



UK Health
Security
Agency

Aniline

Incident management

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Main points

General

Aniline is a volatile, colourless, oily liquid with a musty or fish-like odour. Other names for aniline are phenylamine and aminobenzene.

Aniline reacts vigorously with oxidising materials, acids and alkalis. It also emits highly toxic fumes of ammonia and nitrogen oxide when heated to decomposition.

For fires involving aniline, use chemical protective clothing with liquid-tight connections and breathing apparatus, and alcohol-resistant foam or normal foam if not available.

Health

Major routes of exposure include inhalation, ingestion and dermal contact.

Inhalation, ingestion or dermal contact can cause systemic effects which may be delayed.

Systemic effects include methaemoglobinaemia, cyanosis and haemolysis, tachypnoea, dyspnoea, severe headache, nausea and vomiting, abdominal pain, paraesthesia, tremor, drowsiness and tachycardia.

Dermal contact may cause irritation and ocular exposure causes mild irritation and may cause corneal damage; photophobia, visual impairment and brown discolouration of the conjunctiva and cornea have also been reported.

The International Agency for Research on Cancer (IARC) has also classified aniline as: “probably carcinogenic to humans”.

Casualty decontamination at the scene

Following disrobe, improvised dry decontamination should be considered for an incident involving aniline unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.


Environment

Aniline is hazardous to the environment; spillages and decontamination run-off should be prevented from entering drains and watercourses.

Inform the [Environment Agency](#) of substantial incidents.

Hazard identification

Table 1. Standard (UK) dangerous goods emergency action codes

UN		1547	Aniline	
EAC		•3X	Use alcohol resistant foam but, if not available, normal foam can be used. Wear chemical protective clothing with liquid tight connections for whole body in combination with breathing apparatus [note 1]. Spillages and decontamination run-off should be prevented from entering drains and watercourses	
APP		–	–	
Hazards	Class	6.1	Toxic substance	
	Sub-risks	–	–	
HIN		60	Toxic or slightly toxic substance	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.








Notes to Table 1

[note 1] Chemical protective clothing with liquid tight connections for whole body (type 3) conforming to the relevant standards such as BS 8428 or EN 14605, in combination with breathing apparatus BS EN 137.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2021)

Table 2a. The GB classification, labelling and packaging (CLP) regulation

Hazard class and category	Carc. 2	Carcinogenicity, category 2	
	Muta. 2	Germ cell mutagenicity, category 2	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
	STOT RE 1	Specific target organ toxicity following repeated exposure, category 1	
	Eye Dam. 1	Serious eye damage, category 1	
	Skin Sens. 1	Skin sensitisation, category 1	
	Aquatic Acute 1	Acute hazards to the aquatic environment, category 1	
Hazard statement	H351	Suspected of causing cancer	
	H341	Suspected of causing genetic defects	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	

	H301	Toxic if swallowed
	H372	Causes damage to organs through prolonged or repeated exposure
	H318	Causes serious eye damage
	H317	May cause an allergic skin reaction
	H400	Very toxic to aquatic life
Signal words	DANGER	

Table 2b. The GB classification, labelling and packaging (CLP) regulation specific concentration limits

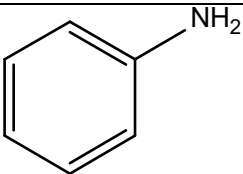
Concentration	Hazard class and category	Hazard statement	
$C \geq 1\%$	STOT RE 1	H372	Causes damage to organs through prolonged or repeated exposure
$0.2\% \leq C < 1\%$	STOT RE 2	H373	May cause damage to organs through prolonged or repeated exposure

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed June 2022)

Physicochemical properties

Table 3. Physicochemical properties

CAS number	62-53-3
Molecular weight	93.1
Formula	C ₆ H ₅ NH ₂
Common synonyms	Benzeneamine, aminobenzene, phenylamine
State at room temperature	Colourless oily liquid. Turns brown on exposure to air or light
Volatility	Vapour pressure = 0.49 mm Hg at 25°C
Specific gravity	1.02 at 20°C (water = 1)
Vapour density	3.2 (air = 1)
Flammability	Combustible
Lower explosive limit	1.2%
Upper explosive limit	11%
Water solubility	Slightly soluble
Reactivity	Aniline is a combustible liquid when exposed to heat or flame. It can react vigorously with oxidising materials, acids and alkalis. Attacks copper and its alloys
Reaction or degradation products	Aniline emits highly toxic fumes including ammonia and nitrogen oxide when heated to decomposition
Odour	Characteristic amine-like or musty, fishy odour
Structure	

References

International Programme on Chemical Safety. '[International chemical safety card entry for Aniline](#)'. ICSC 0011, 2014. World Health Organization (WHO) Geneva

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information (2004-). '[PubChem Compound Summary for CID 6115, Aniline](#)' (viewed June 2022)

Reported effect levels from authoritative sources

Table 4. Exposure by inhalation

ppm	mg/m ³	Exposure duration	Signs and symptoms	Reference
26–66	100–250	Several hours	Slight symptoms	a
6,561	25,000	Acute	Average lethal dose	a

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values.

Reference

a. European Commission. European Union Risk Assessment Report, Aniline, Volume 50, 2004. EC: Luxembourg.

Table 5. Exposure by ingestion

g	Signs and symptoms	Reference
60	Causes death	a

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values.

Reference

a. European Commission. European Union Risk Assessment Report, Aniline, Volume 50, 2004. EC: Luxembourg.

Published emergency response guidelines

Table 6. Acute exposure guideline levels (AEGLs) showing concentrations in ppm

	Concentration (ppm)				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1 [note 1]	48	16	8	2	1.0
AEGL-2 [note 2]	72	24	12	3	1.5
AEGL-3 [note 3]	120	40	20	5	2.5

Notes to Table 6

[note 1] Level of the chemical in air at or above which the general population could experience notable discomfort.

[note 2] Level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

[note 3] Level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

Reference

US Environmental Protection Agency. [Acute Exposure Guideline Levels for Airborne Chemicals | US EPA](#) (viewed June 2022).

Exposure standards, guidelines or regulations

Table 7. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m3	ppm	mg/m3
WEL	1	4	No guideline value specified	

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

Reference

HSE. '[EH40/2005 Workplace Exposure Limits](#) . Fourth Edition' (2020)

Table 8. Public health guidelines

UK drinking water standard	No guideline value specified
WHO guideline for drinking water quality	No guideline value specified
WHO air quality guideline	No guideline value specified

Health effects

Major route of exposure

Aniline is readily absorbed via inhalation, ingestion and dermal exposure.

Table 9. Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
Systemic	<p>Systemic features may occur after ingestion, inhalation and skin contact The key features are methaemoglobinaemia and haemolysis.</p> <p>As a result, patients may show tachypnoea, dyspnoea, severe headache, nausea and vomiting, abdominal pain, paraesthesia, tremor, drowsiness and tachycardia. Haemolysis causes haemoglobinuria and acute kidney injury; acute liver injury is possible in severe cases. Anaemia, cardiac dysrhythmias, coma and cardiovascular shock have been reported. Convulsions and late haemolytic crisis with Heinz body formation may occur, but are uncommon.</p>
Dermal	Aniline is absorbed through intact skin. It can cause systemic effects, which may be delayed. It is a skin irritant.
Ocular	Mild irritant to the eyes, may cause corneal damage. Photophobia, visual impairment and brown discolouration of the conjunctiva and cornea have been reported.

Reference

[TOXBASE](#). Aniline. March 2019 (viewed June 2022)

Decontamination at the scene

Chemical-specific advice

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Following disrobe, improvised dry decontamination should be considered for an incident involving aniline unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.

People who are processed through improvised decontamination should subsequently be moved to a safe location, triaged and subject to health and scientific advice. Based on the outcome of the assessment, they may require further decontamination.

Emergency services and public health professionals can obtain further advice from the UK Health Security Agency (Radiation, Chemicals and Environment Directorate) using the 24-hour chemical hotline number: 0344 892 0555.

Disrobe

The disrobe process is highly effective at reducing exposure to HAZMAT/CBRN material when performed within 15 minutes of exposure.

Therefore, disrobe must be considered the primary action following evacuation from a contaminated area.

Where possible, disrobe at the scene should be conducted by the casualty themselves and should be systematic to avoid transferring any contamination from clothing to the skin. Consideration should be given to ensuring the welfare and dignity of casualties as far as possible.

Improvised decontamination

Improvised decontamination is an immediate method of decontamination prior to the use of specialised resources. This should be performed on all contaminated casualties, unless medical advice is received to the contrary. Improvised dry decontamination should be considered for an incident involving chemicals unless the agent appears to be corrosive or caustic.

Improvised dry decontamination

Any available dry absorbent material can be used such as kitchen towel, paper tissues (for example blue roll) and clean cloth.

Exposed skin surfaces should be blotted and rubbed, starting with the face, head and neck and moving down and away from the body.

Rubbing and blotting should not be too aggressive, or it could drive contamination further into the skin.

All waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage.

Improvised wet decontamination

Water should only be used for decontamination where casualty signs and symptoms are consistent with exposure to caustic or corrosive substances such as acids or alkalis.

Wet decontamination may be performed using any available source of water such as taps, showers, fixed installation hose-reels and sprinklers.

When using water, it is important to try and limit the duration of decontamination to between 45 and 90 seconds and, ideally, to use a washing aid such as cloth or sponge.

Improvised decontamination should not involve overly aggressive methods to remove contamination as this could drive the contamination further into the skin.

Where appropriate, seek professional advice on how to dispose of contaminated water and prevent run-off going into the water system.

Additional notes

Following improvised decontamination, remain cautious and observe for signs and symptoms in the decontaminated person and in unprotected staff.

If water is used to decontaminate casualties this may be contaminated, and therefore hazardous, and a potential source of further contamination spread.

All materials (paper tissues and so on) used in this process may also be contaminated and, where possible, should not be used on new casualties.

The risk from hypothermia should be considered when disrobe and any form of wet decontamination is carried out.

People who are contaminated should not eat, drink or smoke before or during the decontamination process and should avoid touching their face.

Consideration should be given to ensuring the welfare and dignity of casualties as far as possible. Immediately after decontamination the opportunity should be provided to dry and dress in clean robes or clothes.

Interim wet decontamination

Interim decontamination is the use of standard fire and rescue service (FRS) equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

Decontamination at the scene references

Home Office. [‘Initial operational response to a CBRN incident.’](#) Version 2.0 (July 2015)

NHS England. [‘Emergency Preparedness, Resilience and Response \(EPRR\): Guidance for the initial management of self-presenters from incidents involving hazardous materials.’](#) (February 2019)

Clinical decontamination and first aid

Clinical decontamination is the process where trained healthcare professionals using purpose designed decontamination equipment treat contaminated persons individually.

[Detailed information on clinical management](#) can be found on TOXBASE.

Important notes

Once body surface contaminants have been removed or if your patient was exposed by ingestion or inhalation, the risk that secondary care givers may become contaminated is very low. Secondary carers should wear standard hospital PPE as a precaution against secondary contamination from vomit and body fluids.

If the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves.

The area should be well ventilated.

Clinical decontamination following surface contamination

Carry out decontamination after resuscitation.

This should be performed in a well-ventilated area, preferably with its own ventilation system.

Avoid contaminating yourself with this product and wash any exposed area.

Contaminated clothing should be removed, double-bagged, sealed and stored safely.

Decontaminate open wounds first and avoid contamination of unexposed skin.

Any particulate matter adherent to skin should be removed and the patient washed with soap and copious amounts of water under low pressure for at least 10 to 15 minutes.

Pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears.

The earlier irrigation begins, the greater the benefit.

Dermal exposure

Decontaminate (as above) the patient following surface contamination.

If features of systemic toxicity are present manage as for inhalation or ingestion.

Other supportive measures as indicated by the patient's clinical condition

Ocular exposure

Remove contact lenses if present.

Anaesthetise the eye with a topical local anaesthetic (for example, oxybuprocaine, amethocaine or similar). However, do not delay irrigation if local anaesthetic is not immediately available.

Immediately irrigate the affected eye thoroughly with 1,000 mL 0.9% saline or equivalent crystalloid (for example, by an infusion bag with a giving set) for a minimum of 10-15 minutes irrespective of initial conjunctival pH. A Morgan Lens may be used if anaesthetic has been given.

Aim for a neutral conjunctival pH of 7.5 to 8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary.

Any particles lodged in the conjunctival recesses should be removed.

Repeated instillation of local anaesthetics may reduce discomfort and help more thorough decontamination. However, prolonged use of concentrated local anaesthetics is damaging to the cornea.

Patients with corneal damage, those who have been exposed to strong acids or alkalis and those whose symptoms do not resolve rapidly should be discussed urgently with an ophthalmologist.

Other supportive measures as indicated by the patient's clinical condition.

Inhalation or ingestion

Maintain a clear airway and ensure adequate ventilation.

The benefit of gastric decontamination (following ingestion) using activated charcoal is uncertain. See [TOXBASE](#) for more information.

Monitor vital signs and cardiac rhythm; check the capillary blood glucose.

Check and record pupil size.

Please be aware that pulse oximetry is unreliable in the presence of methaemoglobinaemia.

Perform a 12-lead ECG in all patients who require assessment.

Other supportive measures as indicated by the patient's clinical condition.

Clinical decontamination and first aid references

[TOXBASE](#) (viewed in June 2022).

TOXBASE Aniline – features and management (2020)

TOXBASE Chemicals splashed or sprayed into eyes – features and management (2020)

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

[UKHSA](#) is an executive agency, sponsored by the [Department of Health and Social Care](#).

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