



## Kerosene

### Incident Management

#### Key Points

##### General

- liquid at room temperature, practically insoluble in water
- characteristic fuel-like odour
- flammable
- vapour/air mixtures are explosive
- emits acrid smoke and fumes when heated to decomposition

##### Health effects

- inhalation may lead to coma, ataxia, convulsions, cardiac arrhythmias and respiratory distress
- ingestion causes nausea, vomiting and abdominal pain and can lead to systemic effects
- aspiration causes pneumonitis initial symptoms include choking, gasping, coughing and haemoptysis
- dermal exposure can cause irritation, drying and cracking
- ocular exposure may cause an immediate stinging and burning sensation with lacrimation

##### Casualty decontamination at the scene


- following disrobe, improvised dry decontamination should be considered for an incident involving kerosene 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
- spillages and decontamination run-off should be prevented from entering watercourses

## Hazard Identification

### Standard (UK) dangerous goods emergency action codes

|  |                  |      |   |   |
|--|------------------|------|---|---|
| <b>UN</b>  |                  | 1223 | Kerosene  |   |
| <b>EAC</b>   |                  | 3Y   | Use normal foam. Wear normal fire kit in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses |   |
| <b>APP</b>   |                  | –    | –   |   |
| <b>Hazards</b>   | <b>Class</b>     | 3    | Flammable liquid  |  |
|  | <b>Sub-risks</b> | –    | –   |   |
| <b>HIN</b>   |                  | 30   | Flammable liquid (flash point between 23°C and 61°C inclusive)  |   |
| <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><b>Reference</b><br/>           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)\***

|  |             |  |   |
|--|-------------|--|---|
| <b>Hazard class and category</b>   | Asp. Tox. 1 | Aspiration hazard, category 1                |  |
| <b>Hazard statement</b>  | H304        | May be fatal if swallowed and enters airways |   |
| <b>Signal words</b>  | DANGER      |  |   |
| <p>* Implemented in the EU on 20 January 2009</p> <p><b>Reference</b><br/>         European Commission. Harmonised classification – Annex VI of Regulation (EC) No. 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures. <a href="http://echa.europa.eu/information-on-chemicals/cl-inventory-database">http://echa.europa.eu/information-on-chemicals/cl-inventory-database</a> (accessed 03/2019).</p> |             |  |   |

## Physicochemical Properties

|  |   |
|--|---|
| <b>CAS number</b>  | 8008-20-6   |
| <b>Molecular weight</b>  | –   |
| <b>Formula</b>   | Mixture of C <sub>8</sub> to C <sub>16</sub> hydrocarbons         |
| <b>Common synonyms</b>   | Light petroleum, lamp oil   |
| <b>State at room temperature</b>   | Oil liquid  |
| <b>Volatility</b>  | Vapour pressure = 0.480 mmHg at 20°C                              |
| <b>Relative density</b><br><b>Relative vapour density</b>  | 0.8 to <1.0 (water = 1)<br>4.5 (air = 1)                          |
| <b>Flammability</b>  | Flammable. Above 37°C explosive vapour/air mixtures may be formed |
| <b>Lower explosive limit</b>   | 0.7%  |
| <b>Upper explosive limit</b>   | 5%  |
| <b>Water solubility</b>  | Insoluble in water  |
| <b>Reactivity</b>  | Can react with oxidants   |
| <b>Reaction or degradation products</b>  | When heated to decomposition it emits acrid smoke and fumes       |
| <b>Odour</b>   | Petrol odour  |
| <b>References</b>  |   |
| <p>Hazardous Substances Data Bank. Kerosene. HSDB No. 632 (last revision date 26/07/2018). US National Library of Medicine: Bethesda MD. <a href="http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB">http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB</a> (accessed 03/2019).</p> <p>International Programme on Chemical Safety. International chemical safety card entry for kerosene. ICSC 0663, 2018. 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 <sup>3</sup> ) |
|---|--------------------|---------------------------------------|
| <b>ERPG-1*</b>  | No data available  |                                       |
| <b>ERPG-2†</b>  |                    |                                       |
| <b>ERPG-3‡</b>  |                    |                                       |
| <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 (AEGs) (see note)

|  | Concentration (mg/m <sup>3</sup> ) |        |        |         |         |
|--|------------------------------------|--------|--------|---------|---------|
|  | 10 min                             | 30 min | 60 min | 4 hours | 8 hours |
| <b>AEGL-1*</b>   | 290                                | 290    | 290    | 290     | 290     |
| <b>AEGL-2†</b>   | 1,100                              | 1,100  | 1,100  | 1,100   | 1,100   |
| <b>AEGL-3‡</b>   | NR                                 | NR     | NR     | NR      | NR      |
| <p><b>Note</b> Values relate to jet fuels JP-5 and JP-8 of which kerosene is the main ingredient</p> <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> <p>NR Not recommended due to insufficient data</p> <p><b>Reference</b><br/>US Environmental Protection Agency. Acute Exposure Guideline Levels. <a href="http://www.epa.gov/oppt/aegl/pubs/chemlist.htm">http://www.epa.gov/oppt/aegl/pubs/chemlist.htm</a> (accessed 03/2019).</p> |                                    |        |        |         |         |

## Exposure Standards, Guidelines or Regulations

### 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 data available              |                   |                                |                   |
| WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit |                                |                   |                                |                   |

### Public health guidelines

|   |                              |
|---|------------------------------|
| <b>Drinking water standard</b>                          | No guideline value specified |
| <b>Air quality guideline</b>                            | No guideline value specified |
| <b>Soil guideline values and health criteria values</b> | No guideline value specified |

## Health Effects

### Major route of exposure

- systemic toxicity most commonly occurs after inhalation; it may occur following ingestion and rarely after skin contact
- pulmonary toxicity is most likely to occur following ingestion (due to aspiration)

### Immediate signs or symptoms of acute exposure

| Route  | Signs and symptoms  |
|--|---|
| <b>Inhalation</b>  | <p>Drowsiness may manifest following inhalation, with this potentially leading to coma, ataxia, convulsions, cardiac arrhythmias, and respiratory distress</p> <p>Cardiac arrhythmias (in particular ventricular fibrillation) may occur, due to sensitisation of the myocardium to catecholamines. This may be further precipitated by exercise following exposure. Direct inhalation may cause death due to bradycardia and cardiac arrest from vagal stimulation by rapid chilling of the larynx</p>   |
| <b>Ingestion</b>   | <p>Nausea, vomiting and abdominal pain may be observed. Rarely, diarrhoea, haematemesis and melaena, corrosive damage and perforation may also be noted</p> <p>Aspiration into the lungs may cause pneumonitis or lipid pneumonia. Initial features include choking, gasping, coughing and haemoptysis. Signs and symptoms may progress over 24 – 48 hours with wheeze, breathlessness, bronchospasm, hypoxia, fever and leukocytosis. Chest x-ray changes include patchy shadowing and pulmonary oedema (may be delayed for 24 – 72 hours). In severe cases shock and cardiorespiratory arrest can occur</p> <p>Rarer complications include pleural effusions or pneumatoceles, lipid pneumonia, emphysema, pneumothorax and pneumomediastinum</p> |
| <b>Systemic</b>  | <p>Symptoms include drowsiness leading to coma, ataxia, convulsions, cardiac arrhythmias, coma and respiratory collapse. In rare cases, abnormal LFTs, acute renal injury, myocarditis, intravascular haemolysis and disseminated intravascular coagulation may occur</p>   |
| <b>Dermal</b>  | <p>Brief exposures cause irritation, drying and cracking. Prolonged exposures may lead to transient pain with erythema, blistering, necrosis, partial thickness burns and possibly full thickness burns. Rarely systemic toxicity may arise. Dermatitis may develop after repeated exposures</p>  |
| <b>Ocular</b>  | <p>Pain, blepharospasm, lacrimation, conjunctivitis, oedema and photophobia may occur</p>   |
| <p><b>References</b><br/>           TOXBASE. Kerosene, 06/2018. <a href="http://www.toxbase.org">http://www.toxbase.org</a> (accessed 03/2019)</p> |   |



## 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 kerosene 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

Home Office. Initial operational response to a CBRN incident. Version 2.0, July 2015.

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](http://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

- **do not allow smoking nearby – there may be a risk of fire**
- carry out decontamination in a well-ventilated area, preferably with its own ventilation system
- the patient should remove soiled clothing and wash themselves if possible
- put soiled clothing in a sealed container to prevent escape of volatile substances
- wash hair and all contaminated skin with liberal amounts of water (preferably warm) and soap
- pay special attention to skin folds, fingernails and ears

### Dermal exposure

- decontaminate (as above) the patient following surface contamination
- for extensive or prolonged exposure there may be systemic effects – see ingestion
- burns totalling more than 15% of body surface area in adults (more than 10% in children) will require standard fluid resuscitation as for thermal burns
- cover affected area with a clean, non-adherent dressing
- chemical burns should be reviewed by a burns specialist; excision or skin grafting may be required
- 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 (e.g. 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 (e.g. by an infusion bag with a giving set) for a minimum of 10-15 minutes irrespective of initial conjunctival pH. Amphoteric solutions are available and may be used. A Morgan Lens may be used if anaesthetic has been given. 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 adequate ventilation
- give oxygen if indicated
- monitor vital signs, cardiac rhythm and check capillary blood sugar
- perform a 12 lead ECG in all patients that require assessment
- other supportive measures as indicated by the patient's clinical condition

## Ingestion

- maintain a clear airway and adequate ventilation
- give oxygen if indicated
- gastric lavage should **not** be undertaken due to the increased risk of aspiration
- monitor vital signs, cardiac rhythm and check capillary blood sugar
- perform a 12-lead ECG in all patients that require assessment
- 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 Kerosene, 06/2018

|         |  |
|---------|--|
| TOXBASE | Petroleum distillates – features and management, 04/2017 |
| TOXBASE | Petroleum distillates – inhalation, 10/2016              |
| TOXBASE | Petroleum distillates – skin contact, 03/2010            |
| TOXBASE | Chemicals splashed or sprayed into the eyes, 06/2017     |

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](mailto:chemcompendium@phe.gov.uk)

For all other enquiries, please contact: [phe.enquiries@phe.gov.uk](mailto:phe.enquiries@phe.gov.uk)

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