Public Health England

Protecting and improving the nation's health

Polybromodiphenyl ethers (Decabromodiphenyl ether)

Incident Management

Key Points

Fire

- non-flammable
- not soluble in water
- when heated to decomposition it emits toxic fumes of hydrogen bromide

Health

- Deca-DBE and other PBDEs are of low toxicity following acute exposure

Environment

- hazardous to the environment; inform the Environment Agency of substantial incidents where appropriate

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Hazard Identification

Standard (UK) dangerous goods emergency action codes

UN		Not given
EAC		
APP		
Hazards	**Class**	
	Sub-risks	
HIN		
UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number		

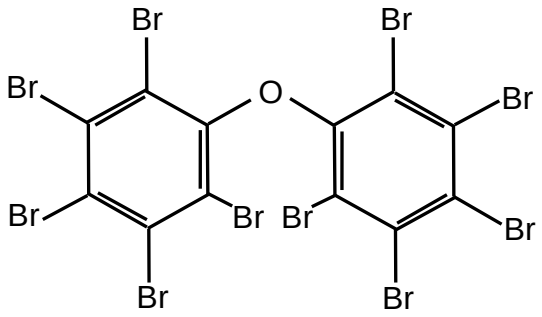
Classification, labelling and packaging (CLP)

Decabromodiphenyl ether has not been given a harmonised classification. However it is classified as a substance of very high concern (SVHC) because it is persistent, bioaccumulative and toxic (PBT) as per the EU REACH regulations.

Reference:

European Chemicals Agency (ECHA). Agreement of the Member State Committee on the Identification Of Bis(Pentabromophenyl) Ether [Decabromodiphenyl Ether] as a Substance of Very High Concern. 2012.

Physicochemical Properties

CAS number	1163-19-5
Molecular weight	959
Formula	$C_{12}Br_{10}O$
Common synonyms	Deca-BDPE; Deca-BDE; Deca-brominated diphenyl ether; Decabromodiphenyl oxide; Bis(Pentabromophenyl) ether
State at room temperature	White crystalline powder
Volatility	Vapour pressure negligible at 21°C
Specific gravity	3.0 (water = 1)
Flammability	Non-flammable
Lower explosive limit	Not applicable
Upper explosive limit	Not applicable
Water solubility	Not soluble in water
Reactivity	-
Reaction or degradation products	When heated to decomposition it emits toxic fumes of hydrogen bromide. Decomposes at 425ºC.
Odour	Odourless
Structure	

References

Hazardous Substances Data Bank. Decabromodiphenyl Ether HSDB No. 2911 (last revision date 19/01/2015). US National Library of Medicine: Bethesda MD. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB (accessed 08/2018)

International Programme on Chemical Safety. International Chemical Safety Card entry for Bis (pentabromophenyl) ether. ICSC 1689, 2008. World Health Organization, Geneva.

National Centre for Biotechnology Information. PubChem Compound Database: CID=14410, https://pubchem.ncbi.nlm.nih.gov/compound/Decabromodiphenyl_oxide#section=Top (accessed 08/2018).

Reported Effect Levels from Authoritative Sources

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

Published Emergency Response Guidelines

Emergency response planning guideline (ERPG) values

	Listed value (ppm)	Calculated value (mg/m^3)
ERPG-1*	Not given	
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*	Not given				
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	Not given			
WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit				

Public health guidelines

Drinking water standard	Guideline value not given
Air quality guideline	
Soil guideline values and health criteria values	

Health Effects

Immediate signs or symptoms of acute exposure

Deca-DBE and other PBDEs are thought to be of low toxicity following acute exposure.

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 Deca-BDE, **unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances**.

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

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 people individually.

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

Important note

- **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

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
- 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 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

- 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

- in hospital – immediately irrigate eye thoroughly with 1000 mL 0.9% saline or equivalent crystalloid (for example via an infusion bag with a giving set) for minimum of 10 - 15 minutes. Amphoteric solutions are available and may be used. A Morgan Lens may be used if anaesthetic has been given
- 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

- other supportive measures as indicated by the patient's clinical condition

Health effects and decontamination references

TOXBASE http://www.toxbase.org (accessed 08/2018)

TOXBASE Skin decontamination - irritants, 01/2018

TOXBASE Eye irritants – features and management, 01/2016

TOXBASE Personal protective equipment and decontamination at the scene or in hospital

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

For all other enquiries, please contact: phe.enquiries@phe.gov.uk