



UK Health
Security
Agency

Acetone

Incident management

This document provides information needed for response to a chemical incident, such as physicochemical properties, health effects and decontamination advice.

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Contents

Main points.....	3
General.....	3
Health.....	3
Casualty decontamination at the scene.....	3
Environment.....	3
Hazard identification.....	4
Physicochemical properties.....	6
Reported effect levels from authoritative sources.....	7
Published emergency response guidelines.....	8
Exposure standards, guidelines or regulations.....	9
Health effects.....	10
Decontamination at the scene.....	11
Chemical specific advice.....	11
Disrobe.....	11
Improvised decontamination.....	12
Improvised dry decontamination.....	12
Improvised wet decontamination.....	13
Additional notes.....	13
Interim wet decontamination.....	14
Decontamination at the scene references.....	14
Clinical decontamination and first aid.....	15
Important notes.....	15
Clinical decontamination following surface contamination.....	15
Dermal exposure.....	16
Ocular exposure.....	16
Ingestion.....	16
Inhalation.....	17
Clinical decontamination and first aid references.....	17
About the UK Health Security Agency.....	18

Main points

General

Acetone is a colourless, volatile, highly flammable liquid with a distinctive fruity odour. Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxides generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions to generate fire and explosion hazard.

Health

Major routes of exposure are inhalation and ingestion, it is poorly absorbed by the skin.

Dermal exposure may cause irritation with erythema, drying, and dermatitis. Systemic toxicity from dermal exposure may occur if exposure is extensive or prolonged.

Inhalation may cause respiratory irritation at high concentrations and systemic effects may also develop.

Ingestion may cause nausea, vomiting, haematemesis, inflammation, and systemic features.

Ocular exposure to liquid acetone may cause irritation and transient epithelial injury.

Systemic effects include headache, sedation, ataxia, lethargy, slurred speech, nausea, vomiting, hypothermia, convulsions, cerebral oedema, coma, and respiratory depression.

Casualty decontamination at the scene

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


Environment

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

Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.

Hazard identification

Table 1. Standard (UK) dangerous goods emergency action codes for acetone

UN		1090	Acetone	
EAC		•2YE	Use alcohol resistant foam but, if not available, fine water spray can be used. Wear normal fire kit 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. There may be a public safety hazard outside the immediate area of the incident [note 2].	
APP		-	-	
Hazards	Class	3	Flammable liquids and desensitised liquid explosives	
	Sub-risks	-	-	
HIN		33	Highly flammable liquid (flash-point below 23°C)	

Abbreviations

UN = United Nations Number.

EAC = Emergency Action Code.

APP = Additional Personal Protection.

HIN = Hazard Identification Number.




Note 1: Normal firefighting clothing is appropriate: self-contained open circuit positive pressure compressed air breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, fire fighters' gloves conforming to BS EN 659 and firefighters' footwear conforming to BS EN 15090 (Footwear for firefighters) type F3- Hazmat and structural firefighting [CH – marking for chemical resistance] or alternatively firefighters' boots conforming to Home Office Specification A29 (rubber boots) or A30 (leather boots). Leather footwear including those conforming to A30 may not provide adequate chemical resistance therefore caution should be exercised in the use of these boots.

Note 2: 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.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)' 2023 (viewed on 08 October 2024)

Table 2. The GB classification, labelling and packaging (CLP) regulation for acetone

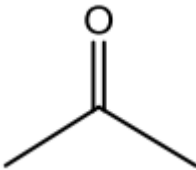
Hazard class and category	Flam. Liq. 2	Flammable liquid, category 2	
	Eye Irrit. 2	Eye irritation, category 2	
	STOT SE 3	Specific target organ toxicity following single exposure, category 3	
Hazard statement	H225	Highly flammable liquid and vapour	
	H319	Causes serious eye irritation	
	H336	May cause drowsiness or dizziness	
Supplemental Hazard Statement	EUH066	Repeated exposure may cause skin dryness or cracking	
Signal words	DANGER		

References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 08 October 2024)

Physicochemical properties

Table 3. Physicochemical properties

CAS number	67-64-1
Molecular weight	58.08
Formula	C ₃ H ₆ O
Common synonyms	2-Propanone, Dimethylformaldehyde, Dimethyl ketone, Propanone
State at room temperature	Clear colourless liquid
Volatility	Vapour pressure = 231 mmHg at 25°C
Specific gravity	0.8 (water = 1) 1.2 (air = 1)
Flammability	Highly flammable
Lower explosive limit	2.2%
Upper explosive limit	13%
Water solubility	Miscible
Reactivity	Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxides generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions to generate fire and explosion hazard. Attacks plastics.
Odour	Characteristic 'fruity' odour
Structure	

References

World Health Organization. International Programme on Chemical Safety. '[International Chemical Safety Card entry for Acetone](#)'. ICSC 0087, 2009 (viewed on 08 October 2024)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. '[PubChem Compound Summary for CID 180, Acetone](#)' (viewed on 08 October 2024)

Reported effect levels from authoritative sources

Table 4. Exposure by ingestion

mL/kg	Signs and symptoms	Reference
2-3	Potential toxic dose for children	a

Table 5. Exposure by inhalation

ppm	mg/m ³	Duration	Signs and symptoms	Reference
≤2,000	≤4,750	Not given	No gross toxic effects but minor transient effects such as irritation to the eyes	b
>12,000	>25,500	~ 4 hours	Severe transient effects including vomiting and fainting	b

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values.

References:

a. National Poisons Information Service (NPIS). TOXBASE '[Acetone](#)' 2020 (viewed on 08 October 2024)

b. World Health Organization. International Programme on Chemical Safety. '[Environmental Health Criteria report for Acetone](#)'. EHC 207 (viewed on 08 October 2024)

Published emergency response guidelines

Table 6. Interim acute exposure guideline levels (AEGLs)

	Concentration (ppm)				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
AEGL-1 [note 1]	200	200	200	200	200
AEGL-2 [note 2]	9,300 [note 4]	4,900 [note 4]	3,200 [note 4]	1,400	950
AEGL-3 [note 3]	[note 5]	8,600 [note 4]	5,700 [note 4]	2,500	1,700

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.

Note 4: Value is greater than 10% of the lower explosive limit of 26,000 ppm. Safety considerations against the hazard(s) of explosion(s) must be taken into account.

Note 5: AEGL 3 value for 10 minutes (16,000 ppm) is greater than 50% of the lower explosive limit of 26,000 ppm. Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

Level of Distinct Odor Awareness = 160 ppm

References

US Environmental Protection Agency (EPA) '[Acute Exposure Guideline Levels](#)' (viewed on 09 October 2024)

Exposure standards, guidelines or regulations

Table 7. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m ³	ppm	mg/m ³
WEL	500	1210	1500	3620

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

References

Health and Safety Executive (HSE). '[EH40/2005 Workplace Exposure Limits Fourth Edition](#)' 2020 (viewed on 09 October 2024)

Table 8. Public health standards and guidelines

Drinking water standard	No value specified
WHO guideline for drinking water quality	No value specified
UK indoor air quality guideline	No value specified
WHO indoor air quality guideline	No value specified
WHO air quality guideline	No value specified

Health effects

Toxic by inhalation and ingestion. Poorly absorbed via the skin.

Table 9. Signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation	Inhalation may cause respiratory irritation and chest tightness at high concentration. Systemic features may also develop.
Ingestion	Ingestion may cause nausea, vomiting, haematemesis and inflammation of the oral mucosa. Systemic features may also develop.
Systemic	Systemic features include headache, sedation, ataxia, lethargy, slurred speech, nausea, vomiting, convulsions, cerebral oedema, coma, hypothermia and respiratory depression. An odour of acetone is often detected on the breath as some is exhaled unchanged. Central nervous system depression may be prolonged due to the long elimination half-life of acetone. Tachycardia, hypotension, hyperglycaemia, ketosis and metabolic acidosis may occur while hepatic and renal toxicity occur rarely.
Eyes	Liquid acetone may cause irritation and transient epithelial injury. Prolonged contact with acetone liquid has caused permanent corneal damage. High vapour concentrations are irritating to the eyes.
Dermal	May cause irritation with erythema, drying and dermatitis. If contact is extensive or prolonged, systemic features may also develop.

References

National Poisons Information Service (NPIS). TOXBASE '[Acetone](#)' 2020 (viewed on 09 October 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.

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

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, Chemical, Climate, and Environmental Hazards 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

Improvised dry decontamination should be considered for an incident involving acetone unless casualties are demonstrating obvious signs of chemical burns or skin irritation.

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

Wet decontamination should be used if contamination with a caustic chemical substance is suspected.

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 2015 (viewed 09 October 2024)

National Health Service England. [‘Emergency Preparedness, Resilience and Response \(EPRR\): Guidance for the initial management of self presenters from incidents involving hazardous materials.’](#) 2019 (viewed on 09 October 2024)

Joint Emergency Service Interoperability Programme. [‘Initial Operational Response \(IOR\) to Incidents Suspected to Involve Hazardous Substances or CBRN Materials’](#) 2024 (viewed 09 October 2024)

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

Avoid contaminating yourself.

Carry out decontamination after resuscitation.

This should be performed in a well-ventilated area, preferably with its own ventilation system.

The patient should remove soiled clothing and wash themselves if possible.

Soiled clothing should be placed into a sealed container to prevent escape of volatile substances.

Decontaminate open wounds first and avoid contamination of unexposed skin. Wash hair and all contaminated skin with liberal amounts of water (preferably warm) and soap.

Pay attention to skin folds, fingernails and ears.

Dermal exposure

Decontaminate (as above) the patient following surface contamination.

Systemic toxicity would not be expected unless exposure has been extensive or prolonged. In such cases follow the management guidance for ingestion of acetone.

Carry out 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 (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 crystalloid (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 neutral conjunctival pH of 7 to 7.2. The conjunctivae may be tested with indicator paper. Retest at 15 to 30 minutes after irrigation and use further irrigation if necessary.

Any particles lodged 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.

Carry out other supportive measures as indicated by the patient's clinical condition.

Ingestion

Maintain a clear airway and ensure adequate ventilation.

Administer oxygen to achieve adequate oxygenation.

Gut decontamination is unlikely to be of benefit as acetone is rapidly absorbed. Activated charcoal does not adsorb acetone.

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.

Carry out other supportive measures as indicated by the patient's clinical condition.

Inhalation

Remove patient from exposure

Maintain a clear airway and ensure adequate ventilation.

Administer oxygen to achieve adequate oxygenation.

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.

Carry out other supportive measures as indicated by the patient's clinical condition.

Clinical decontamination and first aid references

National Poisons Information Service (NPIS). TOXBASE '[Acetone](#)' 2020 (viewed on 10 October 2024)

National Poisons Information Service (NPIS). TOXBASE '[Chemicals Splashed or Sprayed into the Eyes – features and management](#)' 2020 (viewed on 10 October 2024)

National Poisons Information Service (NPIS). TOXBASE '[Skin decontamination – irritants](#)' 2019 (viewed on 10 October 2024)

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.

[UKHSA](#) is an executive agency, sponsored by the [Department of Health and Social Care](#).

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