UK Health Security Agency

Isopropanol

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

General

Isopropanol is a highly flammable liquid. There is a risk of explosion on contact with strong oxidants. Attacks some plastics and rubber. When heated to decomposition, isopropanol emits acrid smoke and fumes.

Health

Ingestion can cause nausea, vomiting, and abdominal pain. A fruity odour on the breath may be detected. Systemic toxicity can also occur.

Inhalation may cause mild irritation to the eyes, nose, and throat. Systemic toxicity may occur following prolonged inhalation.

Dermal contact may cause paraesthesia and erythema. Prolonged skin contact may cause systemic toxicity.

Systemic features include confusion, drowsiness, and unsteadiness. Dizziness, headache, and muscle weakness can also occur.

Ocular exposure may cause irritation to the eyes, causing 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 isopropanol 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 isopropanol

UN		1219	Isopropanol (isopropyl alcohol)	
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.

Notes to Table 1

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 250m away from the incident.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. 'Dangerous Goods Emergency Action Code List'. 2025 (viewed on 30 January 2025)

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

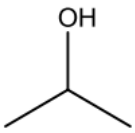
Hazard class and category	Flam. Liq. 2	Flammable liquid, category 2	
	Eye Irrit. 2	Eye irritation, category 2	
	STOT SE 3	Specific target organ toxicity following single exposure, category 3	
Hazard statement	H225	Highly flammable liquid and vapour	
	H319	Causes serious eye irritation	
	H336	May cause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

References

The Health and Safety Executive (HSE). 'GB CLP Regulation' (viewed on 30 January 2025)

Physicochemical properties

Table 3. Physicochemical properties for isopropanol

CAS number	67-63-0
Molecular weight	60.10
Formula	C_3H_8O / $CH_3CHOHCH_3$
Common synonyms	Isopropyl alcohol, 2-Propanol, Propan-2-ol, 1-methylethanol, 2-hydroxypropane, Isopropanol, Dimethylcarbinol
State at room temperature	Colourless liquid
Volatility	Vapour pressure = 33 mmHg at 20°C
Specific gravity	0.79 (water = 1) 2.1 (air = 1)
Flammability	Highly flammable
Lower explosive limit	2.0%
Upper explosive limit	12.7%
Water solubility	Miscible
Reactivity	Vapour/air mixtures are explosive. There is a risk of explosion on contact with strong oxidants. Attacks some plastics and rubber. When heated to decomposition, isopropanol emits acrid smoke and fumes.
Odour	Pleasant odour
Structure	

References

World Health Organization. International Programme on Chemical Safety ‘International Chemical Safety Card entry for Isopropyl alcohol’ ICSC 0554, 2020 (viewed on 30 January 2025)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. ‘PubChem Compound Summary for CID 3776, Isopropyl alcohol’ (viewed on 30 January 2025)

Reported effect levels from authoritative sources

Table 4. Exposure by inhalation

ppm	Signs and symptoms	Reference
400	Mild irritation of respiratory tract	a

Table 5. Exposure by ingestion

mL	Concentration	Signs and symptoms	Reference
<30	>70%	GI upset in children aged 6-years-old and under	b
100	>70%	Estimated minimum lethal dose for adults	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. International Programme on Chemical Safety. Isopropyl Alcohol. Poisons Information Monograph 290, 1990. World Health Organization: Geneva. (viewed on 03 February 2025)

b. National Poisons Information Service (NPIS). TOXBASE 'Isopropanol' 2024 (viewed on 03 February 2025)

Published emergency response guidelines

Table 6. Acute exposure guideline levels (AEGLs)

	Concentration				
	10 minutes	**30 minutes**	**60 minutes**	**4 hours**	**8 hours**
AEGL-1 [note 1]	No values specified				
AEGL-2 [note 2]					
AEGL-3 [note 3]					

Notes to Table 6

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.

Exposure standards, guidelines or regulations

Table 7. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	**mg/m³**	**ppm**	**mg/m³**
WEL	400	999	500	1,250

Abbreviations

WEL = workplace exposure limit.
LTEL = long-term exposure limit.
STEL = short-term exposure limit.

Reference

Health and Safety Executive (HSE). 'EH40/2005 Workplace Exposure Limits Fourth Edition' 2020 (viewed on 30 January 2025)

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

Toxicity is mainly due to CNS depression.

Table 9. Signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation	Brief, accidental inhalation can cause mild irritation to the eyes, nose and throat but would be unlikely to cause systemic effects. Prolonged inhalation can result in systemic features.
Ingestion	Nausea, vomiting and abdominal pain. A fruity odour on the breath can be detected. Haematemesis and melaena can occur.
Eyes	Eye exposure might cause irritation, causing an immediate stinging and burning sensation with lacrimation. Higher concentrations may cause corneal injury and temporary visual impairment.
Skin	Skin contact can cause paraesthesia, erythema, and contact dermatitis. Prolonged skin contact can also result in systemic features. Severe burns have been reported in young children following prolonged skin contact.
Systemic	CNS effects include confusion, drowsiness, and unsteadiness followed by respiratory depression and coma. Dizziness, headache, hypotonia and muscle weakness can also occur. CNS and respiratory depression can be prolonged in severe cases. Cardiovascular effects include initial tachycardia. In severe cases myocardial depression can develop leading to bradycardia, hypotension and cardiovascular collapse. Other complications may include aspiration pneumonia, pancreatitis, renal and hepatic injury and rhabdomyolysis, hypoglycaemia, hyperglycaemia, and hypothermia.

Reference

National Poisons Information Service (NPIS). TOXBASE ‘Isopropanol’ 2024 (viewed on 30January 2025)

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 isopropanol 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, Chemicals, 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 a more structured intervention, such as an Interim Operational Response is conducted, or Specialist Operational Response are present.

Improvised dry decontamination

Improvised dry decontamination should be considered for an incident involving isopropanol 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.

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 on 30 January 2025)

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 30 January 2025)

Joint Emergency Service Interoperability Programme. ‘Initial Operational Response (IOR) to Incidents Suspected to Involve Hazardous Substances or CBRN Materials’ 2024 (viewed on 30 January 2025)

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.

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 soap and water under low pressure for at least 10 to 15 minutes.

Pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears.

The earlier irrigation begins, the greater the benefit.

Skin exposure

Decontaminate (as above) the patient following surface contamination.

Systemic toxicity can occur following prolonged exposure, in such cases follow the management guidance for ingestion.

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

Eye exposure

If symptomatic immediately irrigate the affected eye thoroughly.

At home - use lukewarm water, trickled into the eye or in a small cup held over the eye socket. An eye dropper is an alternative.

In hospital - Immediately irrigate the affected eye thoroughly with 1000 mL 0.9% saline or equivalent crystalloid (for example via an infusion bag with a giving set) for a minimum of 10 to 15 minutes. A Morgan Lens may be used if anaesthetic has been given.

If symptoms persist seek medical assistance.

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

Inhalation

If systemic effects occur manage as for ingestion

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

Ingestion and systemic toxicity

Maintain a clear airway and ensure adequate ventilation.

In the event of cardiac arrest in hospital or witnessed out of hospital cardiac arrest with bystander CPR, resuscitation should be continued for at least 1 hour and only stopped after discussion with a senior clinician. Prolonged resuscitation for cardiac arrest is recommended following poisoning as recovery with good neurological outcome may occur.

Gut decontamination (including activated charcoal) is unlikely to be of benefit.

Monitor vital signs and cardiac rhythm; 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

National Poisons Information Service (NPIS). TOXBASE 'Isopropanol' 2024 (viewed on 30 January 2025)

National Poisons Information Service (NPIS). TOXBASE 'Eye irritants - features and management' 2022 (viewed on 30 January 2025)

National Poisons Information Service (NPIS). TOXBASE 'skin decontamination - irritants' 2019 (viewed on 30 January 2025)

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.

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

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