Chemical Emergency Medical Guideline

Information and recommendations for healthcare professionals

Styrene

CAS No.: 100-42-5

GHS symbols:

GHS06
Acute toxicity

GHS08
Health hazard

Signal word: Danger

Hazard statement:

H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H372	Damages organs (hearing) through prolonged or repeated exposure.
H361d	May cause harm to the unborn child.

Overview

- There is no danger from contact with patients who have only been exposed to styrene vapors. A patient who is wet with liquid styrene (boiling point 145°C) or whose clothing is wet with liquid styrene may endanger other people through direct contact or through styrene vapors.
- Styrene irritates the skin, eyes and respiratory tract and can cause headaches, nausea, dizziness, weakness, confusion and loss of consciousness. Disorders of the central and peripheral nervous system have been observed.
- There is no known specific antidote. Treatment depends on the extent of exposure and the symptoms.

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1. Information on the substance

Styrene (C_8H_8), CAS 100-42-5
Synonyms: vinylbenzene, phenylethylene, cinnamene
At room temperature (boiling point 145°C), styrene is a clear to slightly yellowish, oily liquid. The vapor and liquid are flammable. Styrene has a sweet, pungent odor. The odor threshold is 0.017 to 1.9ppm, with a rapid habituation effect. It is slightly soluble in water but highly soluble in alcohol, ether and acetone and polymerizes spontaneously. Combustion produces carbon monoxide.
Styrene is an organic solvent with low vapor pressure and is used in the manufacture of polystyrene, surface coatings, polyester resins, copolymers with acrylonitrile and butadiene, and as a chemical intermediate. Styrene-butadiene rubber is the most widely used synthetic rubber.

2. Exposition

2.1. Inhalation

Exposure to styrene occurs mainly through inhalation. Styrene is rapidly absorbed through the lungs.

2.2. Skin/eye contact

Styrene is absorbed through the skin and can lead to general symptoms of poisoning.

2.3. Ingestion

Styrene is absorbed through the gastrointestinal tract. Ingestion is rare in the workplace.

3. Acute health effects

3.1. Dose-response relationship

Styrene concentration		Effect/effects
0.017 - 1.9 ppm	-	Odor threshold (with rapid habituation)
50 ppm	-	Subjective complaints such as headaches, weakness, concentration problems
100 ppm	-	Mild irritation of the eyes and throat
400–500 ppm	-	Moderate, still tolerable irritation
800 ppm	-	Immediate irritation of the eyes and throat, increased nasal secretion, metallic taste, dizziness and drowsiness
2500 ppm	-	Life-threatening if exposed for more than 8 hours
10000 ppm	-	Life-threatening if exposed for more than 20–30 minutes

The maximum workplace concentration for styrene is 20 ppm, the short-term exposure limit for the workplace (15 minutes) is 40 ppm (Germany, Committee for Hazardous Substances AGS).

3.2. Respiratory

Styrene irritates the upper respiratory tract.

3.3. Skin contact / eye contact

Local exposure to liquid styrene can cause skin irritation.
Local exposure to liquid styrene or high vapor concentrations can cause eye irritation with redness, burning, tearing or spasmodic eyelid closure.

3.4. Systemic effects

The diagnosis of styrene poisoning is based primarily on clinical signs of irritation and central nervous system disorders, together with a high probability of styrene exposure.
Styrene can cause general symptoms of poisoning such as headache, nausea, dizziness, weakness, confusion and loss of consciousness. Exposure to high concentrations may cause signs of upper respiratory tract irritation, followed by asphyxia, muscle weakness, cardiac arrhythmia, coma and respiratory arrest. Central and peripheral nervous system disorders and liver enzyme changes have been observed with chronic exposure.

3.5. Possible consequences

If the patient survives the first 48 hours after exposure, further improvement in symptoms can be expected. After acute exposure, lung function usually returns to normal within 7 to 14 days. Complete recovery is usually achieved. Increased sensitivity to irritants may persist and cause bronchospasm or chronic bronchitis. Such "reactive airways dysfunction syndrome" (RADS) may persist for several years. Destruction of lung tissue or scarring can lead to chronic bronchial dilation and increased susceptibility to infection.

Central and peripheral neuropathy (impaired psychomotor function, dementia, distal hypesthesia and delayed nerve conduction velocity) and ototoxicity have been observed in chronically exposed workers.

4. Measures

4.1. Self-protection of first responders

If there is a suspicion that the area the helper must enter contains styrene, a self-contained breathing apparatus and a chemical protection suit must be worn.
There is no danger from contact with patients who have only been exposed to styrene vapors. A patient who is wet with liquid styrene or whose clothing is wet with liquid styrene may endanger other people through direct contact or through styrene gas emissions.

4.2. Rescue

Patients should be removed from the danger zone immediately. If they are unable to walk unaided, they should be removed from the danger zone quickly using suitable means, taking care to protect themselves. The "A, B, C procedure" then has absolute priority.

A) Clear the airways (check for blockages caused by the tongue or foreign objects)
B) Ventilation (check the patient's breathing; if necessary, begin ventilation with adequate self-protection, e.g. breathing mask)
C) Circulation (begin resuscitation for any person who does not respond to verbal commands and is not breathing normally)

4.3. Cleaning

Patients who have only been exposed to styrene vapors show no signs of skin or eye irritation do not require any special cleaning measures, unlike all others. If possible, patients should assist in cleaning themselves. If liquid styrene has been exposed and clothing is contaminated, it must be removed and securely wrapped.
In the event of styrene exposure, rinse the eyes with water or neutral saline solution for at least 15 minutes. Remove any contact lenses, if possible, without causing additional danger to the eye. Other important first aid measures must be continued during this time.
Rinse affected skin and hair with water for at least 15 minutes. Other important first aid measures must be continued during this time. Protect eyes while rinsing.

4.4. Initial treatment (preclinical or clinical)

Empirical therapy; no specific antidote available.

The following measures are recommended if the styrene concentration is 100ppm or more (depending on the duration of exposure), if symptoms are present (e.g. irritation of the eyes or upper respiratory tract) or if no concentration can be estimated but relevant exposure is likely:

- Oxygen administration
- Administration of 8 sprays of beclomethasone (800µg beclomethasone dipropionate) from a metered dose inhaler.

If there are signs of airway constriction (e.g. bronchospasm or stridor)

- Nebulization of adrenalin (epinephrine): mix 2mg adrenalin (2ml) with 3 ml NaCl 0.9% and administer via a nebulizer mask
- Administration of a ß2-selective adrenoceptor agonist, e.g. four puffs of terbutaline or salbutamol or fenoterol (one puff usually contains 0.25mg terbutaline sulphate; or 0.1mg salbutamol; or 0.2mg fenoterol); this can be repeated once after 10 minutes.

Alternatively, 2.5mg salbutamol and 0.5mg ipratropium bromide can be administered via a nebulizer mask.
If inhalation is not possible, administer terbutaline sulphate (0.25mg to 0.5mg) subcutaneously or salbutamol (0.2mg to 0.4mg over 15 minutes) intravenously.
Intravenous administration of 250mg methylprednisolone (or an equivalent steroid dose).

If there are signs of toxic pulmonary oedema (e.g. frothy sputum, moist rales)

- CPAP therapy
- Intravenous administration of 1000mg methylprednisolone (or an equivalent steroid dose)
  In case of (increasing) respiratory insufficiency, advanced airway management, e.g. endotracheal intubation or coniotomy if necessary.

Note: The efficacy of corticosteroid administration has not yet been proven in controlled clinical trials.

Prophylactic administration of antibiotics is not recommended but may be considered based on the results of sputum cultures.

Patients with an exposure concentration of 100ppm or more (depending on the duration of exposure) and patients for whom no exposure dose can be estimated but who are very likely to have been exposed should be transported immediately to a hospital with intensive care facilities.

Skin contact with liquid styrene may cause skin irritation; treat this as a burn.
Exposure to the eyes can also cause irritation; this should also be treated as a burn. Consult an ophthalmologist.

Patients who are conscious and able to swallow should, if possible, be given 50 g of activated charcoal (or 1 g/kg body weight for children weighing up to 50 kg). Activated charcoal may be administered repeatedly at any time to complete decontamination if there are signs or suspicion of ongoing absorption. For multiple doses, start with the single-dose amount mentioned above, followed by the same dose every four hours or half the dose every two hours. Avoid inhaling the product.

Avoid vomiting; it can cause irritation of the esophagus and aspiration.

Note: Any contact with liquid styrene in the facial area can have serious consequences.

4.5. Further action and treatment

In addition to taking medical history, performing a physical examination and checking vital signs, spirometry should be carried out. However, various laboratory tests can be performed to monitor and assess complications. Blood count, glucose and electrolytes should be determined as a matter of routine.

4.6. Biomonitoring

To assess the systemic dose absorbed after exposure, biomonitoring can be performed by determining the concentration of mandelic acid and phenylglyoxylic acid in the urine.

4.7. Discharge of the patient / instructions for further rules of conduct

Clinically asymptomatic patients who have been exposed to a concentration of less than 100ppm (depending on the duration of exposure) and show no abnormal clinical findings and no signs of toxic effects after an appropriate follow-up period may be discharged under the following circumstances:

- Information and recommendations for patients with instructions for further action were provided verbally and in writing. The patient was advised to seek immediate medical attention if any health problems arise.
- The patient is aware of and understands the toxic effects of styrene.
- The attending physician has been informed that regular contact between the patient and the physician is possible in the following 24 hours.
- Drinking alcohol should be prohibited for at least 72 hours.
- Heavy physical work should not be done in the following 24 hours.
- Do not smoke or be exposed to cigarette smoke for at least 72 hours; smoke can impair lung function.
- Patients with serious skin or eye injuries should be re-examined after 24 hours.

5. References

Berufsgenossenschaft der Chemischen Industrie, Hrsg. Styrol. Heidelberg: Jedermann-Verlag, 1999. (Merkblätter für gefährliche Arbeitsstoffe; M054)

Buttgereit F, Dimmeler S, Neugebauer E, Burmester GR. Wirkungsmechanismen der hochdosierten Glucocorticoidtherapie. Dtsch Med Wschr 1996; 121: 248-252

Diller WF. Anmerkungen zum Unglück in Bhopal. Dtsch Med Wschr 1985; 110: 1749-1751

Ellenhorn MJ, Schonwald S, Ordog G, Wasserberger J. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed., Baltimore: Williams & Wilkins, 1997: 1422-3, 1494

Goldfrank LR, Flomenbaum NE, Lewin NA, Weisman RS, Howland MA, Hoffman RS. Toxicologic Emergencies. 6th ed., Norwalk, Appleton & Lange, 1998: 466

International Program on Chemical Safety (IPCS): Poison Information Monographs Styrene, 1996

NIOSH: Criteria for a recommended standard occupational exposure to styrene. DHHS, Cincinnati, 1983; DHHS (NIOSH) Publication No. 83-119

Foncerrada G et al, Safety of Nebulized Epinephrine in Smoke Inhalation Injury, J Burn Care Res 2017;38:396–402

Walker PGF et al, Diagnosis and management of inhalation injury: an updated review, Critical Care (2015) 19:351

Olasveengen TM, Semeraro F, et. Al: European Resuscitation Council Guidelines 2021: Basic Life Support. Resuscitation 2021, 161: 98-114

Hoegberg, L. C. G., Gosselin, S., Buckley, N. A., Wood, D. M., Shepherd, G., Hanley, J., … Hoffman, R. S. (2026). Recommendations from the Clinical Toxicology Recommendations Collaborative on the administration of activated charcoal in acute oral overdose. *Clinical Toxicology*, 1–127. https://doi.org/10.1080/15563650.2025.2609807

Administrative Information

Document Type	Chemical Emergency Medical Guideline
Number of Version	EN.2.0.0
Initial Publication	01.01.2026
Next Revision	2029
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