



UK Health
Security
Agency

Nitric acid

Incident management

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Main points

General

Nitric acid is a non-flammable, pale yellow to reddish brown fuming liquid with an acrid odour. Although non-flammable itself, it may ignite other flammable materials and intensify fires.

It is a strong oxidant, that reacts violently with combustible and reducing materials

Nitric acid emits toxic fumes of nitrogen oxides when heated to decomposition.

Health

Inhalation causes irritation of the eyes and nose, with sore throat, cough, chest tightness, headache, fever, wheeze, tachycardia and confusion

In serious cases, corrosive damage to the mucous membranes of both the upper and lower respiratory tract occurs

Ingestion causes immediate pain, with burning in the mouth, throat and stomach

Acids may cause pain, blistering, ulceration and penetrating necrosis

Large or prolonged exposure may result in systemic effects

Ocular exposure causes pain, blepharospasm, lacrimation, conjunctivitis, palpebral oedema and photophobia

Casualty decontamination at the scene



Following disrobe, improvised wet decontamination should be considered (see below for details on wet decontamination).

Environment

Inform the [Environment Agency](#) where appropriate and avoid release into the environment.

Hazard identification

Table 1a. Standard (UK) dangerous goods emergency action codes for nitrating acid mixture with more than 50% nitric acid, packaging group I and nitric acid, other than red fuming, with more than 70% nitric acid

| | | | | |
|----------------|------------------|------|---|---|
| UN | | 1796 | Nitrating acid with more than 50% nitric acid, packaging group I | |
| | | 2031 | Nitric acid, other than red fuming, with more than 70% nitric acid | |
| EAC | | 2P | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. Substance can be violently or explosively reactive. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2]. | |
| APP | | B | Gas tight chemical protective suit with breathing apparatus [note 3] | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | 5.1 | Oxidising substances |  |
| HIN | | 885 | Highly corrosive substance, oxidizing (fire-intensifying) | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1a

[note 1] 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.


[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

[note 3] Chemical protective clothing should be gas-tight conforming to BS EN 943 part 2 in combination with breathing apparatus conforming to BS EN 137.

Reference

[‘Dangerous Goods Emergency Action Code List’](#). National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1b. Standard (UK) dangerous goods emergency action codes for nitrating acid mixture with not more than 50% nitric acid, packaging group II

| | | | | |
|----------------|------------------|------|---|---|
| UN | | 1796 | Nitrating acid mixture with not more than 50% nitric acid, packaging group II | |
| EAC | | 2R | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2]. | |
| APP | | – | – | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | – | – | |
| HIN | | 80 | Corrosive or slightly corrosive substance | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1b



[note 1] 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.

[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1c. Standard (UK) dangerous goods emergency action codes for nitrating acid mixture, spent, with more than 50% nitric acid, packaging group I

| | | | | |
|----------------|------------------|------|--|---|
| UN | | 1826 | Nitrating acid mixture, spent, with more than 50% nitric acid, packaging group I | |
| EAC | | 2W | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. 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 | | B | Gas tight chemical protective suit with breathing apparatus [note 2]. | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | 5.1 | Oxidising substance |  |
| HIN | | 885 | Highly corrosive substance, oxidizing (fire-intensifying) | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1c


[note 1] 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.

[note 2] Chemical protective clothing should be gas-tight conforming to BS EN 943 part 2 in combination with breathing apparatus conforming to BS EN 137.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1d. Standard (UK) dangerous goods emergency action codes for nitrating acid mixture, spent with not more than 50% nitric acid, packaging group II

| | | | | |
|----------------|------------------|------|--|---|
| UN | | 1826 | Nitrating acid mixture, spent with not more than 50% nitric acid, packing group II | |
| EAC | | 2X | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters. | |
| APP | | – | – | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | – | – | |
| HIN | | 80 | Corrosive or slightly corrosive substance | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.



Note to Table 1d

[note 1] 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.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1e. Standard (UK) dangerous goods emergency action codes for Nitric acid, other than red fuming, with more than 70% nitric acid

| | | | | |
|----------------|------------------|------|---|---|
| UN | | 2031 | Nitric acid, other than red fuming, with more than 70% nitric acid | |
| EAC | | 2P | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. Substance can be violently or explosively reactive. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2]. | |
| APP | | B | Gas tight chemical protective suit with breathing apparatus [note 3] | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | 5.1 | Oxidising substance |  |
| HIN | | 885 | Highly corrosive substance, oxidizing (fire-intensifying) | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1e

[note 1] 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.



[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

[note 3] Chemical protective clothing should be gas-tight conforming to BS EN 943 part 2 in combination with breathing apparatus conforming to BS EN 137.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1f. Standard (UK) dangerous goods emergency action codes for Nitric acid, other than red fuming, with at least 65% but not more than 70% nitric acid

| | | | | |
|----------------|------------------|------|---|---|
| UN | | 2031 | Nitric acid, other than red fuming, with at least 65% nitric acid but not more than 70% | |
| EAC | | 2R | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2]. | |
| APP | | – | | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | 5.1 | Oxidising substance |  |
| HIN | | 85 | Corrosive or slightly corrosive substance, oxidizing (fire-intensifying) | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1f


[note 1] 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.

[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

Reference

[‘Dangerous Goods Emergency Action Code List 2023 | Insights | News and insights | Ricardo](#)
Ricardo (2023) (viewed January 2024)

Table 1g. Standard (UK) dangerous goods emergency action codes for Nitric acid, other than red fuming, with less than 65%

| | | | | |
|----------------|------------------|------|--|---|
| UN | | 2031 | Nitric acid, other than red fuming, with less than 65% nitric acid | |
| EAC | | 2R | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2] | |
| APP | | – | – | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | – | – | |
| HIN | | 80 | Corrosive or slightly corrosive substance | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1g




[note 1] 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.

[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 1h. Standard (UK) dangerous goods emergency action codes for Nitric acid, red fuming

| | | | | |
|----------------|------------------|------|--|---|
| UN | | 2032 | Nitric acid, red fuming | |
| EAC | | 2PE | Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus [note 1]. Substance can be violently or explosively reactive. There is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2]. There may be a public safety hazard outside the immediate area of the incident [note 3]. | |
| APP | | B | Gas tight chemical protective suit with breathing apparatus [note 4] | |
| Hazards | Class | 8 | Corrosive substance |  |
| | Sub-risks | 5.1 | Oxidising substances |  |
| | | 6.1 | Toxic substances |  |
| HIN | | 856 | Corrosive or slightly corrosive substance, oxidizing (fire-intensifying) and toxic | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Note to Table 1h

[note 1] 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.

[note 2] In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.




[note 3] People should be warned to stay indoors with all doors and windows closed, preferably in rooms upstairs and facing away from the incident. Ignition sources should be eliminated and ventilation stopped. Effects may spread beyond the immediate vicinity. All non-essential personnel should be instructed to move at least 250 m away from the incident.

[note 4] Chemical protective clothing should be gas-tight conforming to BS EN 943 part 2 in combination with breathing apparatus conforming to BS EN 137.

Reference

[‘Dangerous Goods Emergency Action Code List’](#). National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2023)

Table 2a. The GB classification, labelling and packaging (CLP) regulation for Nitric acid...(C > 70%)

| | | | |
|----------------------------------|---------------|---|--|
| Hazard class and category | Ox. Liq. 2 | Oxidizing liquid, category 2 |  |
| | Skin corr. 1A | Skin corrosion, category 1A |  |
| | Acute Tox. 1 | Acute toxicity, category 1 |  |
| Hazard statement | H272 | May intensify fire; oxidizer | |
| | H330 | Fatal if inhaled | |
| | H314 | Causes severe skin burns and eye damage | |
| | EUH071 | Corrosive to the respiratory tract | |
| Signal words | DANGER | | |

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed January 2024)




Table 2b. Specific concentration limits for Nitric acid ...% (C > 70%)

| Concentration (%) | Hazard class and category | Hazard statement | |
|-------------------|---------------------------|------------------|------------------------------|
| 70 % ≤ C < 99 % | Ox. Liq. 3 | H272 | May intensify fire; oxidizer |
| C ≥ 99% | Ox. Liq. 2 | | |

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed January 2024)

Table 2c. Specific concentration limits for Nitric acid ...% (C ≤ 70%)

| | | | |
|----------------------------------|---------------|---|---|
| Hazard class and category | Ox. Liq. 3 | Oxidizing liquid, category 3 |  |
| | Skin corr. 1A | Skin corrosion, category 1A |  |
| | Acute Tox. 3 | Acute toxicity, category 3 |  |
| Hazard statement | H272 | May intensify fire; oxidizer | |
| | H331 | Toxic if inhaled | |
| | H314 | Causes severe skin burns and eye damage | |
| | EUH071 | Corrosive to the respiratory tract | |
| Signal words | DANGER | | |

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed January 2024)

Table 2d. Specific concentration limits for Nitric acid ...% (C ≤ 70%)

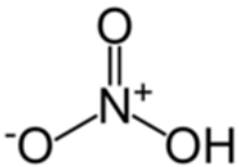
| Concentration (%) | Hazard class and category | Hazard statement | |
|-------------------|---------------------------|------------------|---|
| C ≥ 65 % | Ox. Liq. 3 | H272 | May intensify fire; oxidizer |
| C ≥ 20 % | Skin Corr. 1A | H314 | Causes severe skin burns and eye damage |
| 5 % ≤ C < 20 % | Skin Corr. 1B | | |

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed January 2024)

Physicochemical properties

Table 3. Physicochemical properties

| | |
|----------------------------------|--|
| CAS number | 7697-37-2 |
| Molecular weight | 63.01 |
| Formula | HNO ₃ |
| Common synonyms | Hydrogen nitrate |
| State at room temperature | Pale yellow to reddish brown fuming liquid, off-gassing red-brown fumes |
| Volatility | Vapour pressure = 48 mmHg |
| Specific gravity | (Water = 1) 1.4 |
| Flammability | Non-flammable, but may enhance and accelerate the combustion of other substances |
| Lower explosive limit | Not applicable |
| Upper explosive limit | Not applicable |
| Water solubility | Miscible |
| Reactivity | <p>Powerful oxidising and nitrating agent.</p> <p>May ignite a variety of organic and non-organic compounds including alcohols, ammonia, amines, beryllium alkyls, boranes, dicyanogen, hydrazines, hydrocarbons, hydrogen, nitroalkanes, powdered metals, silanes or thiols on contact.</p> <p>Reacts violently with water to produce heat, fumes and spattering.</p> |
| Odour | Acrid suffocating odour |
| Structure |  |

References

PubChem [Internet]. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004-. [PubChem Compound Summary for CID 944, Nitric Acid](#); (viewed January 2024)

Reported effect levels from authoritative sources

Table 4a. Exposure by ingestion

| mg/kg | Signs and symptoms | Reference |
|-------|---------------------------|-----------|
| 430 | Lowest lethal dose | a |
| % | | |
| 20-30 | Corrosive injury reported | a |

Table 4b. Exposure by inhalation

| ppm | mg/m ³ | Signs and symptoms | Reference |
|-------|-------------------|---|-----------|
| 13.07 | 33.7 | Major mucosal irritation of the upper respiratory tract and lungs | a |

References

a. Bundesinstitut für Risikobewertung (BfR). [Health risks of nitric acid-containing cleaning products](#). (September 2010) (viewed October 2023)

Published emergency response guidelines

Table 5. Acute exposure guideline levels (AEGLs)

| | Concentration ppm | | | | |
|------------------------|-------------------|------------|------------|---------|---------|
| | 10 minutes | 30 minutes | 60 minutes | 4 hours | 8 hours |
| AEGL-1 [note 1] | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| AEGL-2 [note 2] | 43 | 30 | 24 | 6.0 | 3.0 |
| AEGL-3 [note 3] | 170 | 120 | 92 | 23 | 11 |

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.

Reference

US Environmental Protection Agency (EPA) '[Acute Exposure Guideline Levels](#)' (viewed February 2024)

Exposure standards, guidelines or regulations

Table 6. Occupational standards

| | LTEL (8-hour reference period) | | STEL (15-min reference period) | |
|------------|--------------------------------|------------------------|--------------------------------|-------------------|
| | ppm | mg/m ³ | ppm | mg/m ³ |
| WEL | No guideline specified | No guideline specified | 1 | 2.6 |

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

Reference

HSE. '[EH40/2005 Workplace Exposure Limits](#) . Fourth Edition' (2020) (viewed February 2024)

Table 7. Public health standards and guidelines

| | |
|---|------------------------------|
| UK drinking water standard | No guideline value specified |
| WHO guideline for drinking water quality | No guideline value specified |
| WHO air quality guideline | No guideline value specified |

Health effects

Corrosive by inhalation, ingestion, eye contact and skin contact.

Table 8. Signs or symptoms of acute exposure

| Route | Signs and symptoms |
|--------------------------|---|
| <p>Inhalation</p> | <p>Irritation of eyes and nose with sore throat, cough, chest tightness, headache, fever, wheeze, tachycardia and confusion.</p> <p>Chemical pneumonitis, tachypnoea, dyspnoea and stridor due to laryngeal oedema may follow. Pulmonary oedema with increasing breathlessness, wheeze, hypoxia and cyanosis may take up to 36 hours to develop. Optic neuropathy has been reported following both acute and chronic inhalation.</p> <p>In serious cases, corrosive damage to the mucous membranes of both the upper and lower respiratory tract occurs. Severe inhalation injuries may result in persistent hoarseness, pulmonary fibrosis and chronic obstructive pulmonary disease.</p> <p>Prolonged exposure may result in systemic effects.</p> |
| <p>Ingestion</p> | <p>Ingestion of corrosives can cause immediate pain with burning in the mouth, throat and stomach. This may be followed by abdominal pain, vomiting, haematemesis and dyspnoea. Pain and oedema may make swallowing difficult, causing drooling. Haemorrhagic or hypovolaemic shock and airway obstruction from laryngeal and/or epiglottic oedema are features of severe cases.</p> <p>Stridor and respiratory complications (including pneumonitis, pulmonary oedema, ARDS and pulmonary necrosis) can develop following aspiration of corrosive materials.</p> <p>The presence of oropharyngeal burns does not correlate well with the presence of oesophageal injuries, but generally more extensive oral burns are associated with multiple site involvement. Gastric or oesophageal perforation may occur in the early stages of severe cases. Stricture formation is a potential late complication, usually occurring between 2 weeks and 2 months post exposure, although it may not be clinically apparent for several years. Severe injury can cause pyloric stenosis and a small, scarred, immobile stomach.</p> |

| Route | Signs and symptoms |
|---------------|--|
| | <p>Ulceration may be sufficiently severe to cause perforation with complications including mediastinitis, pneumonitis and cardiac injury.</p> <p>Acids tend to damage the stomach with ulceration, necrosis, haemorrhage and perforation. However, in severe cases, extensive areas of the gastrointestinal tract may be involved.</p> <p>Systemic features following corrosive ingestion may include hypovolaemic shock, metabolic acidosis, hypoxia, respiratory failure, acute renal failure, severe electrolyte imbalances, haemolysis and disseminated intravascular coagulation (DIC).</p> |
| Dermal | <p>Symptoms are more likely to occur following direct contact with solid or liquid corrosive materials although features can also occur via contact with corrosive gases and fumes.</p> <p>Acids may cause pain, blistering, ulceration and necrosis. These burns may be self-limiting and superficial with the destruction of the surface epithelium and sub mucosa forming a leathery crust which limits the spread of the product. Large or prolonged exposure may result in systemic effects.</p> |
| Ocular | <p>Pain, watering, conjunctivitis, oedema and photophobia may occur. Acidic solutions may cause corneal burns and limbal ischaemia (whitening/blanching around the edge of the cornea where it meets the sclera)</p> |

Reference

[TOXBASE](#). Corrosives – ingestion. June 2022 (viewed February 2024)
[TOXBASE](#). Corrosives – inhalation. January 2020 (viewed February 2024)
[TOXBASE](#). Skin decontamination - corrosives. January 2020 (viewed February 2024)
[TOXBASE](#). Chemicals Splashed or Sprayed into the Eyes-features and management. January 2020 (viewed February 2024)

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.

Nitric acid is highly corrosive. Therefore, following disrobe, improvised wet decontamination should be considered (see below for details on wet decontamination).

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 and Environment 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 more structured interventions such as Interim or Specialist Operational Response are present.

Improvised dry decontamination

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

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 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 (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)

JESIP. ['Initial Operational Response IOR to Incidents Suspected to Involve Hazardous Substances or CBRN Materials'](#) (January 2023)

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.

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 copious amounts of water under low pressure for at least 10 to 15 minutes, or until the pH of the skin is normal (pH of the skin is 4.5 to 6, although it may be closer to 7 in children, or after irrigation). The earlier irrigation begins, the greater the benefit.

There is experimental evidence that commercially available amphoteric, hypertonic, chelating solutions normalise tissue pH more rapidly than water or saline and may be used if available. The evidence for improved clinical outcome is poor.

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.

Recheck pH of affected areas after a period of 15 to 20 minutes and repeat irrigation if abnormal. Burns with strong solutions may require irrigation for several hours or more. Attention should be paid to avoiding hypothermia during prolonged irrigation with cool fluids.

Once the pH is normal and stabilised, treat as per a thermal injury.

Burns totalling more than 15% of body surface area in adults (>10% in children) will require standard fluid resuscitation as for thermal burns.

Moderate/severe chemical burns should be reviewed by a burns specialist.

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

For comprehensive advice on clinical first aid, clinicians should consult [TOXBASE](#) directly.

Ocular 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 1,000mL 0.9% saline or equivalent crytalloid (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 7.0 to 8.0. The conjunctivae may be tested with indicator paper. Retest 20 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

Maintain airway and establish haemodynamic stability

In severely affected patients, especially those with tachypnoea, stridor or upper airway damage, critical care input is essential with urgent assessment of the airway. A supraglottic-epiglottic burn with erythema and oedema is usually a sign that further oedema will occur that may lead to airway obstruction.

Children are at increased risk of airway obstruction and treating clinicians should have a low threshold for establishing a protected airway.

Do not attempt gastric lavage. Do not give neutralising chemicals as heat produced during neutralisation reactions may increase injury.

Monitor vital signs and cardiac rhythm; check the capillary blood glucose.

Check and record pupil size.

Consider the use of water or milk (maximum initial volume = 100 to 200 mL in an adult; 2 mL/kg in a child) as diluents for symptomatic benefit early after corrosive ingestion provided the patient does not have swallowing or breathing problems (but caution is necessary following large ingestions where mucosal damage / perforation may have already developed). There is experimental evidence to suggest that early dilution therapy with water or milk reduces acute alkali injury of the oesophagus but administration of large volumes of fluid should be avoided as they may induce vomiting and increase the risk of oedema.

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

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

Inhalation

Maintain a clear airway and ensure adequate ventilation.

Administer oxygen to achieve adequate oxygenation.

In severely affected patients, especially those with tachypnoea, stridor or upper airway damage, critical care input is essential with urgent assessment of the airway. A supraglottic-epiglottic burn with erythema and oedema is usually a sign that further oedema will occur that may lead to airway obstruction.

Children are at increased risk of airway obstruction and treating clinicians should have a low threshold for establishing a protected airway.

Monitor vital signs and check the capillary blood glucose.

Check and record pupil size.

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

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

Clinical decontamination and first aid references

[TOXBASE](#) (viewed October 2023).

TOXBASE: 'Nitric acid' (January 2020) (viewed October 2023)

TOXBASE: 'Chemicals splashed or sprayed into eyes – features and management' (2020) (viewed October 2023)

TOXBASE: 'Skin decontamination – corrosives' (January 2020) (viewed October 2023)

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.

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This document from the UKHSA Radiation, Chemicals and Environment Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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