



# Sodium Dichromate

## Incident Management

### Key Points

#### Fire

- not combustible but enhances combustion of other substances
- a strong oxidant, reacts with combustible and reducing materials
- emits toxic fumes of sodium oxide when heated to decomposition

#### Health

- inhalation causes irritation to the respiratory tract; cough, chest pain, chronic rhinitis, laryngitis and pharyngitis have been reported; bronchial asthma and pulmonary oedema may occur and can be delayed for up to 72 hours
- ingestion causes nausea, vomiting, abdominal pain, haematemesis and bloody diarrhoea with circulatory collapse; renal failure may develop 12–24 hours post-exposure; convulsions, hepatic failure and coma with encephalopathy may develop
- dermal exposure causes skin irritation and burns; systemic toxicity may also occur
- ocular exposure causes pain, blepharospasm, lacrimation, conjunctivitis, palpebral oedema and photophobia

#### Environment








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





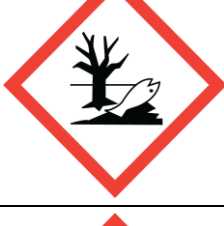

## Hazard Identification

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

<b>UN</b>	No specific data	
<b>EAC</b>		
<b>APP</b>		
<b>Hazards</b>	<b>Class</b>	
	<b>Sub-risks</b>	
<b>HIN</b>		

**Classification, labelling and packaging (CLP)\***

<b>Hazard class and category</b>	Ox. Sol. 2	Oxidising solids, category 2	
	Acute Tox. 3	Acute toxicity (oral), category 3	
	Acute Tox. 4	Acute toxicity (dermal), category 4	
	Skin Corr. 1B	Skin corrosion, category 1B	
	Skin Sens. 1	Skin sensitisation, category 1	
	Acute Tox. 2	Acute toxicity (inhalation), category 2	
	Resp. Sens. 1	Respiratory sensitisation, category 1	

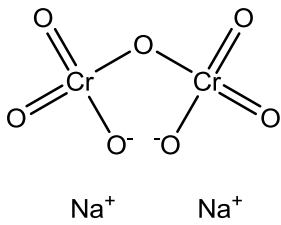
	Muta. 1B	Germ cell mutagenicity, category 1B	
	Carc. 1B	Carcinogenicity category, 1B	
	Repr. 1B	Reproductive toxicity, category 1B	
	STOT RE 1	Specific target organ toxicity following repeated exposure, category 1	
	Aquatic Acute 1	Acute hazards to the aquatic environment, category 1	
	Aquatic Chronic 1	Chronic hazards to the aquatic environment, category 1	
<b>Hazard statement</b>	H272	May intensify fire; oxidiser	
	H301	Toxic if swallowed	
	H312	Harmful in contact with skin	
	H314	Causes severe skin burns and eye damage	
	H317	May cause an allergic skin reaction	
	H330	Fatal if inhaled	

	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
	H340	May cause genetic defects
	H350	May cause cancer
	H360FD	May damage fertility. May damage the unborn child
	H372	Causes damage to organs through prolonged or repeated exposure
	H400	Very toxic to aquatic life
	H410	Very toxic to aquatic life with long-lasting effects
<b>Signal words</b>	DANGER	
* Implemented in the EU on 20 January 2009		
<b>Reference</b>		
European Commission. Harmonised classification – Annexe VI to 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 07/2015).		

### Specific concentration limits

Concentration	Hazard class and category	Hazard statement	
C ≥ 0.2%	Resp. Sens. 1	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
C ≥ 0.2%	Skin Sens. 1	H317	May cause an allergic skin reaction
C ≥ 5%	STOT SE 3	H335	May cause respiratory irritation
<b>Reference</b>			
European Commission. Harmonised classification – Annexe VI to 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 07/2015).			

## Physicochemical Properties

<b>CAS number</b>	10588-01-9
<b>Molecular weight</b>	262
<b>Formula</b>	$\text{Na}_2\text{Cr}_2\text{O}_7$
<b>Common synonyms</b>	Disodium dichromate (VI), dichromic acid, disodium salt, disodium dichromium heptaoxide
<b>State at room temperature</b>	Red to bright orange crystals
<b>Volatility</b>	Data not available
<b>Specific gravity</b>	2.35 at 25°C
<b>Flammability</b>	Not combustible but enhances combustion of other substances
<b>Lower explosive limit</b>	Data not available
<b>Upper explosive limit</b>	Data not available
<b>Water solubility</b>	Very soluble
<b>Reactivity</b>	The substance is a strong oxidant, which reacts with combustible and reducing materials. The solution in water is a weak acid. Forms potentially explosive reactions with acetic anhydride, ethanol + sulphuric acid + heat and hydrazine. Forms a violent reaction or ignition with boron + silicon, organic residues + sulphuric acid, 2-propanol + sulphuric acid and sulphuric acid + trinitrotoluene. Incompatible with hydroxylamine
<b>Reaction or degradation products</b>	When heated to decomposition, sodium dichromate emits toxic fumes of sodium oxide
<b>Odour</b>	Odourless
<b>Structure</b>	 <p>The diagram shows the chemical structure of sodium dichromate. It consists of two chromium (Cr) atoms bridged by a central oxygen (O) atom. Each chromium atom is also bonded to three terminal oxygen atoms. Two of these terminal oxygen atoms are negatively charged (O<sup>-</sup>) and are coordinated to two sodium ions (Na<sup>+</sup>), one under each oxygen atom.</p>
<b>References</b>	<p>International Programme on Chemical Safety. International Chemical Safety Card entry for sodium dichromate. ICSC 1369, 2013. World Health Organization: Geneva.</p> <p>The Merck Index (14th Edition). Sodium Dichromate, Entry 8609, 2006.</p> <p>Sodium Dichromate (HAZARDTEXT™ Hazard Management). In Klasco RK (Ed): TOMES® System, Truven Healthcare Analytics Inc, Greenwood Village CO, US. RightAnswer.com Inc, Midland MI, US. <a href="http://www.rightanswerknowledge.com">http://www.rightanswerknowledge.com</a> (accessed 08/2015).</p>

## Reported Effect Levels from Authoritative Sources

No data available

## Published Emergency Response Guidelines

### Emergency response planning guideline (ERPG) values

	Listed value (ppm)	Calculated value (mg/m <sup>3</sup> )
ERPG-1*	Data not available	
ERPG-2†		
ERPG-3‡		
<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 (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	Data not available				
AEGL-2†					
AEGL-3‡					
<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>					



## 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 guideline value specified			

### 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

- highly toxic by all routes of exposure

### Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
<b>Inhalation</b>	Inhalation causes irritation to the respiratory tract. Cough, chest pain, chronic rhinitis, laryngitis and pharyngitis have been reported. Bronchial asthma and pulmonary oedema, which may be delayed for up to 72 hours, have also been reported
<b>Ingestion</b>	Initial features reflect corrosive damage to the gastrointestinal tract and include nausea, vomiting, abdominal pain, haematemesis and bloody diarrhoea with circulatory collapse. From 12–24 hours post-exposure acute renal failure due to severe renal tubular necrosis frequently occurs. Hepatic dysfunction with prolonged INR and intravascular haemolysis may ensue and pulmonary oedema, convulsions, coma and encephalopathy may develop. Methaemoglobinaemia and pancreatitis have been reported
<b>Dermal</b>	Acute exposure causes skin irritation, ulceration and burns. Systemic toxicity has occurred following partial thickness burns
<b>Ocular</b>	Ocular exposure causes pain, blepharospasm, lacrimation, conjunctivitis, palpebral oedema and photophobia
<b>References</b>	
TOXBASE. Sodium Dichromate, 12/2011. <a href="http://www.toxbase.org">http://www.toxbase.org</a> (accessed 11/2016).	

## Decontamination at the Scene

### Summary

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Sodium dichromate is corrosive. Therefore, following disrobe, improvised wet decontamination should be considered (see below for details).

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.

### Disrobe

The disrobe process is highly effective at reducing exposure to HAZMAT/CBRN material when performed within 15 minutes of exposure.

**Therefore, disrobe must be considered the primary action following evacuation from a contaminated area.**

Where possible, disrobe at the scene should be conducted by the casualty themselves and should be systematic to avoid transferring any contamination from clothing to the skin. Consideration should be given to ensuring the welfare and dignity of casualties as far as possible.

### Improvised decontamination

Improvised decontamination is an immediate method of decontamination prior to the use of specialised resources. This should be performed on all contaminated casualties, unless medical advice is received to the contrary. Improvised dry decontamination should be considered for an incident involving chemicals **unless the agent appears to be corrosive or caustic**.

#### Improvised dry decontamination

- any available dry absorbent material can be used such as kitchen towel, paper tissues (eg blue roll) and clean cloth
- exposed skin surfaces should be blotted and rubbed, starting with the face, head and neck and moving down and away from the body
- rubbing and blotting should not be too aggressive, or it could drive contamination further into the skin
- all waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage

### Improvised wet decontamination

- water should only be used for decontamination where casualty signs and symptoms are consistent with exposure to caustic or corrosive substances such as acids or alkalis
- wet decontamination may be performed using any available source of water such as taps, showers, fixed installation hose-reels and sprinklers
- when using water, it is important to try and limit the duration of decontamination to between 45 and 90 seconds and, ideally, to use a washing aid such as cloth or sponge
- improvised decontamination should not involve overly aggressive methods to remove contamination as this could drive the contamination further into the skin
- where appropriate, seek professional advice on how to dispose of contaminated water and prevent run-off going into the water system

### Additional notes

- following improvised decontamination, remain cautious and observe for signs and symptoms in the decontaminated person and in unprotected staff
- if water is used to decontaminate casualties this may be contaminated, and therefore hazardous, and a potential source of further contamination spread
- all materials (paper tissues etc) used in this process may also be contaminated and, where possible, should not be used on new casualties
- the risk from hypothermia should be considered when disrobe and any form of wet decontamination is carried out
- people who are contaminated should not eat, drink or smoke before or during the decontamination process and should avoid touching their face
- consideration should be given to ensuring the welfare and dignity of casualties as far as possible. Immediately after decontamination the opportunity should be provided to dry and dress in clean robes/clothes
- 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

National Ambulance Resilience Unit. Joint Emergency Services Interoperability Programme (JESIP). Initial operational response to a CBRN incident. Version 1.0, September 2013.

NHS England. Emergency Preparedness, Resilience and Response (EPRR). Chemical incidents: planning for the management of self-presenting patients in healthcare settings. April 2015.

## Clinical Decontamination and First Aid

Clinical decontamination is the process where trained healthcare professionals using purpose designed decontamination equipment treat contaminated persons individually.

Detailed information on clinical management can be found on TOXBASE – [www.toxbase.org](http://www.toxbase.org).

### Important notes

- if the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves
- carry out decontamination after resuscitation; resuscitate the patient according to standard guidelines

### 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
- do **not** apply neutralising chemicals as heat produced during neutralisation reactions may cause thermal burns, and increase injury
- 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 10–15 minutes, or until the pH of the skin is normal (pH of the skin is 4.5–6, although it may be closer to 7 in children, or after irrigation). **The earlier irrigation begins, the greater the benefit**
- 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
- treat as for a thermal burn
- substantial disruption of the dermal barrier may allow systemic chromium uptake
- 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 (eg 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 (eg by an infusion bag with a giving set). A Morgan Lens may be used if anaesthetic has been given. Irrigate for 10–15 minutes irrespective of initial conjunctival pH. 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 ensure adequate ventilation
- give oxygen
- other supportive measures as indicated by the patient's clinical condition

### Ingestion

- maintain a clear airway and ensure adequate ventilation
- gut decontamination is contraindicated
- monitor pulse and blood pressure
- other supportive measures as indicated by the patient's clinical condition

### Clinical decontamination and first aid references

TOXBASE	<a href="http://www.toxbase.org">http://www.toxbase.org</a> (accessed 11/2016)
TOXBASE	Sodium dichromate, 12/2011
TOXBASE	Chromates and dichromates – features and management, 12/2011
TOXBASE	Chemicals splashed or sprayed in the eyes, 01/2014

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: [generaltox@phe.gov.uk](mailto:generaltox@phe.gov.uk)

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