UK Health Security Agency

Picric acid

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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Contents

Main points

General

Picric acid is an odourless, pale yellow solid at room temperature. It is dangerously explosive, especially when exposed to shock, heat or flame. It reacts with oxidising and reducing materials. Combustion of picric acid produces toxic oxides of carbon and nitrogen, and shock-sensitive mixtures are formed with metals, particularly copper, lead, mercury and zinc.

Health

Picric acid is highly toxic by ingestion. Systemic toxicity may also occur after prolonged skin contact or inhalation.

Features following ingestion usually occur within 4 hours. Early features may include agitation, hyperthermia, shortness of breath and diaphoresis. This may progress rapidly to circulatory shock, coma, convulsions and cardiac arrest leading to death.

Casualty decontamination at the scene

Following disrobe, improvised dry decontamination should be considered for an incident involving picric acid, 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.

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

Hazard identification

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

UN		1344	Trinitrophenol (picric acid), wetted, with not less than 30% water, by mass	
		3364	Trinitrophenol (picric acid), wetted, with not less than 10% water by mass	
EAC		1W [note 1]	Use coarse water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 2]. Substance can be violently or explosively reactive. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.	
APP		-	-	
Hazards	**Class**	4.1	Flammable solids, self-reactive substances and desensitised explosives	
	Sub-risks	–	–	
HIN		–	–	

Abbreviations

UN = United Nations number.
EAC = emergency action code.
APP = additional personal protection.
HIN = hazard identification number.

Notes to Table 1

Note 1: Not applicable to the carriage of dangerous goods under the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID), and the Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR).

Note 2: 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

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. 'Dangerous Goods Emergency Action Code List'. 2025 (viewed on 22 January 2025)

Table 2. The GB classification, labelling and packaging (CLP) regulation for picric acid

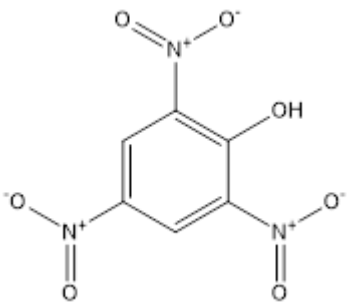
Hazard class and category	Expl. 1.1	Explosives, division 1.1	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
Hazard statement	H201	Explosive; mass explosion hazard	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	
	H301	Toxic if swallowed	
Signal words	DANGER		

References

The Health and Safety Executive (HSE). 'GB CLP Regulation' (viewed on 30 January 2025)

Physicochemical properties

Table 3. Physicochemical properties

CAS number	88-89-1
Molecular weight	229.1
Formula	$C_6H_2(NO_2)_3OH$
Common synonyms	2,4,6-trinitrophenol, picronitric acid, phenol trinitrate, 2-hydroxy-1,3,5-trinitrobenzene, carbazotic acid, nitroxanthic acid
State at room temperature	Pale yellow solid
Volatility	Vapour pressure: negligible at 20°C
Specific gravity	1.76 at 20°C (water = 1) 7.9 (air = 1)
Flammability	Combustible.
Lower explosive limit	-
Upper explosive limit	-
Water solubility	1.4 g/100 mL water
Reactivity	Picric acid is dangerously explosive, especially in the dried form or when exposed to shock, heat or flame. Reacts with oxidising and reducing materials. Picric acid and uranium perchlorate mixtures form very powerful explosives, while mixtures with aluminium and water ignite after a delay.
Reaction or degradation products	Combustion of picric acid produces toxic oxides of carbon and nitrogen. Shock-sensitive mixtures are formed with metals, particularly copper, lead, mercury and zinc.
Odour	Odourless
Structure	

References

World Health Organization. International Programme on Chemical Safety ‘International Chemical Safety Card entry for Picric acid’ ICSC 0316, 2008 (viewed on 14 January 2025)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. ‘PubChem Compound Summary for CID 6954, Picric acid’ (viewed on 14 January 2025)

Reported effect levels from authoritative sources

Table 4. Exposure by ingestion

g	Signs and symptoms	Reference
1-2	Severe poisoning	a

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. Centers for Disease Control and Prevention (CDC). National Institute for Occupational Safety and Health. 'Immediately Dangerous to Life or Health Concentrations' 1994 (viewed on 30 January 2025)

Published emergency response guidelines

Table 5. Acute exposure guideline levels (AEGLs)

	Concentration				
	10 minutes	**30 minutes**	**60 minutes**	**4 hours**	**8 hours**
AEGL-1 [note 1]	No values specified				
AEGL-2 [note 2]					
AEGL-3 [note 3]					

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.

Exposure standards, guidelines or regulations

Table 6. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m³	ppm	mg/m³
WEL	-	0.1	-	0.3

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 30 January 2025)

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

Routes of exposure include ingestion, inhalation and eye and skin contact. Picric acid may be irritating to the skin, eyes and mucous membranes with a risk of skin sensitisation and eye injury.

There is limited information available on health effects associated with exposure to picric acid. The systemic toxicity is expected to be similar to dinitrophenol. The information provided in table 8 below is for dinitrophenol and related compounds.

Table 8. Signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation/ Ingestion/skin	Features following ingestion usually occur within 4 hours. Prolonged skin contact with, or inhalation of these agents may lead to systemic toxicity. Early features may include agitation, hyperthermia, shortness of breath and diaphoresis. This may progress rapidly to circulatory shock, coma, convulsions and cardiac arrest leading to death. Tachycardia, hyperthermia, acidosis and agitation/confusion are independent risk factors for mortality. Other severe features may include myocardial ischaemia or infarction, acute kidney injury and hepatic necrosis. Peripheral neuritis affecting hands and feet has been reported. Cataracts and deafness have occurred rarely. Skin, sclera and urine may be discoloured yellow. Rash, pruritus, desquamation and oedema may occur.

Reference

National Poisons Information Service (NPIS). TOXBASE ‘Picric acid’ 2022 (viewed on 31 January 2025)

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 picric acid 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 Environmental Hazards 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 picric acid 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.

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 2015 (viewed on 31 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 31 January 2025)

Joint Emergency Service Interoperability Programme. ‘Initial Operational Response (IOR) to Incidents Suspected to Involve Hazardous Substances or CBRN Materials’ 2024 (viewed on 31 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.

Picric acid is highly explosive when dry.

For comprehensive clinical advice consult TOXBASE directly.

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.

Skin exposure

Decontaminate (as above) the patient following surface contamination.

If features of systemic toxicity are present, manage as per ingestion/inhalation.

Carry out other supportive measures as indicated by the patient's clinical condition.

Eye 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 to 15 minutes irrespective of initial conjunctival pH. A Morgan Lens may be used if anaesthetic has been given.

Aim for a final 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 lodges 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 Inhalation

There is a significant risk of rapid deterioration with increasing dyspnoea, tachycardia, hyperthermia and agitation leading to cardiovascular collapse. Early institution of cooling measures, fluid resuscitation and sedation may increase the likelihood of recovery. See TOXBASE for further advice. Maintain a clear airway and ensure adequate ventilation.

In the event of cardiac arrest in hospital or witnessed out of hospital cardiac arrest with prompt bystander CPR, resuscitation should be usually continued for at least 1 hour and only stopped after discussion with a senior clinician.

Prolonged resuscitation, even for several hours, may be appropriate following poisoning as recovery with good neurological outcome may occur.

The benefit of gastric decontamination using activated charcoal is uncertain. See TOXBASE for further advice.

Monitor vital signs initially every 15 to 30 minutes including temperature, pulse, blood pressure, respiratory rate and O_2 saturations (please be aware that pulse oximetry is unreliable in the presence of methaemoglobinaemia). Check blood sugar.

Monitor cardiac rhythm continuously.

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

Agitation, hyperthermia and acidosis are predictors of mortality and should be managed as priorities.

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

Clinical decontamination and first aid references

National Poisons Information Service (NPIS). TOXBASE 'Picric acid' 2022 (viewed on 31 January 2025)

National Poisons Information Service (NPIS). TOXBASE 'chemicals splashed or sprayed into the eyes - features and clinical management' 2020 (viewed on 31 January 2025)

National Poisons Information Service (NPIS). TOXBASE 'skin decontamination - irritants' 2019 (viewed on 31 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 Environmental Hazards Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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For queries relating to this document, please contact chemcompendium@ukhsa.gov.uk or enquiries@ukhsa.gov.uk

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