, which is the target organ of benzene toxicity.

Mechanism of toxicity

- Benzen induces pancytopenia by disrupting cell production from the pluripotent stem-cell stage to the functional stage.
- There is good evidence that benzene is cancerogenic.

Clinical features

Acute poisoning results when benzene is ingested or inhaled occupationally, accidentally, or with suicidal or parasuicidal intent.

- Euphoria,
- dizziness,
- headache,
- blurring of vision,
- mucous membrane irritation,
- tremor,
- chest tightness,
- respiratory depression,
- cardiac arrhythmia,
- Coma
- convulsion.
- Direct skin contact with liquid benzene may produce signs of marked irritation due to defeating action of the solvent.

Clinical features

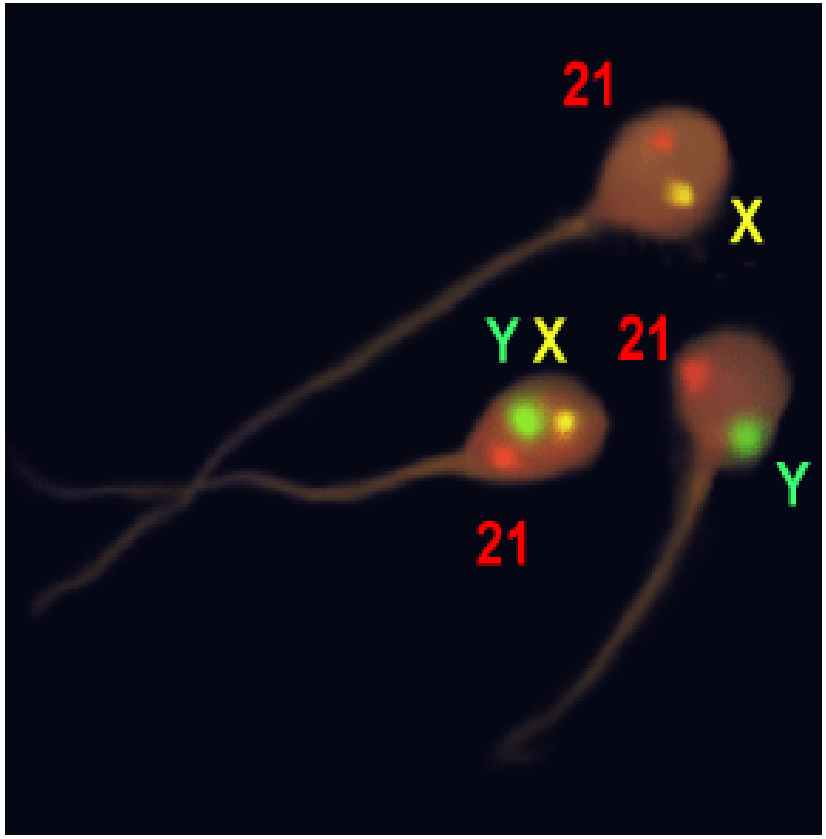
Chronic exposure. The toxic effect of chronic poisoning may not become apparent for months or years after initial contact and indeed they may develop after all exposure has ceased.

- Anorexia, headache, drowsiness, nervousness, and irritability are well described.
- Anemia (including aplastic anemia), leucopenia, thrombocytopenia, pancytopenia;
- Leukemia (particularly of the myelomonocytic type),
- Lymphomas
- Chromosomal abnormalities
- Cerebral atrophy
- A dry, scaly dermatitis may developed on prolonged or repeated skin exposure to liquid benzene.

Chronic exposure

- Men exposed to benzene at levels close to the permissible limit are more likely to have an abnormal number of chromosomes in their sperm, researchers report in the journal Environmental Health Perspectives.

  Known as aneuploidy, this can adversely impact fertility and fetal development.



Acute exposure: protective measures

- If the benzene release was outside, move away from the area where the benzene was released.
- If the benzene release was indoors, get out of the building.
- If you think you may have been exposed to benzene, you should remove your clothing, rapidly wash your entire body with soap and water.

Acute exposure: protective measures

- Quickly take off clothing that may have benzene on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.
- If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.

Acute exposure: protective measures

- As quickly as possible, wash any benzene from your skin with large amounts of soap and water.
- If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes.
- If you wear contacts, remove them after washing your hands and put them with the contaminated clothing. Do not put the contacts back in your eyes (even if they are not disposable contacts).
- If you wear eyeglasses, wash them with soap and water. You can put your eyeglasses back on after you wash them.

Acute exposure: protective measures

- After you have washed yourself, place your clothing inside a plastic bag. Avoid touching contaminated areas of the clothing. If you can't avoid touching contaminated areas, or you aren't sure where the contaminated areas are, wear rubber gloves or put the clothing in the bag using tongs, tool handles, sticks, or similar objects. Anything that touches the contaminated clothing should also be placed in the bag.
- Seal the bag, and then seal that bag inside another plastic bag. Disposing of your clothing in this way will help protect you and other people from any chemicals that might be on your clothes.

Acute exposure: protective measures

- If someone has swallowed benzene, do not try to make them vomit or give them fluids to drink.
- The vomit could be sucked into their lungs and produce aspirative pneumonitis.

Treatment

- Following from the contaminated atmosphere, treatment should be directed towards symptomatic and supportive measures.
- The adequacy of cardiac and respiratory function must be determined and resuscitation begun if needed.
- Patients with altered mental status should immediately receive I.V. glucose, naloxone and thiamine after blood is drawn for testing.

Treatment

- CNS stimulation may require sedation, usually with a benzodiazepine or barbiturate i.v.
- Severe CNS depression require circulatory and ventilatory support
- Endotracheal intubation and rarely tracheotomy may be necessary.
- Corticosteroids are also used


EXPOSURE TO BENZENE CAN BE
DANGEROUS. ARE YOU AT RISK?
CALL 1.800.782.8492