



UK Health  
Security  
Agency

# Polycyclic aromatic hydrocarbons (Benzo[a]pyrene)

## 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

Benzo[a]pyrene is a pale-yellow crystalline solid with a faint aromatic odour at room temperature. It is practically insoluble in water.

Incompatible with strong oxidising agents including various electrophiles, peroxides, nitrogen oxides and sulphur oxides. Oxidised by ozone, chromic acid and chlorinating agents. Readily undergoes nitration and halogenation.

Decomposes when heated and emits fumes and acrid smoke.

### Health

Benzo[a]pyrene and other PAHs are thought to be of low toxicity following acute exposure.

### Casualty decontamination at the scene

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

### Environment

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

## Hazard identification

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

<b>UN</b>		No EACs available for this chemical
<b>EAC</b>		
<b>APP</b>		
<b>Hazards</b>	<b>Class</b>	
	<b>Sub-risks</b>	
<b>HIN</b>		

### Abbreviations

UN = United Nations number.

EAC = emergency action code.




APP = additional personal protection.


HIN = hazard identification number.

### References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)'. 2023 (viewed on 17 January 2025)

**Table 2a. The GB classification, labelling and packaging (CLP) regulation for benzo[a]pyrene**

<b>Hazard class and category</b>	Skin Sens. 1	Skin sensitizer, category 1	
	Muta. 1B	Germ cell mutagen, category 1B	
	Carc. 1B	Carcinogen, category 1B	

	Aquatic Acute 1	Chronic hazard to the aquatic environment, category 2	
	Aquatic Chronic 1	Acute hazards to the aquatic environment	
	Repr. 1B	Toxic to reproduction, category 1B	
<b>Hazard statement</b>	H317	May cause an allergic skin reaction	
	H340	May cause genetic defects	
	H350	May cause cancer	
	H400	Very toxic to aquatic life	
	H410	Very toxic to aquatic life with long lasting effects	
	H360FD	May damage fertility. May damage the unborn child	
<b>Signal words</b>	Danger		

### References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 17 January 2025)

**Table 2b. The GB classification, labelling and packaging (CLP) specific concentration limits for benzo[a]pyrene**

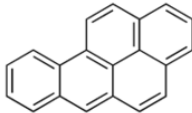
Concentration	Hazard class and category	Hazard statement	
C ≥ 0.01 %	Carc. 1B	H350	May cause cancer

### References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 17 January 2025)

## Physicochemical properties

Table 3. Physicochemical properties

<b>CAS number</b>	50-32-8
<b>Molecular weight</b>	252
<b>Formula</b>	C <sub>20</sub> H <sub>12</sub>
<b>Common synonyms</b>	3,4-Benzpyrene; Benzo(d,e,f)chrysene, Note: polyaromatic hydrocarbons are now also commonly referred to as polycyclic hydrocarbons
<b>State at room temperature</b>	Pale-yellow crystals
<b>Volatility</b>	Vapour pressure negligible at 20°C
<b>Specific gravity</b>	1.4 (water = 1)
<b>Vapour density</b>	8.7 (air = 1)
<b>Flammability</b>	Non-combustible
<b>Lower explosive limit</b>	-
<b>Upper explosive limit</b>	-
<b>Water solubility</b>	Practically insoluble in water
<b>Reactivity</b>	Benzo[a]pyrene undergoes photo-oxidation after irradiation in indoor sunlight or by fluorescent light in organic solvents. Incompatible with strong oxidising agents including various electrophiles, peroxides, nitrogen oxides and sulphur oxides. Oxidised by ozone, chromic acid and chlorinating agents. Readily undergoes nitration and halogenation.
<b>Reaction or degradation products</b>	Decomposes when heated and emits fumes and acrid smoke
<b>Odour</b>	Faint aromatic odour
<b>Structure</b>	

### References

World Health Organization. International Programme on Chemical Safety.

'[International Chemical Safety Card entry for benzo\[a\]pyrene](#)'. ICSC 0104, 2014.

(viewed on 17 January 2025)

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PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. '[PubChem Compound Summary for CID 2336, Benzo\[a\]pyrene](#)' (viewed on 17 January 2025)

## Reported effect levels from authoritative sources

No acute exposure effect levels could be found following a review of authoritative sources.



## Published emergency response guidelines

**Table 4. Acute exposure guideline levels (AEGLs)**

	Concentration				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
<b>AEGL-1</b> [note 1]	No values specified				
<b>AEGL-2</b> [note 2]					
<b>AEGL-3</b> [note 3]					

### Notes to Table 4

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.

## Exposure standards, guidelines or regulations

**Table 5. Occupational standards**

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>
<b>WEL</b>	No values specified			

### Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

### Reference

Health and Safety Executive (HSE). '[EH40/2005 Workplace Exposure Limits](#) . Fourth Edition' 2020 (viewed on 17 January 2025)

**Table 6. Public health standards and guidelines**

<b>Drinking water standard</b>	Benzo[a]pyrene	0.01 µg/L [note 1]		
	Polycyclic aromatic hydrocarbons	0.1 µg/L [note 1]		
<b>WHO guideline for drinking water quality</b>			0.7 µg/L	
<b>WHO air quality guideline</b>			<b>Estimated lifetime cancer risk levels</b>	
			1:10,000	1.2 ng/m <sup>3</sup>
			1:100,000	0.12 ng/m <sup>3</sup>
			1:1,000,000	0.012 ng/m <sup>3</sup>

### Notes for table 6

Note 1: The specified compounds are:

Benzo(b)fluoranthene

Benzo(k)fluoranthene

Benzo(ghi)perylene

Indeno(1,2,3-cd)pyrene

The parametric value applies to the sum of the concentrations of the individual compounds detected and quantified in the monitoring process.

Note 2: For substances that are considered to be carcinogenic, the guideline value is the concentration in drinking-water associated with an upper-bound excess lifetime cancer risk of

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$10^{-5}$  (one additional case of cancer per 100,000 of the population ingesting drinking-water containing the substance at the guideline value for 70 years). Concentrations associated with estimated upper-bound excess lifetime cancer risks of  $10^{-4}$  and  $10^{-6}$  can be calculated by multiplying and dividing, respectively, the guideline value by 10.

#### Reference

[The Private Water Supplies \(England\) Regulations \(2016\)](#) and [The Private Water Supplies \(Wales\) Regulations \(2017\)](#) (viewed on 17 January 2025)

[The Water Supply \(Water Quality\) Regulations \(2018\)](#) (Water, England and Wales) (viewed on 17 January 2025)

World Health Organization Regional Office for Europe, Copenhagen World Health Organization Regional Publications. '[Guidelines for indoor air quality: selected pollutants](#)'. 2010 (viewed on 17 January 2025)

## Health effects

Benzo[a]pyrene and other PAHs are thought to be of low toxicity following acute exposure.

## 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 PAHs, 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 (UKHSA) Radiation, Chemicals, Climate 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 a more structured intervention, such as an Interim Operational Response is conducted, or Specialist Operational Response are present.

## Improvised dry decontamination

Improvised dry decontamination should be considered for an incident involving PAHs unless casualties are demonstrating obvious signs of chemical burns or skin irritation.

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 (viewed on 17 January 2025)

National Health Service England. '[Emergency Preparedness, Resilience and Response \(EPRR\): Guidance for the initial management of self-presenters from incidents involving hazardous materials.](#)' 2019 (viewed on 17 January 2025)

Joint Emergency Service Interoperability Programme. '[Initial Operational Response IOR to Incidents Suspected to Involve Hazardous Substances or CBRN Materials](#)' 2024 (viewed on 17 January 2025)



## 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

Decontamination is only required if there is 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.

## Inhalation and ingestion exposure

Supportive measures as indicated by the patient's clinical condition

## Dermal exposure

Decontaminate (as above) the patient following surface contamination.

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

## Ocular exposure

At home:

Use lukewarm tap water, trickled into the eye or in a small cup held over the eye socket. An eye dropper is an alternative.

In hospital:

Immediately irrigate the affected eye thoroughly with 1000 mL 0.9% saline or equivalent crystalloid (for example via an infusion bag with a giving set) for a minimum of 10 to 15 minutes. A Morgan Lens may be used if anaesthetic has been given.

Amphoteric, hypertonic, chelating solutions may be used if available.

If symptoms persist seek medical assistance.

Check for corneal damage by instillation of fluorescein (either as drops or moistened strips to the conjunctival sac) and examination under the cobalt blue light of the slit lamp or ophthalmoscope; [click here for management](#). Refer for ophthalmological assessment if there is doubt regarding the management of corneal damage.

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

Patients should be advised on discharge to seek medical attention if symptoms subsequently develop.

## Clinical decontamination and first aid references

National Poisons Information Service (NPIS). [Skin decontamination - irritants](#) (viewed on 17 January 2025)

National Poisons Information Service (NPIS). TOXBASE. '[Eye irritants – features and management](#)', 2022. (viewed on 17 January 2025)

## 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](#).

This document from the UKHSA Radiation, Chemicals, Climate and Environment Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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