Public Health England

Protecting and improving the nation's health

Picric Acid

Incident Management

Key Points

Fire

- dangerously explosive, especially when exposed to shock, heat or flame
- vigorous reactions occur with oxidising and reducing materials
- combustion of picric acid produces toxic oxides of carbon and shock-sensitive compounds are formed with metals, particularly copper, lead, mercury and zinc
- in the event of a fire involving picric acid, use coarse water spray and chemical protective clothing with liquid-tight connections and breathing apparatus

Health

- inhalation may cause cough, sore throat and respiratory irritation
- ingestion may cause mucosal ulceration and severe gastroenteritis with nausea, vomiting, diarrhoea and abdominal pain
- dermal exposure may cause irritation and yellow staining
- ocular exposure may cause irritation and corneal injury
- systemic effects include dizziness, headache, weakness, bradycardia, intravascular haemolysis, supraventricular tachycardia, pyrexia, hyperthermia, coma, convulsions, pulmonary oedema and death

Environment

- avoid release to the environment; inform the Environment Agency of substantial incidents

PHE publications gateway number: 2014790
Published: January 2016

Hazard Identification

Standard (UK) dangerous goods emergency action codes *(see note)*

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[(1)]	Use coarse water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus*. Danger that the substance can be violently or explosively reactive. Spillages and decontamination run-off should be prevented from entering drains and watercourses	
APP		–	–	
Hazards	**Class**	4.1	Flammable solid	
	Sub-risks	–	–	
HIN		–	–	

Note: Chemicals of different UN No. are grouped in this table as they individually carry the same EACs

UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number

(1) Not applicable to the carriage of dangerous goods under RID or ADR

* Chemical protective clothing with liquid-tight connections for whole body (type 3) conforming to the relevant standards such as BS EN8428 or BS EN14605, in combination with breathing apparatus BS EN137.

Reference

Dangerous Goods Emergency Action Code List, National Chemical Emergency Centre (NCEC), Part of Ricardo-AEA, The Stationery Office, 2015.

Classification, labelling and packaging (CLP)*

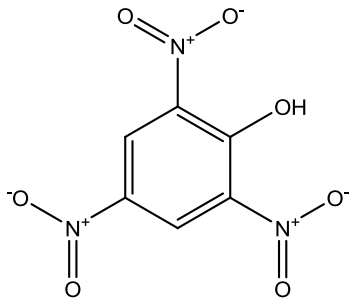
Hazard class and category	Expl. 1.1	Explosives, divisions 1.1	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
Hazard statement	H201	Explosive; mass explosion hazard	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	
	H301	Toxic if swallowed	
Signal words	DANGER		

* Implemented in the EU on 20 January 2009

Reference

European Commission. Harmonised classification – Annexe VI to Regulation (EC) No. 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures. http://echa.europa.eu/information-on-chemicals/cl-inventory-database (accessed 07/2015).

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 **Vapour density**	1.76 at 20°C (water = 1) 7.9 (air = 1)
Flammability	Explosive above 300°C
Lower explosive limit	Data not available
Upper explosive limit	Data not available
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. Vigorous reactions occur 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. Picric acid is corrosive to metals
Reaction or degradation products	Combustion of picric acid produces toxic oxides of carbon and nitrogen. Shock-sensitive compounds are formed with metals, particularly copper, lead, mercury and zinc
Odour	Odourless
Structure	

References

International Programme on Chemical Safety. International Chemical Safety Card entry for Picric acid. ICSC 0316, 2008.. World Health Organization: Geneva.

Picric Acid (HAZARDTEXT™ Hazard Management). In Klasco RK (Ed): TOMES® System, Truven Healthcare Analytics Inc, Greenwood Village CO, US. RightAnswer.com Inc, Midland MI, US. http://www.rightanswerknowledge.com (accessed 08/2015).

Reported Effect Levels from Authoritative Sources

Exposure by inhalation

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

Reference

a Centers for Disease Control and Prevention (CDC). National Institute for Occupational Safety and Health. Documentation for Immediately Dangerous to Life Concentrations, Picric Acid, 1994.

Published Emergency Response Guidelines

Emergency response planning guideline (ERPG) values

	Listed value (ppm)	Calculated value (mg/m^3)
ERPG-1*	Data not available	
ERPG-2†		
ERPG-3‡		

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour

† Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action

‡ Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects

Acute exposure guideline levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	Data not available				
AEGL-2†					
AEGL-3‡					

* Level of the chemical in air at or above which the general population could experience notable discomfort

† 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

‡ 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

Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m^3	ppm	mg/m^3
WEL	–	0.1	–	0.3

WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit

Reference

HSE. EH40/2005 Workplace Exposure Limits, 2nd Edition, 2011.

Public health guidelines

Drinking water standard	No guideline value specified
Air quality guideline	No guideline value specified
Soil guideline values and health criteria values	No guideline value specified

Health Effects

Major routes of exposure

- ingestion, inhalation and eye and skin contact

Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation	Inhalation may cause cough, sore throat and respiratory irritation
Ingestion	Ingestion may cause mucosal ulceration and severe gastroenteritis with nausea, vomiting, diarrhoea and abdominal pain
Dermal	Dermal exposure may cause irritation and yellow staining
Ocular	Ocular exposure may cause irritation and corneal injury
Systemic	Systemic effects include dizziness, headache, weakness, bradycardia, supraventricular tachycardia, pyrexia, hyperthermia, coma convulsions, pulmonary oedema and death. Hepatic and renal damage may occur 12–72 hours after exposure. Yellow colouration of all tissues and xanthopsia (yellow vision) may also occur

References

TOXBASE. Picric Acid, 01/2004. http://www.toxbase.org (accessed 11/2016).

Decontamination at the Scene

Summary

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.**

Emergency services and public health professionals can obtain further advice from Public Health England (Centre for Radiation, Chemical and Environmental Hazards) 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 (eg 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 etc) 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/clothes
- 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

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

National Ambulance Resilience Unit. Joint Emergency Services Interoperability Programme (JESIP). Initial operational response to a CBRN incident. Version 1.0, September 2013.

NHS England. Emergency Preparedness, Resilience and Response (EPRR). Chemical incidents: planning for the management of self-presenting patients in healthcare settings. April 2015.

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 – www.toxbase.org.

Important notes

- if the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves
- **highly explosive when dry**

Clinical decontamination following surface contamination

- avoid contaminating yourself with this product and wash any exposed area
- any particulate matter adherent to the skin should be removed and the patient washed with soap and water under low pressure for at least 10 – 15 minutes
- pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears

Dermal exposure

- decontaminate (as above) the patient following surface contamination
- 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 (eg 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 (eg by an infusion bag with a giving set). A Morgan Lens may be used if anaesthetic has been given. Irrigate for 10–15 minutes irrespective of initial conjunctival pH. Aim for a final conjunctival pH of 7.5–8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary
- 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

- maintain a clear airway and ensure adequate ventilation
- give oxygen to symptomatic patients
- other supportive measures as indicated by the patient's clinical condition

Ingestion

- maintain a clear airway and ensure adequate ventilation
- do **not** attempt to empty the stomach
- give oral fluids
- other supportive measures as indicated by the patient's clinical condition

Clinical decontamination and first aid references

TOXBASE http://www.toxbase.org (accessed 11/2016)

TOXBASE Picric acid, 01/2004

TOXBASE Skin decontamination – irritants, 05/ 2012

TOXBASE Chemicals splashed or sprayed into the eyes, 02/2014

This document from the PHE Centre for Radiation, Chemical and Environmental Hazards reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

For queries relating to this document, please contact: generaltox@phe.gov.uk

First published: January 2016

Update: November 2016 Health Effects, Decontamination at the Scene & Clinical Decontamination and First Aid.