Sodium hydroxide: Human health tier II assessment

25 November 2016

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
Sodium hydroxide (Na(OH))	1310-73-2
Sodium hydroxide (Na(OH)), monohydrate	12200-64-5

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:**www.nicnas.gov.au**

Disclaimer

NICNAS has made every effort to assure the quality of information available in this report. However, before relying on it for a specific purpose, users should obtain advice relevant to their particular circumstances. This report has been prepared by NICNAS using a range of sources, including information from databases maintained by third parties, which include data supplied by industry. NICNAS has not verified and cannot guarantee the correctness of all information obtained from those databases. Reproduction or further distribution of this information may be subject to copyright protection. Use of this information without obtaining the

ACRONYMS & ABBREVIATIONS

Import, Manufacture and Use

Australian

The following Australian industrial uses were reported under previous mandatory and/or voluntary calls for information.

The chemicals have reported cosmetic use.

The chemicals have reported domestic uses, including in:

- cleaning/washing agents and additives; and
- adhesives.

The chemicals have reported commercial uses including:

- in flotation agents;
- in pH regulation agents;
- as a solvent;
- in water treatment agents; and
- as a photochemical.

The chemicals have reported site-limited use, including as a reducing agent and in hydraulic fracturing.

The chemical sodium hydroxide (CAS No. 1310-73-2) is listed on the 2006 High Volume Industrial Chemicals List (HVICL) with a total reported volume of over 1,000,000 tonnes.

International

The following international uses have been identified through the Organisation for Economic Cooperation and Development Screening information data set International Assessment Report (OECD SIAR, 2002), Galleria Chemica, the Substances and Preparations in the Nordic countries (SPIN) database and the European Commission Cosmetic Ingredients and Substances (CosIng) database.

The chemicals have reported cosmetic use.

The chemicals have reported domestic uses, including in:

- anti-condensation agents;
- anti-freezing agents;
- bleaching agents;
- cleaning and washing agents;
- colouring agents;
- corrosion inhibitors;
- fillers;
- insulating materials;
- odour agents;
- paints, lacquers and varnishes;
- surface treatment agents; and
- surface-active agents.

The chemicals have reported commercial uses including, in:

- adsorbents and adsorbents;

- anti-set-off and anti-adhesive agents;
- conducting agents;
- construction materials;
- cutting fluids;
- fixing agents;
- flotation agents;
- flux agents for casting or joining materials;
- foaming agents;
- impregnation materials;
- lubricants and additives;
- oxidising agents;
- photochemicals;
- pH regulating agents;
- process regulators;
- reprographic agents;
- softeners;
- solvents;
- tanning agents; and
- viscosity adjustors.

The chemicals have reported site-limited uses, including in:

- complexing and flocculating agents;
- electroplating agents;
- heat transferring agents;
- intermediates;
- reducing agents; and
- stabilisers;
- hydraulic fracturing.

The chemicals have reported non-industrial uses, including in:

- food/feedstuff flavourings and nutrients;
- non-agricultural pesticides and preservatives;
- pesticides; and
- pharmaceuticals.

Restrictions

Australian

This chemical is listed in the *Poisons standard—the Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedules 5 and 6 and Appendix C (SUSMP, 2014).

Schedule 5

'SODIUM HYDROXIDE (excluding its salts and derivatives) in preparations containing 5 per cent or less of sodium hydroxide being:

(a) solid preparations, the pH of which in a 10 g/L aqueous solution is more than 11.5; or

(b) liquid or semi-solid preparations, the pH of which is more than 11.5 except in food additive preparations for domestic use'.

Schedule 6

'SODIUM HYDROXIDE (excluding its salts and derivatives) except:

(a) when included in Schedule 5;

(b) in preparations containing 5 per cent or less of sodium hydroxide being:

(i) solid preparations, the pH of which in a 10 g/L aqueous solution is 11.5 or less; or

(ii) liquid or semi-solid preparations, the pH of which is 11.5 or less; or

(c) liquid or semi-solid food additive preparations, the pH of which is more than 11.5, for domestic use'.

Appendix C

'SODIUM HYDROXIDE (excluding its salts and derivatives), in liquid or semi-solid food additive preparations, for domestic use, the pH of which is more than 11.5'.

Schedule 6 chemicals are described as 'Substances with a moderate potential for causing harm, the extent of which can be reduced through the use of distinctive packaging with strong warnings and safety directions on the label'. Schedule 6 chemicals are labelled with 'Poison' (SUSMP, 2014).

Schedule 5 chemicals are described as 'Substances with a low potential for causing harm, the extent of which can be reduced through the use of appropriate packaging with simple warnings and safety directions on the label.' Schedule 5 chemicals are labelled with 'Caution’ (SUSMP, 2014).

Appendix C chemicals are substances, other than those included in Schedule 9, of such danger to health as to warrant prohibition of sale, supply and use.

Sodium hydroxide is also included in the Australian Dangerous Goods Code 7th edition (ADG Code 2007), with separate entries for sodium hydroxide solid (UN Number 1823) and sodium hydroxide solution (UN Number 1824). Both forms are listed as Corrosive, in Class 8. The ADG Code contains detailed provisions for the packaging, transport and marking of containers in Class 8.

Australia New Zealand Food Standards code for sodium hydroxide has the following inclusion: 'Processing Aids - Generally permitted - permitted for use as acidity regulator'. Sodium hydroxide is allotted an International Numbering System of food additives number: INS 524 (FSANZ, 2013).

No aesthetic or health related guidance values were identified for sodium hydroxide. However, since sodium hydroxide readily dissociates in water into sodium and hydroxide ions, the *Australian Drinking Water Guidelines* for sodium state that, based on aesthetic considerations (taste), the concentration of sodium in drinking water should not exceed 180 mg/L. No health-based guideline value is proposed for sodium (NHMRC, 2011).

Medical practitioners treating people with severe hypertension or congestive heart failure are advised to be aware of the sodium concentration in the patient’s drinking water exceeding 20 mg/L (NHMRC, 2011).

International

Sodium hydroxide is listed by the United States Food and Drug Administration (US FDA) as a food processing substance that is generally recognised as safe (GRAS) for its intended use (21 CFR 184.1763). According to the Select Committee on GRAS Substances (SCOGS) there is no evidence in the available information on sodium hydroxide that demonstrates, or suggests, reasonable grounds to suspect a hazard to the public when it is used as an ingredient of food packaging materials in the manner now practised, or that might reasonably be expected in the future (USFDA, 2013).

Sodium hydroxide is also included in the US CWA *(Clean Water Act)*—List of Hazardous Substances and the UK Dangerous Goods Emergency Action Code List 2011 [Emergency Action Code (EAC): 2W].

Existing Worker Health and Safety Controls

Hazard Classification

The chemical sodium hydroxide (CAS No. 1310-73-2) is classified as hazardous, with the following risk phrase for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

- C; R35 (Corrosive)

The chemical sodium hydroxide monohydrate (CAS No. 12200-64-5) is not separately listed on the HSIS (Safe Work Australia).

Exposure Standards

Australian

Sodium hydroxide has an exposure standard of 2 mg/m^3, time weighted average (TWA) (Safe Work Australia 2013).

International

The following exposure standards are identified (Galleria Chemica):

- Occupational Exposure Limit (OEL) of 2 mg/m^3 in different countries, such as, Argentina, Belgium, Bulgaria, China, India, Japan, Korea and the US National Institute for Occupational Safety and Health (NIOSH).
- Occupational Exposure Limit Values: 0.5 mg/m^3 (Latvia)
- Ceiling limit of 2 mg/m^3 in Canada (Alberta, British Columbia, Nova Scotia, Quebec and the Northwest Territories).
- Short term exposure limit (STEL): 2 mg/m^3 (UK)
- US DOE Temporary Emergency Exposure Limits (TEELs) = 0.5 mg/m^3 (TEEL-0 and TEEL-1), 5 mg/m^3 (TEEL-2) and 50 mg/m^3 (TEEL-3).

Health Hazard Information

Toxicokinetics

The constituents of sodium hydroxide (sodium ion and hydroxide ions) are normal physiological constituents. Accordingly, systemic health effects, such as repeated dose toxicity, carcinogenicity and reproductive toxicity are not expected. The available data support this conclusion.

Information on the absorption of sodium hydroxide through oral exposure is not available. Concentrated sodium hydroxide is corrosive and can burn the lips, tongue, throat and stomach. Sodium is a normal constituent of the blood and excess is excreted in urine. Between 3.0 and 6.0 g of sodium is taken by humans via the food every day (Fodor et al., 1999). Uptake of hydroxyl ions has the potential to increase the pH of the blood. However, the blood pH (7.4–7.5) is efficiently regulated by mechanisms such as urinary excretion of bicarbonate and exhalation of carbon dioxide. Symptoms of overdose of sodium hydroxide include nausea, vomiting, stomach cramps and diarrhoea and can cause death (CCOHS, 2013).

No reliable data are available on the dermal absorption of sodium hydroxide. A 50 % dermal NaOH solution caused a burn that was rapid and progressive in both depth and extent when applied to two square inches of the clipped backs of mice (Bromberg et al., 1965). It can be assumed from this observation that concentrated sodium hydroxide would penetrate the skin by destroying the tissue. Dermal absorption of non-irritating concentrations of sodium hydroxide is expected to be low due to the low absorption of ions by the skin. It is unlikely that sodium ions penetrate the skin to a considerable extent.

Sodium hydroxide can be absorbed into the body by inhaling the aerosol form (OECD, 2002). Absorbed sodium hydroxide rapidly dissociates into sodium and hydroxide ions, which enter the body's electrolyte pool. The body pool of these ions is large and regulated by well known human physiological processes.

The kidney is the key regulator of sodium content in higher animals. Although urine is the main route for excreting sodium ions, small quantities are lost in the stool, sweat, tears, nasal mucus and saliva (Forbes, 1962). Changes to the body fluids' pH caused by hydroxide ions, are buffered and regulated within a narrow range to maintain homeostasis, with respiratory excretion of carbon dioxide and bicarbonate regeneration through proton secretion in the urine (Ganong, 2001).

Acute Toxicity

Oral

No acute oral studies using international guidelines are available in animals to establish a median lethal dose (LD50) for sodium hydroxide. In a very old acute oral study in rabbits, using 1–10 % sodium hydroxide solutions, an LD50 of 325 mg/kg bw was established (Naunyn-Schmiedeberg, 1937).

An oral LD50 of 140–340 mg/kg in rats has also been reported (National Research Council, 2011). Details of the study are not available.

Dermal

Sodium hydroxide has low to moderate acute dermal toxicity. In an acute dermal study, mice were treated dermally with 50 % sodium hydroxide, and the treated area was irrigated with water at various intervals. The mortality of mice was 20, 40, 80 or 71 % when they were irrigated at 30 minutes, one hour, two hours or not at all after the application, respectively. All animals rapidly developed progressive burns. No mortality or burns were observed when the treated area was irrigated immediately after the application (OECD, 2002).

A dermal LD50 of 1,350 mg/kg has been reported in rabbits (National Research Council, 2011). Details of the study are not available.

Inhalation

No data are available.

Observation in humans

Cases of fatality due to ingesting liquid sodium hydroxide have been reported in humans. Ingesting sodium hydroxide causes oesophageal and gastric injury. A person who ingested 10 g of sodium hydroxide as an aqueous solution suffered transmural necrosis of the oesophagus and stomach and died three days after admission to the hospital (OECD, 2002). A 42-year-old female swallowed approximately 30 mL of 16 % sodium hydroxide in a suicide attempt. This resulted in a 9 cm stricture of the oesophagus that was treated by gastric antral patch oesophagoplasty (Hugh et al., 1991).

A worker suffered a fatal burn from dermal exposure to sodium hydroxide at an aluminium plant (Lee et al., 1995). The worker was found lying in a shallow pool of concentrated sodium hydroxide, which had been heated to ~95 °C.

A 14-year-old boy accidentally put a 30 % sodium hydroxide solution into his mouth. Oesophagoscopy revealed mucosal lesions in the upper oesophagus. Serious inflammatory changes were observed, with mediastinal emphysema and purulent pleuritis. On the 44th day after ingestion, profuse bleeding was observed through the nasogastric tube. A right side thoracotomy showed a 4–5 mm rupture of the descending part of the aorta with bleeding into the left pleura. The aorta wall was fragile and could not be repaired. The patient died on the operating table (IPCS, 1996).

Nine other cases of liquid sodium hydroxide ingestion that resulted in oesophageal and gastric injury were reported (OECD, 2002). One person who ingested 10 g of sodium hydroxide in water suffered transmural necrosis of the oesophagus and stomach and died three days after admission to the hospital.

Workers exposed to 0.24–1.86 mg/m^3 sodium hydroxide for 2–15 minutes reported throat irritation and watery eyes (NIOSH, 1975).

Corrosion / Irritation

Corrosivity

Sodium hydroxide is corrosive to the skin, eyes and respiratory tract and corrosive following ingestion. It causes deep penetrating burns and necrosis. The skin is discoloured and becomes brown or black, which can make initial assessment of the injury difficult. There could be recurring skin breakdown over a long period (O'Donoghue et al., 1996).

In a skin irritation test, 2 molar (M) (8 %), 4M (16 %) and 6M (24 %) sodium hydroxide solutions were applied on the lower abdominal region of Yorkshire weanling pigs. Gross blisters developed within 15 minutes of application, and 8 % and 16 % sodium hydroxide produced severe necrosis in all epidermal layers. The 24 % solution produced numerous severe blisters with necrosis extending deeper into the subcutaneous tissue.

An in vitro test was also performed with isolated perfused skin flaps of Yorkshire weanling pigs using sodium hydroxide concentrations of 4M (16 %) and 6M (24 %). At both concentrations, the chemical produced severe necrosis of all epidermal cell layers and dermis. At times, this lesion extended deep into the subcutaneous layers (OECD, 2002).

A 5 % aqueous solution of sodium hydroxide produced severe necrosis when applied to the skin of rabbits for four hours (Clayton & Clayton, 1993).

Sodium hydroxide is corrosive to eyes. In an eye irritation study, 10 ml of 2 % and 8 % sodium hydroxide were directly applied to the cornea of the right eye of each test rabbit; the left eyes served as controls. Eyes and eyelids were macroscopically examined for signs of irritation beginning three hours after dosing and periodically until recovery or day 35. The macroscopic and microscopic changes were consistent with mild (2 % sodium hydroxide) and severe (8 % sodium hydroxide) eye irritancy (Maurer & Parker, 2000)**.**

In another study, 0.1 mL of different concentrations of sodium hydroxide was placed in the lower conjunctival sac of the left eye of Stauffland Albino rabbits. Both the left and the right eyes were evaluated for irritation and corneal thickness for up to 21 days. According to US EPA criteria, 0.001M (0.004 %), 0.01M (0.04 %) and 0.05M (0.2 %) sodium hydroxide were considered non-irritant, while irritation at 0.1M (0.4 %) was mild and 0.3M (1.2 %) sodium hydroxide was considered corrosive (Morgan et al., 1987).

Observation in humans

A human skin irritation test with 0.5 % sodium hydroxide was performed with exposure periods of 15, 30 and 60 minutes. The treatment sites were assessed 24, 48 and 72 hours after patch removal. The results showed that after a 60-minute exposure, 61 % of the volunteers (20/33) showed a positive skin irritation reaction (OECD, 2002).

Sodium hydroxide-induced irritation was also studied in 34 volunteers by 24-hour patch testing at different concentrations. With 4 % sodium hydroxide, 9/34 volunteers showed an enhanced inflammatory response, decreased dermal reflectivity and increased trans-epidermal water loss (OECD, 2002).

Sensitisation

Skin Sensitisation

Sodium hydroxide is not considered a skin sensitiser.

Animal studies on skin sensitisation caused by sodium hydroxide are not available. In a human skin sensitisation test reported by Park and Eun (1995), the backs of male volunteers were exposed to sodium hydroxide at concentrations 0.063–1.0 % (induction). After seven days, the volunteers were challenged with 0.125 % sodium hydroxide. The irritant response correlated well with the concentration of sodium hydroxide, but an increased response was not observed when the previously patch tested sites were re-challenged. Based on this study, it was concluded 'that sodium hydroxide has no skin sensitisation potential'.

Repeated Dose Toxicity

Oral

No animal data are available on repeated dose toxicity studies on oral exposure. A limited oral drinking water study with rats, revealed effects on growth (details not provided). This effect can be explained by the fact that sodium hydroxide neutralises the acid environment in the stomach, which decreases the digestion and absorption of food (OECD, 2002).

Dermal

No data are available.

Inhalation

In a repeat dose inhalation study, 27 white rats were exposed twice weekly (exposure time not specified) to aerosols generated from 5 %, 10 %, 20 % or 40 % sodium hydroxide solutions. The airborne concentrations of sodium hydroxide in the four tests were not measured. Rats exposed to aerosols from the 40 % solution died within a month, mostly from bronchopneumonia. In rats exposed to the aerosol generated from a 20 % sodium hydroxide solution, the bronchi were dilated, the epithelial cover was thin and frequently desquamated, and the septa were dilated and cracked. Light round cell infiltration of the sub-mucous membrane tissue was also observed. Few changes occurred in rats exposed to aerosols from 10 % sodium hydroxide, but rats exposed to an aerosol of 5 % sodium hydroxide had dilated bronchi and slightly degenerated mucous membrane, with thickened strata of lymphadenoid tissue surrounding the bronchi. A no observed adverse effect level (NOAEL) was not established in this study (NIOSH, 1975).

Observation in humans

In a case of adverse effects from occupational exposure to sodium hydroxide, obstructive airway disease was reported in a factory worker following chronic occupational exposure to sodium hydroxide mist. The worker developed a cough, dyspnoea and tachypnoea after 20 years of exposure to sodium hydroxide. He was involved in cleaning jam containers in sodium hydroxide solution (concentration not reported), which were boiled in the solution for two hours. He had a barrel chest with limited movement and diffuse expiratory wheezing. A chest X-ray showed severe pulmonary hyperinflation (IPCS, 1996).

Genotoxicity

Both the in vitro and the in vivo genotoxicity tests indicate no evidence for a mutagenic activity.

Sodium hydroxide was assayed in the Ames reversion test with *Salmonella typhimurium* strains TA1535, TA1537, TA1538, TA98, TA100 and in a DNA-repair test with *Escherichia coli* strains WP2, WP67 and CM871. Based on the results of these tests, sodium hydroxide was considered to be non-genotoxic (De Flora et al., 1984).

A mouse bone marrow micronucleus test using 15 mM sodium hydroxide at a dose of 10 mg/kg bw revealed no significant increase of micronucleated polychromatic erythrocytes. The test compound was administered as a single intraperitoneal dose to five males and five females (Aaron et al., 1989).

The clastogenic activity of sodium hydroxide was studied in an in vitro chromosomal aberration test using Chinese hamster ovary (CHO) K1 cells. No clastogenic activity was found at concentrations of 0, 4, 8 and 16 mM sodium hydroxide, which corresponded with initial pH values of 7.4, 9.1, 9.7 and 10.6, respectively (Morita et al., 1989).

Carcinogenicity

No data are available.

Reproductive and Developmental Toxicity

The effect of sodium hydroxide on fertility is not known. No valid studies were identified regarding effects on fertility or developmental toxicity in animals after oral, dermal or inhalation exposure to sodium hydroxide. Sodium hydroxide is not expected to be systemically available in the body under normal handling and use conditions due to the regulatory processes for sodium ion concentration and pH, and for this reason it can be stated that the substance will not reach the foetus nor reach male and female reproductive organs (EC, 2008).

Risk Characterisation

Critical Health Effects

Sodium hydroxide is corrosive to the skin, eyes and gastrointestinal and respiratory tracts. Based on human data, concentrations of 0.5–4.0 % are irritating to the skin, while a concentration of 8.0 % is corrosive.

Public Risk Characterisation

Sodium hydroxide has uses in domestic and cosmetic products where it is normally used under buffering conditions that avoid extremes of pH. The main route of public exposure is expected to be through the eyes and skin. Labelling for sodium hydroxide formulations is controlled by the *Poisons Schedule* (SUSMP, 2014). Provided that the appropriate precautions are taken to avoid skin and eye contact and inhaling chemical vapours, the risk from the use of domestic and cosmetic products is not considered to be unreasonable.

Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure might occur, particularly where manual or open processes are used. These could include transfer and blending activities, quality control analysis, and cleaning and maintaining equipment. Worker exposure to the chemical at lower concentrations could also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical health effects, the chemical could pose an unreasonable risk to workers unless adequate control measures to minimise dermal, ocular and inhalation exposure are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine the appropriate controls.

NICNAS Recommendation

Current risk management measures for sodium hydroxide (CAS No. 1310-73-2) are considered adequate to protect public and workers' health and safety, provided that all requirements are met under workplace health and safety, and poisons legislation as adopted by the relevant state or territory. The classification for anhydrous sodium hydroxide should be extended to include sodium hydroxide monohydrate. No further assessment is required.

Regulatory Control

Public Health

Products containing the chemicals should be labelled in accordance with state and territory legislation (SUSMP, 2014).

Work Health and Safety

The chemicals are recommended for classification and labelling under the current approved criteria and adopted GHS as below. This assessment does not consider classification of physical and environmental hazards. This is the existing classification for sodium hydroxide (CAS No. 1310-73-2).

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Irritation / Corrosivity	Causes severe burns (C; R35)	May cause respiratory irritation - Specific target organ tox, single exp Cat. 3 (H335) Causes severe skin burns and eye damage - Cat. 1A (H314)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemical should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from oral, dermal, ocular and inhalation exposure to the chemical should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemical is used. Examples of control measures which could minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- using local exhaust ventilation to prevent the chemical from entering the breathing zone of any worker;
- air monitoring to ensure control measures in place are working effectively and continue to do so;

- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of this chemical has not been undertaken as part of this assessment.

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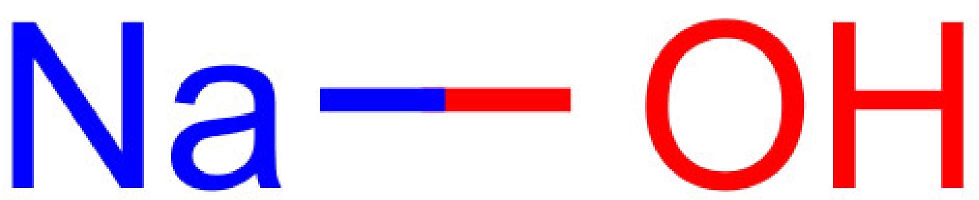
USFDA (2013) Select Committee on GRAS Substances (SCOGS) Opinion: Sodium hydroxide. Direct food substances affirmed as Geneally Recognised As Safe (GRAS) 21CFR184.1903 –at **http://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/SCOGS/ucm260919.htm**

Last Update 25 November 2016

Chemical Identities

Chemical Name in the Inventory and Synonyms	**Sodium hydroxide (Na(OH))** Caustic soda Sodium hydrate Soda lye Lye
CAS Number	1310-73-2
Structural Formula	
Molecular Formula	HNaO
Molecular Weight	40.0

Chemical Name in the Inventory and Synonyms	**Sodium hydroxide (Na(OH)), monohydrate**
CAS Number	12200-64-5
Structural Formula	No Structural Diagram Available
Molecular Formula	H2O.HNaO
Molecular Weight	58.00

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