



Lead

Incident Management

Key Points

General

- Metallic and solid at room temperature
- odourless
- non-combustible
- reacts with hot concentrated nitric acid, boiling hydrochloric or sulphuric acid

Health effects

- toxicity most frequently results from ingestion or inhalation and rarely from dermal exposure
- exposure may cause metallic taste, abdominal pain, anorexia, diarrhoea with black stools (if acute massive exposure), constipation and vomiting
- encephalopathy with headache, confusion, drowsiness, coma and seizures secondary to cerebral oedema may occur; lead encephalopathy is more common in children

Casualty decontamination at the scene


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

Environment


- hazardous to the environment; inform the Environment Agency where appropriate

Hazard Identification

Standard (UK) dangerous goods emergency action codes

UN		2291	Lead compound, soluble, N.O.S.	
EAC		2Z	Use fine water spray. Wear normal fire kit in combination with breathing apparatus*. 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	
<p>UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number</p> <p>* Normal firefighting clothing is appropriate, ie breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, firefighters' gloves conforming to BS EN 659 and firefighters' boots conforming to Home Office specification A29 or A30</p> <p>Reference Dangerous Goods Emergency Action Code List. National Chemical Emergency Centre (NCEC), Part of Ricardo-AEA. The Stationery Office, 2019.</p>				


Classification, labelling and packaging (CLP)*
Lead powder; [particle diameter < 1 mm]

Hazard class and category	Lact.	Additional reproductive toxicity category for effects on or via lactation	No pictogram
	Repr. 1A	Reproductive toxicity, category 1A	
Hazard statement	H362	May cause harm to breast-fed children	
	H360FD	May damage fertility. May damage the unborn child	
Signal words	DANGER		
<p>* Implemented in the EU on 20 January 2009</p> <p>Reference European Commission. Harmonised classification – Annex VI of 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 03/2019).</p>			

Specific concentration limits

Concentration	Hazard class and category	Hazard statement	
C ≥ 0.03 %	Repr. 1A	H360D	May damage the unborn child
<p>Reference European Commission. Harmonised classification – Annex VI of 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 03/2019).</p>			

Lead massive; [particle diameter > 1 mm]

Hazard class and category	Lact.	Additional reproductive toxicity category for effects on or via lactation	No pictogram
	Repr. 1A	Reproductive toxicity, category 1A	
Hazard statement	H362	May cause harm to breast-fed children	
	H360FD	May damage fertility. May damage the unborn child	

Signal words	DANGER
* Implemented in the EU on 20 January 2009	
Reference European Commission. Harmonised classification – Annex VI of 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 03/2019).	

Physicochemical Properties

CAS number	7439-92-1
Molecular weight	207
Formula	Pb
Common synonyms	–
State at room temperature	Solid
Volatility	Non-volatile at 20°C
Specific gravity	11.3 at 20°C (water = 1)
Flammability	Non-combustible
Lower explosive limit	Not applicable
Upper explosive limit	Not applicable
Water solubility	None
Reactivity	Can react vigorously with oxidising materials. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric or sulphuric acid. Finely dispersed particles form explosive mixtures in air
Reaction or degradation products	Decomposes on heating producing irritating or toxic fumes
Odour	Odourless
References	
<p>Hazardous Substances Data Bank. Lead. HSDB No. 231 (last revision date 25/10/2016). US National Library of Medicine: Bethesda MD. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB (accessed 03/2019).</p> <p>International Programme on Chemical Safety. International chemical safety card entry for lead. ICSC 0052, 2002. World Health Organization: Geneva.</p>	

Reported Effect Levels from Authoritative Sources

Data not available

Published Emergency Response Guidelines

Emergency response planning guideline (ERPG) values

	Listed value (ppm)	Calculated value (mg/m ³)
ERPG-1*	No data available	
ERPG-2†		
ERPG-3‡		
<p>* 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</p> <p>† 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</p> <p>‡ 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</p>		

Acute exposure guideline levels (AEGLs)

	Concentration (ppm)				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	No data available				
AEGL-2†					
AEGL-3‡					
<p>* Level of the chemical in air at or above which the general population could experience notable discomfort</p> <p>† 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</p> <p>‡ Level of the chemical in air at or above which the general population could experience life-threatening health effects or death</p>					

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	No data			
WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit				

Public health guidelines

Drinking water standard	10 µg/L
WHO provisional guideline value	10 µg/L
Air quality guideline	0.5 µg/m ³ (annual average)
<p>References</p> <p>The Private Water Supplies (England) Regulations 2016 and The Private Water Supplies (Wales) Regulations 2017. The Water Supply (Water Quality) Regulations 2018 (Water, England and Wales). WHO. Guidelines for Drinking-water Quality, 4th Edition Incorporating the First Addendum, 2017. World Health Organization: Geneva. WHO Regional Office for Europe. Air Quality Guidelines for Europe, European Series No. 91, 2nd Edition, 2000. World Health Organization Regional Publications: Copenhagen.</p>	

Health Effects

Major route of exposure

- toxicity most frequently occurs from ingestion and inhalation and rarely from skin exposure
- features of poisoning are the same, irrespective of the route of exposure

Immediate signs or symptoms of acute exposure

Signs and symptoms

Metallic taste, abdominal pain, anorexia, diarrhoea with black stools (if acute massive exposure), constipation and vomiting may occur. Toxic megacolon has been reported rarely

Headaches, irritability, fatigue, insomnia, depression, peripheral neuropathy (predominantly motor), wrist drop and arthropathy may occur

Proximal renal tubular dysfunction with aminoaciduria, glycosuria, phosphaturia and renal tubular acidosis may occur

Encephalopathy with headache, confusion, drowsiness, coma and seizures secondary to cerebral oedema may occur. Lead encephalopathy is more common in children and is more likely to occur at blood lead concentrations ≥ 100 micrograms/dL

Reference

TOXBASE. Lead, 03/2010. <http://www.toxbase.org> (accessed 03/2019).

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 lead 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.

General advice on disrobe and decontamination

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 (e.g. 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). 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 people individually.

Detailed information on clinical management can be found on TOXBASE – www.toxbase.org.

Important note

- ambulance staff, paramedics and emergency department staff treating chemically contaminated casualties should be equipped with appropriate personal protective equipment (PPE)

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
- 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 10–15 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

- if symptomatic, immediately irrigate the affected eye thoroughly
- for patients 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, 1,000 mL 0.9% saline at room temperature by an infusion bag with a giving set is appropriate, irrigate for 10–15 minutes
- refer for ophthalmological assessment if there is doubt regarding the management of corneal damage
- other supportive measures as indicated by the patient's clinical condition

Inhalation/ingestion

- ensure a clear airway and adequate ventilation
- other supportive measures as indicated by the patient's clinical condition

Clinical decontamination and first aid references

TOXBASE <http://www.toxbase.org> (accessed 03/2019)

TOXBASE Lead (lead salts), 03/2010

TOXBASE Skin decontamination – irritants, 01/2018

TOXBASE Eye irritants, 01/2016

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.

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

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