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## Information and recommendations for paramedics and doctors at the site

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- Patients whose clothing or skin is contaminated with aniline can secondarily contaminate rescue and medical personnel by direct contact or through evaporation of aniline.
  - Aniline is rapidly absorbed after inhalation and ingestion as well as through intact skin.
  - Aniline exposure can cause methemoglobinemia and red blood cell hemolysis, which impairs the delivery of oxygen to tissues. Depression of the central nervous system and cardiovascular collapse may result.
  - Immediate treatment for aniline overexposure consists of cardiorespiratory support and intravenous administration of the antidote toluidine blue. If toluidine blue is not available, methylene blue is the recommended antidote.
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### 1. Substance information

Aniline (C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>), CAS 62-53-3

Synonyms: aminobenzene, aminophen, benzenamine, phenylamine. At room temperature, aniline has a low vapor pressure and is a clear to slightly yellow, oily liquid that darkens to brown color on exposure to air. It is slightly soluble in water. Aniline has an aromatic or fishy odor. Aniline is synthesized by catalytic hydrogenation of nitrobenzene or by ammonolysis of phenol. It is used in the synthesis of a variety of products including polyurethane foam, photographic developers, rubber, dyes, and crop protection products.

### 2. Routes of exposure

#### *Inhalation*

**Inhaled aniline is rapidly and significantly absorbed from the lungs, leading to systemic toxicity.** Aniline's odor usually provides an adequate warning of hazardous concentrations. Aniline vapor is heavier than air and may cause asphyxiation in poorly ventilated, low-lying or enclosed spaces.

#### *Skin/eye contact*

Contact with liquid aniline usually causes only mild irritation of the eyes. **However, liquid aniline or aniline vapor are absorbed very well through the skin and may cause systemic toxicity.**

#### *Ingestion*

Involuntary ingestion of aniline is unlikely. Ingestion can lead rapidly to severe systemic toxicity.

### 3. Acute health effects

**Aniline exposure can cause methemoglobinemia and hemolysis, which impairs the delivery of oxygen to tissues.**

Aniline concentrations up to 30-50 ppm over several hours caused only minor health disturbances while concentrations greater than 100 ppm could not be tolerated over more than 1 hour without major adverse health effects.

Signs and symptoms expected at various percentages of methemoglobin formation are outlined below. Patients who have underlying diseases may develop signs and symptoms at even lower methemoglobin percentages. Methemoglobin levels of about 5% may be caused by smoking.

<u>Methemoglobin percentages</u>	<u>Signs and symptoms</u>
15-30	- Gray to bluish color of the skin
30-50	- Headache, fatigue, dizziness, rapid heart rate, mild shortness of breath
50-70	- Stupor, slow heart rate, respiratory depression, irregular heart rhythm, acid-base imbalance
60-70	- Cardiac arrest, loss of consciousness, coma
> 90	- Death

Acute aniline exposure can cause dysuria, hematuria and acute kidney failure.

Absorption of high amounts of aniline might lead to liver damage and jaundice.

Aniline exposure usually causes only mild eye, nose, and throat irritation. When methemoglobin levels are 15 % to 30 %, the patient may become bluish in color, which is due to the dark color of methemoglobin and not to inadequate oxygen in the blood. Methemoglobin levels exceeding 90 % are usually fatal.

Acute or delayed hemolytic anemia caused by destruction of red blood cells may result from aniline exposure. **Persons with glucose-6-phosphate dehydrogenase deficiency are at increased risk of aniline-induced hemolysis.**

#### 4. Actions

##### *Rescuer self-protection*

**If the zone which has to be entered by the rescuer is suspected of containing aniline in response situations that involve exposure to potentially unsafe levels of aniline vapor (concentration of 10 ppm or greater) or contact with liquid aniline, pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn.** Use appropriate protective gloves, e.g. butyl rubber gloves or latex gloves (thickness greater than 1 mm, **not** those smaller ones commonly used by health personal).

Rescuer exposure to a concentration lower than 10 ppm might be accepted without protective measures only for acute rescue operations. Patients whose clothing or skin is contaminated with aniline may secondarily contaminate rescue and medical personnel by direct contact or through evaporation of aniline.

##### *Patient recovery*

Patients should be removed from the contaminated zone immediately. Patients who are unable to walk may be removed on backboards or stretchers; if these are not available, carefully remove/transport patients with appropriate action to a safe zone, taking into account your self-protection.

Immediate priorities must follow the "**A, B, C's**" (Airway, Breathing, Circulation) of resuscitation.

##### *Decontamination*

Patients exposed only to aniline vapor who have no evidence of eye irritation do not need decontamination. All others require decontamination.

Patients who are able and cooperative may assist with their own decontamination. If the exposure involved liquid aniline and if clothing is contaminated, remove and double-bag the clothing.

**Assure that exposed or irritated eyes have been irrigated with plain water or saline for at least 15 minutes.** If not, continue eye irrigation during other basic care and transport.

Remove contact lenses if present and easily removable without additional trauma to the eye.

**Assure that exposed skin and hair have been flushed with soap and water for at least 15 minutes.** If not, continue flushing during other basic care and transport. Protect eyes during flushing of skin and hair.

*Initial treatment  
of methemoglobinemia*

**If signs of hypoxemia are present, supplemental oxygen should be administered.**

Intubation of the trachea or an alternative airway management should be considered in cases of respiratory compromise. When the patient's condition precludes this, consider cricothyrotomy if equipped and trained to do so.

Methemoglobinemia can be detected at the bedside by the characteristic chocolate-brown color that it imparts to blood. Methemoglobin levels greater than 10% can usually be detected by comparing a drop of the patient's blood with a drop of normal blood on white filter paper or gauze.

**The following measures are recommended for patients who demonstrate symptoms (not only cyanosis, but also headache, fatigue, dizziness, rapid or irregular heart rate, respiratory distress) suggesting a methemoglobin level of more than 30%:**

*Antidotal treatment*

**Initially, establishment of intravenous access and intravenous administration of toluidine blue over 5 to 10 minutes (2-4 mg/kg body weight; 0.07 to 0.14 ml/kg body weight of a 3% solution). If toluidine blue is not available, use intravenous methylene blue at a dosage of 1-2 mg/kg body weight over 5 to 10 minutes (0.1 to 0.2 ml/kg body weight of a 1% solution).** In persons with glucose-6-phosphate dehydrogenase deficiency, toluidine blue or methylene blue might not be useful but cause additional hemolysis.

**All patients who might have been exposed to aniline concentrations greater than 30 ppm or who have significant dermal exposure affecting more than 100 cm<sup>2</sup> (15 square inches) of skin should be transferred to a hospital/emergency department.**

The administration of toluidine blue can be repeated once after 30 minutes, of methylene blue after 60 minutes, depending upon the methemoglobin level and the clinical condition of the patient.

*Patient release/  
follow-up instructions*

**Asymptomatic patients exposed to a concentration less than 30 ppm and without significant dermal exposure as well as patients who have a normal clinical examination and no signs or symptoms of toxicity may be discharged after an appropriate observation period in the following circumstances:**

- a) The evaluating physician is experienced in the evaluation of individuals with aniline exposure.
- b) Information and recommendations for patients with follow-up instructions are provided verbally and in writing. Patients are advised to seek medical care promptly if symptoms develop or recur.
- c) The physician is comfortable that the patient understands the health effects of aniline and the provided follow-up instructions.
- d) Site medical is notified, so that the patient may be contacted at regular intervals in the 24-hour period following release.
- e) Heavy physical work should be precluded for 24 hours.
- f) Exposure to cigarette smoke should be avoided for 72 hours; the smoke may worsen the condition of the lungs and methemoglobinemia.

In this document BASF has made a diligent effort to ensure the accuracy and currency of the information presented but makes no claim that the document comprehensively addresses all possible situations related to this topic. This document is intended as an additional resource for paramedics and doctors at the site in assessing the condition and managing the treatment of patients exposed to aniline. It is not, however, a substitute for the professional judgement of a paramedic or a doctor and must be interpreted in the light of specific information regarding the patient available to such a paramedic or doctor and in conjunction with other sources of authority.

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