

1,3-Dichlorobenzene (C₆H₄Cl₂)

CAS 541-73-1; UN 2810

Synonyms include: *m*-dichlorobenzene, *m*-dichlorobenzol, *m*-phenylene dichloride, *meta*-dichlorobenzene.

- **Persons exposed only to 1,3-dichlorobenzene vapor do not pose risk of secondary contamination to others. Persons whose clothing or skin is contaminated with liquid 1,3-dichlorobenzene can cause secondary contamination by direct contact or through off-gassing vapor.**
- **1,3-Dichlorobenzene is a colorless volatile non-flammable liquid at room temperature. 1,3-Dichlorobenzene vapors are heavier than air and may accumulate in low-lying areas. Odor detection cannot be used as an indicator of hazardous concentrations of 1,3-dichlorobenzene.**
- **1,3-Dichlorobenzene is absorbed rapidly and distributed extensively after inhalation and ingestion. Dermal absorption does not appear to be a major route of absorption. 1,3-Dichlorobenzene has been detected in breast milk.**

Description

At ambient temperatures, 1,3-dichlorobenzene is a colorless volatile non-flammable liquid, which apparently has no distinctive odor. 1,3-Dichlorobenzene is partially soluble in water and soluble in alcohol and ether. Flammability limits for 1,3-dichlorobenzene vapors are not available. When 1,3-dichlorobenzene is heated to decomposition, it produces toxic hydrogen chloride gas, a severe pulmonary irritant. 1,3-Dichlorobenzene should be stored at ambient temperature in a well-ventilated area away from heat and sources of ignition such as smoking and open flames (HSDB 2007; ICSC 2003; NJDHSS 1999).

Routes of Exposure

Inhalation

Inhalation is the most likely route of significant exposure to 1,3-dichlorobenzene, which is readily absorbed from the lungs. Acute exposure to 1,3-dichlorobenzene vapors may result in irritation of the eyes and respiratory tract. Odor thresholds are not available for 1,3-dichlorobenzene; odor detection is not an indicator of potentially hazardous concentrations. The vapor is heavier than air and can collect to toxic levels in poorly ventilated or low-lying spaces (ATSDR 2006; HSDB 2007).

Children exposed to the same levels of 1,3-dichlorobenzene vapor as adults may receive larger doses because they have greater lung surface area:body weight ratios and higher minute volumes:weight ratios. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of benzene vapor found nearer to the ground.

Skin/Eye Contact

1,3-Dichlorobenzene may cause ocular irritation similar to that caused by 1,2- and 1,4-dichlorobenzene (ATSDR 2006).

Ingestion

Gastrointestinal absorption of 1,3-dichlorobenzene is rapid. Although hepatotoxicity assessment is not available for 1,3-dichlorobenzene, ingestion of large amounts of the chemical could potentially result in liver damage.

Sources/Uses

1,3-Dichlorobenzene is produced by reacting liquid benzene with gaseous chlorine in the presence of a catalyst at moderate temperature and atmospheric pressure. 1,3-Dichlorobenzene has been used in the production of herbicides, insecticides, pharmaceuticals, and dyes; however, its uses in registered pesticides have been cancelled (ATSDR 2006; HSDB 2007).

Standards and Guidelines

OSHA PEL (permissible exposure limit) = no data (OSHA 1999).

Physical Properties

Description: colorless volatile non-flammable liquid (ATSDR 2006)

Warning properties: unknown

Molecular weight: 147.00 daltons (Lide 2005)

Boiling point: 173 EC (343.4 EF) (Lide 2005)

Melting point: -24.8 EC (-12.6 EF) (Lide 2005)

Vapor pressure: 2.15 mm Hg at 25 EC (77 EF) (ATSDR 2006)

Relative vapor density: 5.07 (air = 1) (Verschuereen 2001)

Specific gravity: 1.29 at 20 EC (68 EF) (relative to water at 4 EC) (Budavari et al. 2001)

Water solubility: 123 mg/L at 25 EC (77 EF) (Verschuereen 2001)

Flammability: no data

Incompatibilities

1,3-Dichlorobenzene forms hydrogen chloride gas when in the presence of strong oxidizers or chemically active metals like aluminum, or when heated to decomposition (HSDB 2007).

Health Effects

- **1,3-Dichlorobenzene may be irritating to the eyes and respiratory tract. Acute inhalation or oral exposure to high concentrations of 1,3-dichlorobenzene may result in liver damage.**
- **Animal studies indicate that 1,3-dichlorobenzene may adversely affect the endocrine system.**

Acute Exposure

Acute exposure to airborne 1,3-dichlorobenzene may cause reversible irritation of the eyes and respiratory tract similar to that observed following exposure to 1,2- or 1,4-dichlorobenzene vapors. Acute inhalation or oral exposure to high levels of 1,3-dichlorobenzene may cause damage to the liver and endocrine systems.

1,3-Dichlorobenzene appears to be metabolized mainly in the liver where reactive products are formed; its metabolites are predominantly excreted by the kidney. 1,3-Dichlorobenzene hepatotoxicity is thought to be caused by reactive metabolites produced in the liver (ATSDR 2006).

Children do not always respond to chemicals in the same manner as adults. Different protocols for managing their care may be needed.

Respiratory

Irritation of the nose and respiratory passages have been reported following acute occupational exposure to 100 ppm of 1,2- or 1,4-dichlorobenzene vapors (ATSDR 2006; HSDB 2007); similar effects might be expected following inhalation exposure to 1,3-dichlorobenzene.

Children may be more vulnerable to gas exposure because of relatively higher minute ventilation per kg and failure to recognize the need to promptly evacuate an area when exposed.

Ocular/Ophthalmic

Acute exposure to high 1,3-dichlorobenzene vapor concentrations may result in ocular irritation similar to that observed from 1,2- or 1,4-dichlorobenzene exposure (ATSDR 2006; HSDB 2007).

<i>Hepatic</i>	Acute inhalation or oral exposure to high levels of 1,3-dichlorobenzene may cause liver damage (ATSDR 2006).
<i>CNS</i>	Inhalation exposure to high vapor concentrations of 1,4-dichlorobenzene has resulted in reported headaches and dizziness (ATSDR 2006). Similar effects might be expected following acute inhalation exposure to high vapor concentrations of 1,3-dichlorobenzene.
<i>Potential Sequelae</i>	There are no known long term effects from acute exposure to 1,3-dichlorobenzene.
Chronic Exposure	Health effects data for chronic exposure to 1,3-dichlorobenzene are not available for humans or animals; oral exposure of rats to 1,3-dichlorobenzene for 90 days at doses as low as 9 and 147 mg/kg/day resulted in histologic thyroid and pituitary lesions, respectively (ATSDR 2006).
<i>Carcinogenicity</i>	The International Agency for Research on Cancer (IARC 1999) has assigned 1,3-dichlorobenzene to Group 3 (not classifiable as to its carcinogenicity to humans). Information regarding the carcinogenicity of 1,3-dichlorobenzene is not available from the U.S. EPA (IRIS 2007).
<i>Reproductive and Developmental Effects</i>	The reproductive or developmental toxicity of 1,3-dichlorobenzene has not been adequately assessed (ATSDR 2006).

Prehospital Management

- **Victims exposed only to 1,3-dichlorobenzene vapor do not pose significant risks of secondary contamination to rescuers outside the Hot Zone. Victims whose clothing or skin is contaminated with 1,3-dichlorobenzene can secondarily contaminate response personnel by direct contact or through off-gassing vapor. Vomitus from patients who have ingested 1,3-dichlorobenzene can also off-gas the vapor.**
- **Airborne 1,3-dichlorobenzene may be irritating to the eyes and respiratory passages.**
- **There is no specific antidote for 1,3-dichlorobenzene. Treatment is supportive, with particular attention to the respiratory system.**

Hot Zone

Rescuers should be trained and appropriately attired before entering the Hot Zone. If the proper equipment is not available, or if rescuers have not been trained in its use, assistance should be obtained from a local or regional HAZMAT team or other properly equipped response organization.

Rescuer Protection

1,3-Dichlorobenzene is absorbed well by inhalation and may be a respiratory-tract irritant (ATSDR 2006; HSDB 2007).

Respiratory Protection: Positive-pressure, self-contained breathing apparatus (SCBA) is recommended in response situations that involve exposure to 1,3-dichlorobenzene (HSDB 2007).

Skin Protection: Chemical-protective clothing is recommended (HSDB 2007).

ABC Reminders

Quickly establish a patent airway; ensure adequate respiration and pulse. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible.

Victim Removal

If victims can walk, lead them out of the Hot Zone to the Decontamination Zone. Victims who are unable to walk may be removed on backboards or gurneys; if these are not available, carefully carry or drag victims to safety.

Victims with chemically-induced acute disorders may suffer from anxiety, especially children who may be separated from a parent or other adult.

Decontamination Zone

Victims exposed only to 1,3-dichlorobenzene vapor do not need decontamination. They may be transferred immediately to the Support Zone. All others require decontamination as described below.

Rescuer Protection

If exposure levels are determined to be safe, decontamination may be conducted by personnel wearing a lower level of protection than that worn in the Hot Zone (described above).

ABC Reminders

Quickly establish a patent airway; ensure adequate respiration and pulse. Stabilize the cervical spine with a collar and a backboard if trauma is suspected. Administer supplemental oxygen as required. Assist ventilation with a bag-valve-mask device if necessary.

Basic Decontamination

Victims who are able and cooperative may assist with their own decontamination. Remove and double-bag contaminated clothing and personal belongings.

Flush 1,3-dichlorobenzene-contaminated skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading the material to unaffected skin (HSDB 2007). Remove contact lenses if easily removable without additional trauma to the eye. Use caution to avoid hypothermia when decontaminating victims, particularly children or the elderly. Use blankets or warmers after decontamination as needed.

Do not induce emesis following ingestion of irritative chemicals such as 1,3-dichlorobenzene. If the victim is alert, asymptomatic, and has a gag reflex, consider prompt dilution with 4–8 oz (120–240 mL) of water (not to exceed 4 oz in a child). Activated charcoal treatment is not recommended for victims who have ingested irritative or corrosive chemicals because it may cause vomiting (HSDB 2007).

Provide reassurance to chemically-contaminated victims during decontamination, particularly children who may suffer separation anxiety if separation from a parent occurs.

Transfer to Support Zone

As soon as basic decontamination is complete, move the victim to the Support Zone.

Support Zone

Be certain that victims have been decontaminated properly (see Decontamination Zone above). Persons who have undergone decontamination or have been exposed only to vapor pose no serious risks of secondary contamination. Support Zone personnel require no specialized protective gear in such cases.

ABC Reminders

Quickly establish a patent airway. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible. Ensure adequate respiration and pulse. Administer supplemental oxygen as required. Establish intravenous access if necessary. Place on a cardiac monitor.

Additional Decontamination

Continue irrigating exposed skin and eyes, as appropriate.

Do not induce emesis following ingestion of irritative chemicals such as 1,3-dichlorobenzene. If not already done, and the victim is alert, asymptomatic, and has a gag reflex, consider prompt dilution with 4–8 oz (120–240 mL) of water (not to exceed 4 oz in a child). Activated charcoal treatment is not recommended for victims who have ingested irritative or corrosive chemicals because it may cause vomiting (HSDB 2007).

Advanced Treatment

In cases of respiratory compromise, secure airway and support respiration according to advanced life support (ALS) protocols.

Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be

administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). 1,3-Dichlorobenzene poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution; repeat every 20 minutes as needed while observing for myocardial variability.

Patients who are comatose, hypotensive, or having seizures or cardiac arrhythmias should be treated according to ALS protocols when clinically indicated.

If evidence of shock or hypotension is observed, begin fluid administration. For adults with systolic pressure less than 80 mm Hg, bolus perfusion of 1,000 mL/hour intravenous saline or lactated Ringer's solution may be appropriate. Higher adult systolic pressures may necessitate lower perfusion rates. For children with compromised perfusion, administer a 20 mL/kg bolus of normal saline over 10–20 minutes, followed by reassessment of perfusion and further management as clinically appropriate.

Transport to Medical Facility

Only decontaminated patients or patients not requiring decontamination should be transported to a medical facility. "Body bags" can increase exposure and are not recommended.

Report to the base station and the receiving medical facility the condition of the patient, treatment given, and estimated time of arrival at the medical facility.

If 1,3-dichlorobenzene has been ingested, prepare the ambulance in case the victim vomits. Have ready several towels and open plastic bags to quickly clean up and isolate vomitus. Take measures to avoid pulmonary aspiration, i.e., place patient in lateral position.

Multi-Casualty Triage

Consult with the base station physician or the regional poison control center for advice regarding triage of multiple victims.

Patients with evidence of significant inhalation exposure (irritation of eyes or respiratory passages) and patients who ingested 1,3-dichlorobenzene should be transported to a medical facility for evaluation.

Patients who have inhalation exposure who did not experience irritation of the eyes or respiratory passages are not likely to have had a significant exposure. After their names, addresses, and telephone numbers are recorded, these patients may be released from the scene with instructions to rest and to seek medical care promptly if symptoms develop (see *Patient Information Sheet* below).

Emergency Department Management

- **Hospital personnel can be secondarily exposed by direct contact or by vapor off-gassing from heavily contaminated clothing or skin. Patients do not pose contamination risks after clothing is removed and the skin is washed. Vomitus from patients who have ingested 1,3-dichlorobenzene may off-gas 1,3-dichlorobenzene vapor.**
- **Airborne 1,3-dichlorobenzene may be irritating to the eyes and respiratory passages.**
- **There is no specific antidote for 1,3-dichlorobenzene. Treatment is supportive, with particular attention to the respiratory system.**

Decontamination Area

Previously decontaminated patients and patients exposed only to 1,3-dichlorobenzene vapor who have no respiratory or eye irritation may be transferred immediately to the Critical Care Area. Other patients will require decontamination as described below.

Be aware that use of protective equipment by the provider may cause anxiety, particularly in children, resulting in decreased compliance with further management efforts.

ABC Reminders

Evaluate and support airway, breathing, and circulation. Children may be more vulnerable to irritative agents than adults because of the smaller diameter of their airways.

Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). 1,3-Dichlorobenzene poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution; repeat every 20 minutes as needed while observing for myocardial variability.

Patients who are comatose, hypotensive, or have seizures or ventricular arrhythmias should be treated in the conventional manner.

Basic Decontamination

Patients who are able and cooperative may assist with their own decontamination. If the patient's clothing is wet with 1,3-dichlorobenzene, remove and double-bag the contaminated clothing and personal belongings.

Flush 1,3-dichlorobenzene-exposed skin or eyes with copious amounts of running water (HSDB 2007). Remove contact lenses if easily removable without additional trauma to the eye. Use caution to avoid hypothermia when decontaminating victims, particularly children or the elderly. Use blankets or warmers after decontamination as needed.

Do not induce emesis following ingestion of irritative chemicals such as 1,3-dichlorobenzene. Activated charcoal treatment is not recommended for victims who have ingested irritative or corrosive chemicals because it may cause vomiting (HSDB 2007).

Critical Care Area

Be certain that appropriate decontamination has been carried out (see *Decontamination Area* above).

ABC Reminders

Evaluate and support airway, breathing, and circulation as in ABC Reminders above. Children may be more vulnerable to irritative agents than adults because of the smaller diameter of their airways. Establish intravenous access in seriously ill patients.

Patients who are comatose, hypotensive, or have seizures or cardiac arrhythmia should be treated in the conventional manner.

<i>Inhalation Exposure</i>	Administer supplemental oxygen by mask to patients who have respiratory symptoms. Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). 1,3-Dichlorobenzene poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.
<i>Skin Exposure</i>	If the skin was in prolonged contact with liquid 1,3-dichlorobenzene, rinse the skin in running water. Because of their larger surface area:weight ratio, children are more vulnerable to toxicants that affect the skin.
<i>Eye Exposure</i>	Ensure that adequate eye irrigation has been completed. Examine the eyes for corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have corneal injuries.
<i>Ingestion Exposure</i>	Do not induce emesis following ingestion of irritative chemicals such as 1,3-dichlorobenzene. Activated charcoal treatment is not recommended for victims who have ingested irritative or corrosive chemicals because it may cause vomiting (HSDB 2007). Consider gastric lavage with a small nasogastric tube if: (1) a large dose has been ingested; (2) the patient's condition is evaluated within 30 minutes; (3) the patient has oral lesions or persistent esophageal discomfort; and (4) the lavage can be administered within 1 hour of ingestion. Care must be taken when placing the gastric tube because blind gastric-tube placement may further injure the chemically damaged esophagus or stomach.

Gastric lavage is useful in certain circumstances to remove caustic material and prepare for endoscopic examination. Because the risk of perforation from NG intubation is relatively high in children, lavage is discouraged in children unless intubation is performed under endoscopic guidance.

Consider endoscopy to evaluate the extent of gastrointestinal tract injury. Extreme throat swelling may require airway management using ALS protocols.

Antidotes and Other Treatments

There is no antidote for 1,3-dichlorobenzene. Treatment is supportive, with particular attention to the respiratory system.

Laboratory Tests

The diagnosis of acute 1,3-dichlorobenzene toxicity may be primarily clinical for inhalation exposure, based on symptoms of respiratory tract irritation or respiratory distress. Ingestion of a large amount of 1,3-dichlorobenzene may result in compromised liver function. In symptomatic patients, monitor complete blood count and liver function (HSDB 2007).

1,3-Dichlorobenzene levels in blood or expired air are not clinically useful but can be used to document an exposure. Exposure to 1,3-dichlorobenzene is also suggested by detection of sulfur-containing metabolites such as 2,4- and 3,5-dichlorophenyl methyl sulfoxides and sulfones in urine of 1,3-dichlorobenzene-treated rats; however, these metabolites not specific for 1,3-dichlorobenzene (ATSDR 2006).

Disposition and Follow-up

Consider hospitalizing symptomatic patients who have significant inhalation exposure and patients who have ingested large amounts of 1,3-dichlorobenzene.

Patient Release

Patients who have remained asymptomatic 6–12 hours after exposure may be discharged, advised to rest and to seek medical care promptly if symptoms develop (see the *1,3-Dichlorobenzene—Patient Information Sheet* below).

Follow-up

Obtain the name of the patient's primary care physician so that the hospital can send a copy of the ED visit to the patient's doctor.

Follow-up laboratory evaluation of hepatic function should be arranged for severely exposed patients. Patients who have corneal damage should be re-examined within 24 hours.

Reporting

If a work-related incident has occurred, you may be legally required to file a report; contact your state or local health department.

Other persons may still be at risk in the setting where this incident occurred. If the incident occurred in the workplace, discussing it with company personnel may prevent future incidents. If a public health risk exists, notify your state or local health department or other responsible public agency. When appropriate, inform patients that they may request an evaluation of their workplace from OSHA or NIOSH. See Appendices III and IV for a list of agencies that may be of assistance.

1,3-Dichlorobenzene Patient Information Sheet

This handout provides information and follow-up instructions for persons who have been exposed to 1,3-dichlorobenzene.

What is 1,3-dichlorobenzene?

At room temperature, 1,3-dichlorobenzene is a colorless volatile non-flammable liquid without apparent distinctive odor. 1,3-Dichlorobenzene is used to make other chemicals. 1,3-Dichlorobenzene has been used in the production of herbicides, insecticides, pharmaceuticals, and dyes; however, its uses in registered pesticides have been cancelled.

What immediate health effects can be caused by exposure to 1,3-dichlorobenzene?

Breathing 1,3-dichlorobenzene may cause irritation of the eyes and respiratory passages similar to that observed from exposure to other dichlorobenzenes. Breathing or swallowing very large amounts can cause liver damage. Generally, the more serious the exposure, the more severe the symptoms.

Can 1,3-dichlorobenzene poisoning be treated?

There is no antidote for 1,3-dichlorobenzene, but its acute effects can be treated and most exposed persons recover completely. Persons who have swallowed or inhaled large amounts of 1,3-dichlorobenzene might need to be hospitalized.

Are any future health effects likely to occur?

Delayed or long-term effects generally do not occur from single exposures to 1,3-dichlorobenzene. A high-dose exposure, or an exposure over many years, can affect the liver.

What tests can be done if a person has been exposed to 1,3-dichlorobenzene?

Blood and urine can be tested for the presence of 1,3-dichlorobenzene breakdown products. However, these tests are generally not available to your doctor and have limited usefulness in treatment. If a severe exposure has occurred, blood and other tests might show whether the liver has been damaged. Testing is not needed in every case.

Where can more information about 1,3-dichlorobenzene be found?

More information about 1,3-dichlorobenzene can be obtained from your regional poison control center; the state, county, or local health department; the Agency for Toxic Substances and Disease Registry (ATSDR); your doctor; or a clinic in your area that specializes in occupational and environmental health. If the exposure happened at work, you may wish to discuss it with your employer, the Occupational Safety and Health Administration (OSHA), or the National Institute for Occupational Safety and Health (NIOSH). Ask the person who gave you this form for help in locating these telephone numbers.

Follow-up Instructions

Keep this page and take it with you to your next appointment. Follow *only* the instructions checked below.

Call your doctor or the Emergency Department if you develop any unusual signs or symptoms within the next 24 hours, especially:

- irritation of eyes
- irritation of respiratory passages

No follow-up appointment is necessary unless you develop any of the symptoms listed above.

Call for an appointment with Dr. _____ in the practice of _____.

When you call for your appointment, please say that you were treated in the Emergency Department at _____ Hospital by _____ and were advised to be seen again in _____ days.

Return to the Emergency Department/_____ Clinic on (date) _____ at _____ AM/PM for a follow-up examination.

Do not perform vigorous physical activities for 1 to 2 days.

You may resume everyday activities including driving and operating machinery.

Do not return to work for ____ days.

You may return to work on a limited basis. See instructions below.

Avoid exposure to cigarette smoke for 72 hours; smoke may worsen the condition of your lungs.

Avoid drinking alcoholic beverages for at least 24 hours; alcohol may worsen injury to your stomach or have other effects.

Avoid taking the following medications: _____

You may continue taking the following medication(s) that your doctor(s) prescribed for you:

Other instructions: _____

- Provide the Emergency Department with the name and the number of your primary care physician so that the ED can send him or her a record of your emergency department visit.

- You or your physician can get more information on the chemical by contacting: _____ or _____, or by checking out the following Internet Web sites: _____;

_____.

Signature of patient _____ Date _____

Signature of physician _____ Date _____

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