



UK Health
Security
Agency

Phenol

Incident management

This document provides information needed for response to a chemical incident, such as physicochemical properties, health effects and decontamination advice.

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Main points

General

Phenol is solid at room temperature with a distinctive sweet odour.

Phenol is combustible when exposed to heat, flames or oxidising materials. It emits acrid smoke of irritating and flammable vapours when heated to decomposition.

Health

Systemic effects and local irritation or burns may develop by any route of exposure. Contact can sometimes be painless due to local anaesthetic activity.

Systemic effects include nausea, vomiting, hypotension, tachycardia, cardiac arrhythmias, metabolic acidosis, sweating and cardiogenic shock. Initial CNS stimulation such as agitation is followed by drowsiness, convulsions and respiratory depression.

Casualty decontamination at the scene

Phenol causes corrosive effects on contact with skin (that can sometimes be painless due to local anaesthetic effect of phenol); therefore, following disrobe, improvised wet decontamination should be considered.


Environment

Inform the [Environment Agency](#) where appropriate and avoid release into the environment.

Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.

Hazard identification

Table 1a. Standard (UK) dangerous goods emergency action codes for phenol solid and solution

UN		1671	Phenol, solid	
		2821	Phenol, solution	
EAC		2X	Use fine water. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.	
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 1a

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 conforming to BS EN 137.

References

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office 2023

Table 1b. Standard (UK) dangerous goods emergency action codes for molten phenol

UN		2312	Phenol, molten	
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, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.	
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 1b

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 conforming to BS EN 137.

References

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

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





Hazard class and category	Muta. 2	Germ cell mutagenicity, category 2	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
	STOT RE 2	Specific target organ toxicity following repeated exposure, category 2	
	Skin Corr. 1B	Skin corrosion, category 1B	
Hazard statement	H341	Suspected of causing genetic defects	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	
	H301	Toxic if swallowed	
	H373	May cause damage to organs through prolonged or repeated exposure	
	H314	Causes severe skin burns and eye damage	
Signal words	DANGER		

Table 2b. Specific concentration limits for phenol


Concentration	Hazard class and category	Hazard statement	
$C \geq 3\%$	Skin Corr. 1B	H314	Causes severe skin burns and eye damage
$1\% \leq C < 3\%$	Skin Irrit. 2	H315	Causes skin irritation
$1\% \leq C < 3\%$	Eye Irrit. 2	H319	Causes serious eye irritation

References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed September 2024).

Physicochemical properties

Table 3. Physicochemical properties

CAS number	108-95-2
Molecular weight	94
Formula	C ₆ H ₆ O
Common synonyms	Carbolic acid, phenolic acid, hydroxybenzene
State at room temperature	Solid
Volatility	Vapour pressure = 0.35 mmHg at 25°C
Specific gravity	1.06 (water = 1) 3.2 (air = 1)
Flammability	Combustible when exposed to heat, flames or oxidising materials
Lower explosive limit	1.3 %
Upper explosive limit	9.5 %
Water solubility	Moderately soluble in water
Reactivity	The solution in water is a weak acid. Reacts with oxidants generating fire and explosion hazard. Also incompatible with acids, aluminium chloride and calcium hypochlorite.
Odour	Distinctive sweet odour
Structure	

References

International Programme on Chemical Safety. [International Chemical Safety Card entry for Phenol](#). ICSC 0070, 2017. World Health Organization: Geneva. (viewed September 2024)

PubChem [Internet]. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004. [PubChem Compound Summary for CID 996, Phenol](#) (viewed September 2024)

Reported effect levels from authoritative sources

Table 4. Skin exposure

%	Signs and symptoms	Reference
1	Can cause irritation, dermatitis and burns to the skin following prolonged contact.	a
>3	Corrosive to the skin	b
30	Death within 30 minutes	c
80-100	Contact with solutions, emulsions or preparations at this concentration for 5-30 minutes has been reported to result in death	b

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

References

- a. [TOXBASE](#) Phenols and creosols - features and management 2024 (viewed September 2024)
- b. EC [risk assessment report phenol](#) 2006 European Commission
- c. ATSDR [Toxicological profile for phenol](#) 2008

Published emergency response guidelines

Table 5. Acute exposure guideline levels (AEGLs)

	Concentration (ppm)				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
AEGL-1 [note 1]	19	19	15	9.5	6.3
AEGL-2 [note 2]	29	29	23	15	12
AEGL-3 [note 3]	NR	NR	NR	NR	NR

Notes to Table 5

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.

NR = Not recommended due to insufficient data

Reference

US Environmental Protection Agency (EPA) '[Acute Exposure Guideline Levels](#)' (viewed September 2024)

Exposure standards, guidelines or regulations

Table 6. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m ³	ppm	mg/m ³
WEL	2	7.8	4	16

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 7. Public health standards and guidelines

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

Health effects

Highly toxic by ingestion, inhalation and skin contact.

Table 8. Signs or symptoms of acute exposure

Route	Signs and symptoms
Systemic	<p>Systemic effects can occur via all routes of exposure.</p> <p>GI upset, hypotension, tachycardia, cardiac arrhythmias, elevated anion-gap metabolic acidosis, sweating and cardiogenic shock.</p> <p>Initial CNS stimulation such as agitation is followed by drowsiness, convulsions, respiratory depression, cyanosis, coma, bronchospasm, acute lung injury, rapid onset pulmonary oedema and death.</p> <p>Methaemoglobinaemia is recognised. Acute Heinz-body anaemia and intravascular haemolysis have been reported. Urine is often a dark green/black colour and can contain protein and free haemoglobin.</p> <p>Hepatic injury and acute kidney injury requiring haemodialysis has been reported.</p>
Inhalation	Local irritation or burns.
Ingestion	<p>Irritating or corrosive depending on the concentration.</p> <p>Significant ingestion can cause white/brown skin and mucosal burns which may be painless as phenol destroys nerve endings.</p> <p>Laryngeal oedema can occur, and oesophageal stricture may be a late complication.</p>
Eyes	<p>Causes irritation at low concentrations.</p> <p>Can cause corrosive damage manifesting as conjunctival and corneal oedema, and blindness in severe cases.</p>
Dermal	Even dilute solutions (1%) can cause irritation, dermatitis and burns to the skin following prolonged contact. Often presents as relatively painless white or brown necrotic lesions due to the anaesthetic effect on nerve endings; the brown discolouration may remain after healing.

Reference

[TOXBASE](#) Phenols and cresols - features and management, August 2024 (viewed September 2024)

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.

Phenol causes corrosive effects on contact with skin (that can sometimes be painless due to local anaesthetic effect of phenol); therefore, following disrobe, improvised wet decontamination should be considered.

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 (UKHSA) 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, disrobing should be conducted at the scene and by the casualty themselves. Disrobing should be systematic to prevent transfer of contaminant from clothing to skin. Clothing should not be pulled over the head if possible.

Clothing stuck to the casualty by the contaminant should not be forcefully removed, as this risks causing further harm.

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.

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.

Unprotected first responders and members of the public should not approach casualties incapacitated by exposure to administer improvised decontamination, as they may be exposed to contaminants and become a casualty themselves.

Important note: Improvised decontamination should continue until more structured interventions such as Interim or Specialist Operational Response are present.

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 first and then rubbed, starting with the face, head, and neck, and moving down and away from the body.

Blotting and rubbing should not be too aggressive, as it could drive contamination further into the skin.

Casualties should also blow their nose to remove contaminants from the nasal cavities.

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

Improvised wet decontamination

Wet decontamination should be used if contamination with a caustic chemical substance is suspected.

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 copious amounts of water from any available source such as taps, showers, water bottles, fixed installation hose-reels and sprinklers to gently rinse the affected skin. Other natural sources of water may be considered unless this creates greater risks to the individuals affected. Wet wipes or baby wipes may be used as an effective alternative.

Improvised decontamination should not involve overly aggressive methods to remove contamination as this could further damage affected tissues and 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.

When vulnerable people are affected by a hazardous substance, they may need additional support to remove themselves, their clothing, or the substance.

Casualties should remain in the area and should not leave to seek care at a hospital, as this presents a contamination risk. Further care will be administered on site by the appropriate emergency services.

Interim wet decontamination

Interim decontamination is the use of standard Fire and Rescue Service 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)

JESIP. '[Initial Operational Response IOR to Incidents Suspected to Involve Hazardous Substances or CBRN Materials](#)' (June 2024)

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.

For comprehensive clinical advice consult [TOXBASE](#) directly.

Clinical decontamination following surface contamination

Avoid contaminating yourself.

Carry out decontamination after resuscitation. This should be performed in a well-ventilated area, preferably with its own ventilation system.

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 copious amounts of water under low pressure for at least 10 to 15 minutes, or until pH of skin is normal (pH of the skin is between 4.5 and 6 although it may be closer to 7 in children, or after irrigation). The earlier irrigation begins, the greater the benefit.

Pay special attention to skin folds, fingernails and ears.

Dermal exposure

Decontaminate (as above) the patient following surface contamination.

Recheck pH of affected areas after a period of 15 to 20 minutes and repeat irrigation if abnormal. Burns with strong solutions may require irrigation for several hours or more. Attention should be paid to avoiding hypothermia during prolonged irrigation with cool fluids. Once the pH is normal and stabilised, treat as per a thermal injury.

Burns totalling more than 15% of body surface area in adults (more than 10% in children) will require standard fluid resuscitation as for thermal burns.

Moderate/severe chemical burns should be reviewed by a burns specialist.

If there are symptoms of systemic toxicity, manage as per 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 1,000mL 0.9% saline or equivalent crystalloid (for example, by an infusion bag with a giving set) for a minimum of 10 to 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 to 7.2. The conjunctivae may be tested with indicator paper. Retest at 15 to 30 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.

Ingestion and systemic toxicity

Maintain a clear airway and ensure adequate ventilation.

In severely affected patients, especially those with tachypnoea, stridor or upper airway damage, critical care input is essential with urgent assessment of the airway. A supraglottic-epiglottic burn with erythema and oedema is usually a sign that further oedema will occur that may lead to airway obstruction.

Children are at increased risk of airway obstruction.

Do not attempt gastric lavage.

Do not give neutralising chemicals as heat produced during neutralisation reactions may increase injury.

Monitor vital signs, cardiac rhythm and check capillary blood sugar.

Check and record pupil size.

Perform a 12 lead ECG in all patients that require assessment.

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

Inhalation

Maintain a clear airway and ensure adequate ventilation.

Administer oxygen to achieve adequate oxygenation.

In severely affected patients, especially those with tachypnoea, stridor or upper airway damage, critical care input is essential with urgent assessment of the airway. A supraglottic-epiglottic burn with erythema and oedema is usually a sign that further oedema will occur that may lead to airway obstruction.

Children are at increased risk of airway obstruction.

Monitor vital signs, cardiac rhythm and check capillary blood sugar.

Check and record pupil size.

Perform a 12 lead ECG in all patients that require assessment.

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

Clinical decontamination and first aid references

[TOXBASE](#) (viewed September 2024)

TOXBASE Phenol, (2019)

TOXBASE Phenols and cresols – features and management, (2020)

TOXBASE Chemicals splashed or sprayed into the eyes, (2020)

TOXBASE Skin decontamination – corrosives, (2020)

TOXBASE Corrosives – inhalation, (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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