Chemical Emergency Medical Guideline

Information and recommendations for healthcare professionals

Acrylamide

CAS No.: 79-06-1

GHS symbols:

GHS06
Acute toxicity

GHS08
Health hazard

Signal word: Danger

Hazard statements:

H301	Toxic if swallowed.
H317	May cause allergic skin reactions.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Damages organs through prolonged or repeated exposure.
H361f	May damage fertility.

Overview

- There is no danger from contact with patients who have only been exposed to acrylamide vapors. A patient who is wet with aqueous acrylamide solution, or whose clothing is wet with it, may endanger other persons through direct contact or through acrylamide gas emissions.
- Acrylamide irritates the skin, eyes and respiratory tract and can cause hallucinations, a drop in blood pressure, cramps, gastrointestinal and respiratory problems. Disorders of the central and peripheral nervous system may occur.
- 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

Acrylamide (CH_2=CHCONH$_2$), CAS 79-06-1
Synonyms: acrylic acid amide, vinylamide
At room temperature (melting point 84.5 °C), acrylamide is present in the form of colorless and odorless crystals. It is soluble in acetone and ether and miscible with water and alcohol. Acrylamide is stable at room temperature, but it is highly reactive and polymerizes rapidly when heated to its melting point or exposed to UV light. For this reason, acrylamide is usually handled as a stabilized aqueous solution. Thermal decomposition products include carbon monoxide, carbon dioxide, ammonia and nitrogen oxides.
Acrylamide is used as a reactive monomer and intermediate in the production of organic chemicals and for the manufacture of acrylamide polymers and copolymers, such as adhesives, fibers, paper additives, molded parts, flocculants and textiles.

2. Exposition

2.1. Inhalation

Exposure to acrylamide occurs mainly through inhalation. Acrylamide is rapidly absorbed through the lungs.

2.2. Skin/eye contact

Acrylamide is absorbed through the skin and can cause symptoms of poisoning.

2.3. Ingestion

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

3. Acute health effects

3.1. Dose-response relationship

There are no quantitative dose-response relationships for humans. In general, acrylamide exposure in the workplace is low. There is evidence that central nervous system disorders can occur after high acute exposure and peripheral neurological disorders after chronic exposure to low concentrations.
The maximum workplace concentration for acrylamide is 0.03mg/m^3. The concentration to which a person can be exposed for 30 minutes without suffering permanent damage to their health is specified as 600mg/m^3(self-rescue/escape).

3.2. Respiratory tract

Acrylamide irritates the upper respiratory tract.

3.3. Skin contact

Local exposure to aqueous acrylamide solution may cause skin irritation.

3.4. Eye contact

Local exposure to aqueous acrylamide solution or high vapor concentrations can cause severe eye irritation with redness, burning, tearing or spasmodic eyelid closure.

3.5. Systemic effects

Acrylamide can cause symptoms of poisoning such as hallucinations, sudden drops in blood pressure, convulsions, gastrointestinal and respiratory problems. Disorders of the central and peripheral nervous system may occur. Respiratory depression and circulatory collapse may occur. These symptoms may also occur hours after acute high-dose exposure.

3.6. Central Nervous System

Central and peripheral neurological disorders may occur.

3.7. 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 may lead to chronic bronchial dilation and increased susceptibility to infection. Central and peripheral neuropathy (weakness, paresthesia, fatigue, lethargy, decreased tactile and vibration sensitivity, decreased reflexes, scaling of the palms and soles, sweating, and peripheral circulatory disorders) has been observed in chronically exposed workers.

3.8. Carcinogenicity

According to Directive EC 1272/2008, acrylamide is classified as follows:
Carc. 1B (probably carcinogenic to humans; mainly based on findings in animals) and Muta. 1B (it is assumed that the substance causes heritable damage to human germ cells).

4. Measures

4.1. Self-protection of assistants

If there is a suspicion that the area the helper must enter contains acrylamide, 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 acrylamide vapors. A patient who is wet with aqueous acrylamide solution, or whose clothing is wet with it, may endanger other people through direct contact or through evaporating acrylamide.

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 appropriate means, taking care to protect themselves. The "A, B, C procedure" 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 acrylamide vapors and show no signs of skin or eye irritation do not require any special cleaning measures, unlike all others.
If possible, patients should assist in their own decontamination. If they have been exposed to an aqueous acrylamide solution and their clothing is contaminated, it must be removed and securely wrapped.

If the eyes have been exposed to acrylamide or if there is eye irritation, rinse with water or a neutral saline solution for at least 15 minutes. If eye rinsing is impeded by spasmodic eyelid closure, the use of a local anesthetic solution (e.g. lidocaine, oxybuprocaine) may be considered. Remove any contact lenses, if possible, without causing additional danger to the eye. Other important emergency measures must be continued in the meantime.

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.
Avoid vomiting; this may cause irritation of the esophagus and aspiration.

4.4. Estimation of inhaled dose

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 likely to have been exposed should be transported immediately to a hospital with intensive care facilities.

4.5. Initial treatment (preclinical or clinical)

The diagnosis of acrylamide poisoning is based primarily on clinical signs of irritation and central nervous system disorders, together with confirmed or probable exposure to acrylamide.

Empirical therapy; no specific antidote available.
The following measures are recommended if acrylamide exposure has occurred and symptoms are present (e.g. irritation of the eyes or upper respiratory tract):

- 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 3ml 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, if necessary, coniotomy.

Note: The development of toxic pulmonary oedema after inhalation of acrylamide is rather unlikely. The efficacy of corticosteroid administration has not yet been proven in controlled clinical studies.

Skin contact with aqueous acrylamide solution may cause skin irritation; this should be treated as a burn. Exposure of the eyes may 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.

Note: Any contact with aqueous acrylamide solution in the facial area can have serious consequences.

4.6. Further procedure and treatment

In addition to taking medical history, performing a physical examination and checking vital signs, spirometry should be carried out. Laboratory tests can be performed to monitor and assess complications. Blood count, liver enzymes, glucose and electrolytes should be checked routinely.

If pulmonary symptoms persist, a chest X-ray may be considered. Prophylactic antibiotics are not routinely recommended.

4.7. Biomonitoring

Biomonitoring with determination of the concentration of acrylamide mercapturic acid (AAMA) in urine can be performed to assess the systemic dose absorbed after exposure.

4.8. Discharge of the patient / instructions for further action

Clinically asymptomatic patients who have only been exposed to low concentrations of acrylamide or have had brief (less than 15 minutes) or had only minor contact with aqueous acrylamide solution and who show unremarkable clinical examination 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 acrylamide.
- The attending physician has been informed that regular contact between the patient and the physician is possible in the following 24 hours.
- No alcohol consumption for at least 72 hours.
- Heavy physical work should not be done in the following 24 hours.
- Do not smoke or be around cigarette smoke for at least 72 hours; smoke can worsen lung function.
- Patients with serious skin or eye injuries should be re-examined after 24 hours.

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