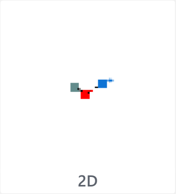
PubChem

COMPOUND SUMMARY

Sodium hydroxide

Cite Download

CONTENTS

PubChem CID:	14798
Structure:	 2D Find Similar Structures
Chemical Safety:	 Corrosive Laboratory Chemical Safety Summary (LCSS) Datasheet
Molecular Formula:	NaOH or HNaO
Chemical Names:	SODIUM HYDROXIDE Caustic soda 1310-73-2 Sodium hydrate Soda lye More...
Molecular Weight:	39.997 g/mol
Dates:	Modify: 2019-08-10 Create: 2005-03-26

Sodium hydroxide is an alkali metal hydroxide.

▸ from ChEBI

At room temperature, sodium hydroxide is a white crystalline odorless solid that absorbs moisture from the air. It is a manufactured substance. When dissolved in water or neutralized with acid it liberates substantial heat, which may be sufficient to ignite combustible materials. Sodium hydroxide is very corrosive. It is generally used as a solid or a 50% solution. Other common names include caustic soda and lye. Sodium hydroxide is used to manufacture soaps, rayon, paper, explosives, dyestuffs, and petroleum products. It is also used in processing cotton fabric, laundering and bleaching, metal cleaning and processing, oxide coating, electroplating, and electrolytic extracting. It is commonly present in commercial drain and oven cleaners.

▸ from CDC-ATSDR Toxic Substances Portal

Sodium hydroxide is also known as _lye_ or _soda_ , or _caustic soda_ [L1971]. At room temperature, sodium hydroxide is a white crystalline odorless solid that absorbs moisture from the air. It is a synthetically manufactured substance. When dissolved in water or neutralized with acid it releases substantial amounts of heat, which may prove sufficient to ignite combustible materials. Sodium hydroxide is highly corrosive [L1965]. Sodium hydroxide is generally used as a solid or a diluted in a 50% solution. This chemical is used to manufacture soaps, rayon, paper, explosives, dyestuffs, and petroleum products [L1965]. It is also used in processing cotton fabric, laundering and bleaching, metal cleaning and processing, oxide coating, electroplating, and electrolytic extracting. It is commonly found in commercial drain/ oven cleaners [L1965]. According to the the FDA, sodium hydroxide is considered a direct food recognized as safe, where it serves as a pH control agent and follows good manufacturing guidelines [L1967]. Interestingly, sodium hydroxide has been studied for its use in the treatment of prion disease (as occurs in mad cow disease and kuru). The use of this compound has been shown to effectively reduce prion levels in an in vitro inactivation assay [A32334].

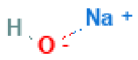
▸ from DrugBank

1 Structures

1.1 2D Structure

Find Similar Structures Get Image Download

Chemical Structure Depiction



▸ from PubChem

1.2 3D Status

Conformer generation is disallowed since MMFF94s unsupported element, mixture or salt

▸ from PubChem

2 Names and Identifiers

2.1 Computed Descriptors

2.1.1 IUPAC Name

sodium;hydroxide

▸ from PubChem

2.1.2 InChI

InChI=1S/Na.H2O/h;1H2/q+1;/p-1

▸ from PubChem

2.1.3 InChI Key

HEMHJVSKTPXQMS-UHFFFAOYSA-M

▸ from PubChem

2.1.4 Canonical SMILES

[OH-].[Na+]

▸ from PubChem

2.2 Molecular Formula

$NaOH$

▸ from EU Food Improvement Agents; ILO International Chemical Safety Cards (ICSC); Wikipedia

$HNaO$

▸ from PubChem

2.3 Other Identifiers

2.3.1 CAS

1310-73-2

▸ from ChemIDplus; DrugBank; DTP/NCI; EPA Chemicals under the TSCA; EPA DSSTox; European Chemicals Agency (ECHA); ILO International Chemical Safety Cards (ICSC); Occupational Safety and Health Administration (OSHA)

Other CAS

8012-01-9

1418731-95-9

▸ from ChemIDplus

2.3.2 European Community (EC) Number

EC Number

215-185-5

▸ from EU Food Improvement Agents; European Chemicals Agency (ECHA)

923-604-4

▸ from European Chemicals Agency (ECHA)

2.3.3 ICSC Number

0360

▸ from ILO International Chemical Safety Cards (ICSC)

2.3.4 NSC Number

135799

▸ from DTP/NCI

2.3.5 RTECS Number

WB4900000

▸ from The National Institute for Occupational Safety and Health (NIOSH)

2.3.6 UN Number

1824

- from CAMEO Chemicals

1823

- from CAMEO Chemicals; DOT Emergency Response Guidebook; ILO International Chemical Safety Cards (ICSC); NJDOH RTK Hazardous Substance List

2.3.7 UNII

55X04QC32I

- from FDA/SPL Indexing Data

2.3.8 Wikipedia

Sodium hydroxide

- from Wikipedia

2.3.9 Shipping Name/ Number DOT/UN/NA/IMO

IMO 8.0; Sodium hydroxide solid; Sodium hydroxide solution

- from HSDB

UN 1823; Sodium hydroxide, solid

- from HSDB

UN 1824; Sodium hydroxide solution

- from HSDB

2.3.10 Standard Transportation Number

49 352 35; Dry

- from HSDB

49 352 40; Liquid

- from HSDB

49 352 43; 52% Solution

▶ from HSDB

2.4 Synonyms

2.4.1 MeSH Entry Terms

Caustic Soda
Hydroxide, Sodium
Soda, Caustic
Sodium Hydroxide

▶ from MeSH

2.4.2 Depositor-Supplied Synonyms

SODIUM HYDROXIDE
Caustic soda
1310-73-2
Sodium hydrate
Soda lye
White caustic
Sodium hydroxide (Na(OH))
Aetznatron
Ascarite
Sodium hydroxide solution
Soda, caustic
Natriumhydroxid
Rohrputz
Plung
Collo-Grillrein
Liquid-plumr
Caustic soda solution
Collo-Tapetta
Fuers Rohr
Rohrreiniger Rofix
NaOH
Hydroxyde de sodium
Natriumhydroxyde
Sodium hydroxide dimer
White caustic solution
Sodium hydrate solution
Soda, hydrate
Natrium causticum
Soda, kaustische
Lewis-red devil lye
Sodio(idrossido di)
Caustic soda, liquid
Sodium(hydroxyde de)
Caswell No. 773
MFCD00003548
sodiumhydroxide
Sodium hydroxide (Na2(OH)2)
Natriumhydroxid [German]
Natriumhydroxyde [Dutch]
Sodium hydroxide, pellets
Sodium Oxidanide
Natrium-hydroxid, reinstes
UN 1823 (solid)
UN 1824 (solution)
Hydroxyde de sodium [French]
UNII-55X04QC32I
HSDB 229
Sodio(idrossido di) [Italian]
Sodium(hydroxyde de) [French]
Sodium hydroxide, flake
Sodium hydroxide, pearl
Sodium hydroxide, solid
EINECS 215-185-5
UN1823
UN1824
LYE
EPA Pesticide Chemical
NSC 135799
CHEBI:32145
Sodium Hydroxide, 0.1N
55X04QC32I
Buffer Solution, pH 8.0
Sodium hydroxide, pure
Sodium hydroxide, 98%
Sodium hydroxide, 1N s

▶ from PubChem

3 Chemical and Physical Properties

3.1 Computed Properties

Property Name	Property Value
Molecular Weight	39.997 g/mol
Hydrogen Bond Donor Count	1
Hydrogen Bond Acceptor Count	1

Property Name	Property Value
Rotatable Bond Count	0
Exact Mass	39.992509 g/mol
Monoisotopic Mass	39.992509 g/mol
Topological Polar Surface Area	1 A^2
Heavy Atom Count	2
Formal Charge	0
Complexity	2
Isotope Atom Count	0
Defined Atom Stereocenter Count	0
Undefined Atom Stereocenter Count	0
Defined Bond Stereocenter Count	0
Undefined Bond Stereocenter Count	0
Covalently-Bonded Unit Count	2
Compound Is Canonicalized	Yes

▸ from PubChem

3.2 Experimental Properties

3.2.1 Physical Description

DryPowder; DryPowder, Liquid; Liquid; OtherSolid; OtherSolid, Liquid; PelletsLargeCrystals; PelletsLargeCrystals, Liquid; PelletsLargeCrystals, OtherSolid

▸ from EPA Chemicals under the TSCA

White or nearly white pellets, flakes, sticks, fused masses or other forms. Solutions are clear or slightly turbid, colourless or slightly coloured, strongly caustic and hygroscopic and when exposed to the air they absorb carbon dioxide, forming sodium carbonate

▸ from EU Food Improvement Agents

WHITE HYGROSCOPIC SOLID IN VARIOUS FORMS.

▸ from ILO International Chemical Safety Cards (ICSC)

Colorless to white, odorless solid (flakes, beads, granular form).

▸ from Occupational Safety and Health Administration (OSHA); The National Institute for Occupational Safety and Health (NIOSH)

3.2.2 Color/Form

White, orthogonal crystals

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 4-90

▸ from HSDB

Colorless to white ... solid (flakes, beads, granular form).

NIOSH. NIOSH Pocket Guide to Chemical Hazards. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2010-168 (2010). Available from, as of Oct 7, 2011: ***http://www.cdc.gov/niosh/npg/***

▸ from HSDB

Brittle, white, translucent crystalline solid

Eggeman T; Kirk-Othmer Encyclopedia of Chemical Technology. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: 15 April 2011

▸ from HSDB

3.2.3 Odor

... Odorless ...

NIOSH. NIOSH Pocket Guide to Chemical Hazards. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2010-168 (2010). Available from, as of Oct 7, 2011: ***http://www.cdc.gov/niosh/npg/***

▸ from HSDB

3.2.4 Taste

Detection - the minimum physical intensity detection by a subject where he or she is not required to identify the stimulus but just detect the existence of the stimulus - in water: 8.00X10-3 mol/L.

ASTM; Compilation of Odor and Taste Threshold Values Data p.150 (1978)

▸ from HSDB

3.2.5 Boiling Point

greater than 266 ° F at 760 mm Hg (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

Very high (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

1388

MSDS

▸ from DrugBank

1388 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 4-90

▸ from HSDB

1388 °C

▸ from ILO International Chemical Safety Cards (ICSC)

2534°F

▸ from Occupational Safety and Health Administration (OSHA); The National Institute for Occupational Safety and Health (NIOSH)

3.2.6 Melting Point

604 ° F (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

323

MSDS

▸ from DrugBank

323 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 4-90

▸ from HSDB

318 °C

▸ from ILO International Chemical Safety Cards (ICSC)

605°F

▸ from Occupational Safety and Health Administration (OSHA); The National Institute for Occupational Safety and Health (NIOSH)

3.2.7 Solubility

111 % (NIOSH, 2016)

National Institute of Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards (full website version). ***https://www.cdc.gov/niosh/npg*** *(accessed August 2016).*

▶ from CAMEO Chemicals

easily soluble in cold water, hot water

MSDS

▶ from DrugBank

Very soluble in water. Freely soluble in ethanol

▶ from EU Food Improvement Agents

1 g dissolves in 7.2 mL absolute alcohol, 4.2 mL methanol; also soluble in glycerol

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▶ from HSDB

1 g dissolves in 0.9 mL water, 0.3 mL boiling water

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▶ from HSDB

Solubility in water, g/100ml at 20 °C: 109 (very good)

▶ from ILO International Chemical Safety Cards (ICSC)

111%

▶ from The National Institute for Occupational Safety and Health (NIOSH)

3.2.8 Density

1.5 at 68 ° F (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▶ from CAMEO Chemicals

2.13 at 68 ° F (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

- from CAMEO Chemicals

2.13 g/cu cm 25 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 4-90

- from HSDB

2.1 g/cm^3

- from ILO International Chemical Safety Cards (ICSC)

2.13

- from Occupational Safety and Health Administration (OSHA); The National Institute for Occupational Safety and Health (NIOSH)

3.2.9 Vapor Pressure

0 mm Hg (approx) (NIOSH, 2016)

National Institute of Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards (full website version). ***https://www.cdc.gov/niosh/npg*** *(accessed August 2016).*

- from CAMEO Chemicals

1.82X10-21 mm Hg at 25 deg C /extrapolated/

Ohe S; Computer Aided Data Book of Vapor Pressure. Tokyo, Japan: Data Book Publ. Co. (1976)

- from HSDB

0 mmHg (approx)

- from Occupational Safety and Health Administration (OSHA); The National Institute for Occupational Safety and Health (NIOSH)

3.2.10 Stability/Shelf Life

CONTAINERS OF LYE MUST BE TIGHTLY CLOSED TO PREVENT CONVERSION TO SODIUM CARBONATE BY CARBON DIOXIDE OF AIR.

Jones, L.M., et al. Veterinary Pharmacology & Therapeutics. 4th ed. Ames: Iowa State University Press, 1977., p. 867

- from HSDB

3.2.11 Autoignition Temperature

Auto-Ignition

Not flammable (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

3.2.12 Decomposition

When heated to decomposition it emits toxic fumes of /sodium oxide/.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3254

▸ from HSDB

3.2.13 Viscosity

4.0 cP at 350 deg C

General Electric Co; Material Safety Data Sheet MSDS #3 (1984)

▸ from HSDB

3.2.14 Corrosivity

Very corrosive (caustic) to ... aluminum metal in presence of moisture

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

3.2.15 Heat of Combustion

SRP4: Non-combustible

▸ from HSDB

3.2.16 Heat of Vaporization

175 kJ/mol at 1388 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 6-130

▸ from HSDB

3.2.17 pH

Strongly alkaline (1 % solution)

▸ from EU Food Improvement Agents

pH of a 0.05% wt/wt solution about 12; 0.5% solution about 13; 5% solution about 14

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

3.2.18 Surface Tension

At 18 deg C: 74.35 dynes/cm (2.72 wt%), 75.85 dynes/cm (5.66 wt%), 83.05 dynes/cm (16.66 wt%), 96.05 dynes/cm (30.56 wt%), 101.05 dynes/cm (35.90 wt%)

Weast, R.C. (ed.) Handbook of Chemistry and Physics. 67th ed. Boca Raton, FL: CRC Press, Inc., 1986-87., p. F-31

▸ from HSDB

3.2.19 Polymerization

SRP4: Not polymerized

▸ from HSDB

3.2.20 Refractive Index

Refractive index at 589.4 nm: 1.433 at 320 deg C; 1.421 at 420 deg C

Eggeman T; Kirk-Othmer Encyclopedia of Chemical Technology. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: 15 April 2011

▸ from HSDB

3.2.21 Dissociation Constants

SRP4: Completely dissociated

▸ from HSDB

3.2.22 Other Experimental Properties

5% solution (wt/wt): density: 1.056, FP: -4 deg C, BP: 102 deg C. 10% solution (wt/wt): density: 1.111, FP: -10 deg C, BP: 105 deg C. 20% solution (wt/wt): density: 1.222, FP: -26 deg C, BP: 110 deg C. 30% solution (wt/wt): density: 1.333, FP: 1 deg C, CP: 115 deg C. 40% solution (wt/wt): density: 1.434, FP: 15 deg C, BP: 125 deg C. 50% solution (wt/wt): density: 1.530, FP: 12 deg C, BP: 140 deg C

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

VP: 1 Pa at 513 deg C; 10 Pa at 605 deg C; 100 Pa at 722 deg C; 1kPa at 874 deg C; 10 kPa at 1080 deg C; 100 kPa at 1377 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 6-90

▶ from HSDB

Rapidly absorbs carbon dioxide and water from air

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▶ from HSDB

Deliquescent

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1146

▶ from HSDB

Heat of Formation: -425.8 kK/mol at 298.15 K (crystal); -191.0 kJ/mol at 298.15 K (gas)

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 5-13

▶ from HSDB

Heat of Transition, alpha to beta, J/g = 103.3. Heat of formation from the elements: Alpha form, kJ/mol = 422.46; Beta form, kJ/mol = 426.60. Transition temperature, 299.6 deg C.

Eggeman T; Kirk-Othmer Encyclopedia of Chemical Technology. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: 15 April 2011

▶ from HSDB

70-73 % solution: MP 62 deg C; Density = 2.0 at 15.5 deg C

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.1 (1981)

▶ from HSDB

Caustic soda reacts with all the mineral acids to form the corresponding salts. It also reacts with weak-acid gases, such as hydrogen sulfide, sulfur dioxide, and carbon dioxide. Caustic soda reacts with amphoteric metals (Al, Zn, Sn) and their oxides to form complex anions such as AlO2(-), ZnO2(-2), SNO2(-2), and H2 (or H2O with oxides). All organic acids also react with sodium hydroxide to form soluble salts. Another common reaction of caustic soda is dehydrochlorination.

Kirk-Othmer Encyclopedia of Chemical Technology. 4th ed. Volumes 1: New York, NY. John Wiley and Sons, 1991-Present., p. V1: 1008

▶ from HSDB

Heat capacity (constant pressure): 59.5 J/mol-K (crystal); 48.0 j/mol-K (gas)

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 5-13

▶ from HSDB

Heat of Fusion: 6.60 kJ/mol at 25 deg C

Haynes, W.M. (ed.) CRC Handbook of Chemistry and Physics. 91st ed. Boca Raton, FL: CRC Press Inc., 2010-2011, p. 6-149

from HSDB

Heat of Solution: -44.51 kJ/mol @ 323 deg C

Lide, D.R. (ed.). CRC Handbook of Chemistry and Physics. 76th ed. Boca Raton, FL: CRC Press Inc., 1995-1996., p. 5-100

from HSDB

4 Spectral Information

4.1 IR Spectra

4.1.1 ATR-IR Spectra

Instrument Name	Bio-Rad FTS
Technique	ATR-Neat (DuraSamplIR II)
Source of Spectrum	Forensic Spectral Research
Source of Sample	British Drug House Ltd. Poole, England
Copyright	Copyright © 2012-2018 Bio-Rad Laboratories, Inc. All Rights Reserved.
Thumbnail	

from SpectraBase

5 Related Records

5.1 Related Compounds with Annotation

▶ from PubChem

5.2 Related Compounds

Same Connectivity	6 Records
Mixtures, Components, and Neutralized Forms	2 Records
Similar Compounds	6 Records

▶ from PubChem

5.3 Substances

5.3.1 Related Substances

Same	305 Records

▶ from PubChem

5.3.2 Substances by Category

▸ from PubChem

5.4 Entrez Crosslinks

PubMed	11 Records
Protein Structures	1 Record
Taxonomy	2 Records
Gene	12 Records

▸ from PubChem

6 Chemical Vendors

from PubChem

7 Drug and Medication Information

7.1 Drug Indication

Used to destroy or kill the nail matrix (matrixectomies) [L1968].

from DrugBank

7.2 Therapeutic Uses

Caustics

National Library of Medicine's Medical Subject Headings online file (MeSH, 2011)

from HSDB

Vet: Caustic, dehorning of calves.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

from HSDB

VET: A 2% solution of soda lye (contains 94% sodium hydroxide) in hot water is used as a disinfectant against many common pathogens, such as those causing fowl cholera and pullorum disease.

Kahn, C.M. (Ed.); The Merck Veterinary Manual 9th ed. Merck & Co. Whitehouse Station, NJ. 2005, p. 2153

from HSDB

8 Food Additives and Ingredients

8.1 Food Additive Classes

JECFA Functional Classes

Food Additives: ACIDITY_REGULATOR

from FAO/WHO Food Additive Evaluations (JECFA)

8.2 FDA Substances Added to Food

Substance	SODIUM HYDROXIDE
Used for (Technical Effect)	WASHING OR SURFACE REMOVAL AGENT

Document Number (21 CFR)	73.85 172.560 172.814 172.892 173.310 176.170 176.180 176.210 177.1600 177.2800 184.1763

from FDA Center for Food Safety and Applied Nutrition (CFSAN)

8.3 Evaluations of the Joint FAO/WHO Expert Committee on Food Additives - JECFA

Chemical Name	CAUSTIC SODA
ADI	NOT LIMITED
Evaluation Year	1965
Report	NMRS 40/TRS 339-JECFA 9/16

from FAO/WHO Food Additive Evaluations (JECFA)

9 Agrochemical Information

9.1 Agrochemical Category

Herbicide

from EU Pesticides Database

9.2 EU Pesticides Data

Substance	sodium hydroxide
Status	Not Approved

from EU Pesticides Database

10 Pharmacology and Biochemistry

10.1 Pharmacology

Sodium Hydroxide 10% forms a strongly alkaline and caustic solution. As a caustic agent, it is used to destroy organic tissue by chemical action [L1968].

▸ from DrugBank

10.2 MeSH Pharmacological Classification

Caustics

Strong alkaline chemicals that destroy soft body tissues resulting in a deep, penetrating type of burn, in contrast to corrosives, that result in a more superficial type of damage via chemical means or inflammation. Caustics are usually hydroxides of light metals. SODIUM HYDROXIDE and potassium hydroxide are the most widely used caustic agents in industry. Medically, they have been used externally to remove diseased or dead tissues and destroy warts and small tumors. The accidental ingestion of products (household and industrial) containing caustic ingredients results in thousands of injuries per year. (See all compounds classified as Caustics.)

▸ from MeSH

10.3 Absorption, Distribution and Excretion

Absorption

There are no quantitative data for the absorption of sodium hydroxide through the skin. Solutions which contain 50 % sodium hydroxide have been shown to be corrosive and lethal when applied dermally to mice [L1977].

▸ from DrugBank

ALKALIS PENETRATE SKIN SLOWLY.

Dreisbach, R. H. Handbook of Poisoning. 9th ed. Los Altos, California: Lange Medical Publications, 1977., p. 202

▸ from HSDB

Ammonium hydroxide penetrates fastest, followed by sodium hydroxide, potassium hydroxide, and finally calcium hydroxide.

Sullivan, J.B. Jr., G.R. Krieger (eds.). Hazardous Materials Toxicology-Clinical Principles of Environmental Health. Baltimore, MD: Williams and Wilkins, 1992., p. 433

▸ from HSDB

10.4 Mechanism of Action

Because of its high-level alkalinity, sodium hydroxide in aqueous solution directly causes bond breakage in proteins (especially disulfide bridges). Hair and fingernails are found to be dissolved after 20 hours of direct contact with sodium hydroxide at pH values higher than 9.2 [L1975]. Sodium hydroxide has depilatory effects which have been described after accidental contact with solutions in the workplace. The breakage of bonds in proteins may lead to severe necrosis to the application site. The level of corrosion depends on the period of contact with the tissue, and on the concentration of sodium hydroxide [L1975].

▸ from DrugBank

11 Use and Manufacturing

11.1 Use Classification

EPA Safer Chemical Functional Use Classes	Processing Aids and Additives
Safer Chemical Classes	● Green circle - The chemical has been verified to be of low concern

▸ from EPA Safer Choice

Agrochemical Category	Herbicide

▸ from EU Pesticides Database

JECFA Functional Classes	Food Additives: ACIDITY_REGULATOR

▸ from FAO/WHO Food Additive Evaluations (JECFA)

NJDOH RTK Fire Hazard Classes	Corrosive, Reactive - 1st degree

▸ from NJDOH RTK Hazardous Substance List

Household Products Categories	Auto Products; Commercial / Institutional; Home maintenance; Inside the Home; Landscape/Yard; Personal care; Pesticides; Pet Care

▸ from NLM Household Products Database

11.2 Household Products

NLM Household Products and Categories

Febreze Fabric Refresher, Downy April Fresh, Pump Spray-05/10/2016 [Inside the Home]

Pantene Pro-V Expert Age Defy Conditioner-05/20/2015 [Personal care]

GoJo Fine Italian Pumice Hand Cleaner, Professional Use-04/09/2015 [Commercial / Institutional]

... see the complete list of household products

▸ from NLM Household Products Database

11.3 Uses

EPA CPDat Chemical and Product Categories

The Chemical and Products Database, a resource for exposure-relevant data on chemicals in consumer products, Scientific Data, volume 5, Article number: 180125 (2018), DOI:10.1038/sdata.2018.125

from EPA Chemical and Products Database (CPDat)

Use Classification

Food additives

from EU Food Improvement Agents

Both oil base and water base fracturing fluids are being used in the fracturing industry. Water base, which includes alcohol-water mixtures and low strength acids, make up the majority of treating fluids. The common chemicals added to these fluids are polymers for viscosity development, crosslinkers for viscosity enhancement, pH control chemicals, gel breakers for polymer degradation following the treatment, surfactants, clay stabilizers, alcohol, bactericides, fluid loss additives and friction reducer. /Hydraulic fracturing/

Halliburton; Hydraulic Fracturing. Document ID: EPA-HQ-ORD-2010-0674-1634 p.32. Available from, as of October 27, 2011: ***http://www.regulations.gov/#!documentDetail;D=EPA-HQ-ORD-2010-0674-1634***

from HSDB

Hydraulic fracturing uses a specially blended liquid which is pumped into a well under extreme pressure causing cracks in rock formations underground. These cracks in the rock then allow oil and natural gas to flow, increasing resource production. ... Chemical Name: Sodium hydroxide; Chemical Purpose: Adjusts the pH of fluid to maintain the effectiveness of other components, such as crosslinkers; Product Function: pH Adjusting agent.

FracFocus; Chemical Disclosure Registry, Hydraulic Fracturing, How it Works; What Chemicals are Used. Available from, as of October 28, 2011: ***http://fracfocus.org/chemical-use/what-chemicals-are-used***

from HSDB

For sodium hydroxide (USEPA/OPP Pesticide Code: 075603) ACTIVE products with label matches. /SRP: Registered for use in the U.S. but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses./

National Pesticide Information Retrieval System's USEPA/OPP Chemical Ingredients Database on Sodium Hydroxide (1310-73-2). Available from, as of October 10, 2011: ***http://npirspublic.ceris.purdue.edu/ppis/***

▸ from HSDB

In inorganic chemistry, sodium hydroxide is used in the manufacture of sodium salts, for alkaline ore digestion, and for pH regulation.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

The organic chemical industry uses sodium hydroxide for saponification reactions, production of nucleophilic anionic intermediates, etherification and esterification, basic catalysis, and the production of free organic bases. Sodium hydroxide solution is used for scrubbingwaste gases and neutralizing wastewater.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

In the paper industry ... sodium hydroxide solution is used for cooking wood (removal of lignin).

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

The textile industry uses sodium hydroxide solution to manufacture viscose and viscose staple fibers. The sodium hydroxide solution used must contain only traces of **chloride** ions (**rayon** quality). The surface of cotton can be improved by treatment with sodium hydroxide solution (mercerization).

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

... Used for **sodium phosphate** production in the detergent industry. Soaps are manufactured by the saponification of fats and oils with sodium hydroxide solution, and detergents are produced from organic sulfonic acids and sodium hydroxide.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

In the **aluminum** industry, sodium hydroxide is used mainly for the treatment of bauxite.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▶ from HSDB

Waterworks use dilute sodium hydroxide solution to regenerate ion exchangers for water purification and wastewater treatment.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▶ from HSDB

In the food industry, sodium hydroxide is used for degreasing, cleaning, and for peeling potatoes.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). NY, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▶ from HSDB

Vegetable oil refining; regenerating ion exchange resins; organic fusions; peeling of fruits and vegetables in food industry; etching and electroplating

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1146

▶ from HSDB

NaOH solutions are used to neutralize acids and make sodium salts, e.g., in petroleum refining to remove sulfuric and organic acids; to treat cellulose in making viscose rayon and cellophane; in reclaiming rubber to dissolve out the fabric; in making plastics to dissolve casein. NaOH solutions hydrolyze fats and form soaps; they precipitate alkaloids (bases) and most metals (as hydroxides) from water solutions of their salts. Pharmaceutic aid (alkalizer).

Thomson/Micromedex. Drug Information for the Health Care Professional. Volume 1, Greenwood Village, CO. 2007., p. 1485

▶ from HSDB

Gelling agent

US EPA; Expanded Site Investigation - Field Sampling Plan, Pavillion Area Groundwater Investigation. Pavillion, Fremont County, Wyoming. USEPA Contract No. EP-W-05-050. TDD No., 0901-01. January 6, 2010. START 3. Superfund Technical Assessment and Response Team 3-Region 8. Available from, as of Oct 11, 2011: ***http://www.epa.gov/region8/superfund/wy/pavillion/Pavillion_GWInvestigationFSP.pdf***

▶ from HSDB

It is used in the manufacture of rayon, mercerized cotton, soap, paper, aluminum, petroleum, chemicals, and dye-stuffs. It is also used for metal cleaning, electrolytic extraction of zinc, tin plating, oxide coating, laundering, and bleaching.

Zenz, C., O.B. Dickerson, E.P. Horvath. Occupational Medicine. 3rd ed. St. Louis, MO., 1994, p. 674

▶ from HSDB

MEDICATION: VET

▶ from HSDB

11.3.1 Industry Uses

- Acid neutralization
- Adhesives and sealant chemicals
- Adsorbents and absorbents
- Agricultural chemicals (non-pesticidal)
- Bleaching agents
- Corrosion inhibitors and anti-scaling agents
- Defoamer
- Dyes
- Finishing agents
- Flame retardants
- Food and Beverage Sanitation Chemicals
- Fuels and fuel additives
- Functional fluids (closed systems)
- Intermediates
- Ion exchange agents
- Lubricants and lubricant additives
- Not specified by customer
- Oxidizing/reducing agents
- Paint additives and coating additives not described by other categories
- Pigments
- Plasticizers
- Plating agents and surface treating agents
- Primarily Municipal and Industrial waste water treatment
- Process regulators
- Processing aids, not otherwise listed
- Processing aids, specific to petroleum production
- Solids separation agents
- Solvents (for cleaning and degreas
- Solvents (which become part of pr
- Surface active agents
- Water Treatment
- Water and wastewater treatment
- neutralization reagent
- pH adjustment
- polymer stabilizer
- raw material in the manufacturing

https://www.epa.gov/chemical-data-reporting

from EPA Chemicals under the TSCA

11.3.2 Consumer Uses

- Adhesives and sealants
- Agricultural products (non-pesticidal)
- Animal Care Product
- Automotive care products
- Building/construction materials not covered elsewhere
- C909 the product is used as a cleaner in plating processes. The processes are diverse, examples of final uses are: automotive, machinery, bascially all applications of plating.
- Catalyst
- Cleaning and furnishing care products
- Cleaning compound
- Electrical and electronic products
- Fabric, textile, and leather products not covered elsewhere
- Food packaging

https://www.epa.gov/chemical-data-reporting

from EPA Chemicals under the TSCA

11.4 Methods of Manufacturing

By reacting calcium hydroxide with sodium carbonate; from sodium chloride by electrolysis; from sodium metal and water vapor at low temperature.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

Sodium hydroxide is produced industrially mainly by the electrolysis of sodium chloride. This yields sodium hydroxide solution, chlorine, and hydrogen in the mass ratios 1:0.88:0.025.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

Solid sodium hydroxide (caustic soda) is obtained by evaporating sodium hydroxide solution until the water content is < 0.5 - 1.5 wt%. The most efficient utilization of energy is achieved with multistage equipment.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

Causticization of sodium carbonate: A hot, ca. 12% solution of sodium carbonate is mixed with quicklime (CaO). The calcium carbonate that precipitates out is removed and the ca. 12% solution of sodium hydroxide is evaporated in several stages.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 349 (1993)

▸ from HSDB

Ferrite Recovery process (mainly used in small paper pulp plants): Waste liquor containing sodium salt and organic substances is evaporated, and the residue mixed with Fe2O3 and calcined. The sodium ferrite formed is decomposed by water to give sodium hydroxide and Fe2O3.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 347 (1993)

▸ from HSDB

Solid sodium hydroxide (Caustic soda) is obtained by evaporating sodium hydroxide solution until the water content is <0.5-1.5 wt %.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 349 (1993)

▸ from HSDB

11.5 Impurities

Major impurities which are normally tested for are sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, and nickel.

Kirk-Othmer Encyclopedia of Chemical Technology. 4th ed. Volumes 1: New York, NY. John Wiley and Sons, 1991-Present., p. V1: 1012 (1991)

▸ from HSDB

11.6 Formulations/Preparations

Solid sodium hydroxide is supplied in the form of flakes, prills, cast blocks, and less commonly as tablets, briquettes, or granules.

Kurt C, Bittner J; Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2011). New York, NY: John Wiley & Sons; Sodium Hydroxide. Online Posting Date: July 15, 2006

▸ from HSDB

Grades: commercial; ground; flake; beads; Food Chemical Codex grade; granulated (60% and 76% Na2O); rayon (low in iron, copper, and manganese); purified by alcohol (sticks, lumps, and drops); reagent; highest purity: CP, USP.

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 1146

▸ from HSDB

When kept in tight containers, the usual grades contain 97-98% sodium hydroxide.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

Anhydrous (Rayon Grade) 99.0% minimum; Rayon Grade: 50% liquid; Regular Grade: 50% liquid, 47.7-51% purity.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.1 (1981)

▸ from HSDB

Drano crystals contain 54.2% sodium hydroxide; Clinitest tablets contain 232.5 mg sodium hydroxide /From table/

Gossel, T.A., J.D. Bricker. Principles of Clinical Toxicology. 3rd ed. New York, NY: Raven Press, Ltd., 1994., p. 224

▸ from HSDB

Mr. Clean Multi-Surfaces Antibacterial (The Procter & Gamble Co.), Sodium hydroxide 0.34%.

Purdue University; National Pesticide Information Retrieval System, Sodium hydroxide (1310-73-2), PC Code: 75603. Available from, as of October 14, 2011 ***http://npirspublic.ceris.purdue.edu/ppis/***

▸ from HSDB

Ultra Mr. Clean (The Procter & Gamble Co.), Sodium hydroxide 0.46%.

Purdue University; National Pesticide Information Retrieval System, Sodium hydroxide (1310-73-2), PC Code: 75603. Available from, as of October 14, 2011 ***http://npirspublic.ceris.purdue.edu/ppis/***

▸ from HSDB

PH 12.6 (Western Pacific Pulp & Paper), Sodium hydroxide 0.18%.

Purdue University; National Pesticide Information Retrieval System, Sodium hydroxide (1310-73-2), PC Code: 75603. Available from, as of October 14, 2011 ***http://npirspublic.ceris.purdue.edu/ppis/***

▸ from HSDB

11.7 Consumption Patterns

51% IS CONSUMED IN CHEMICAL PROCESSING AND METAL PROCESSING OTHER THAN ALUMINUM; 6% FOR ALUMINUM PROCESSING; 18% IS USED IN PAPER AND PULP MANUFACTURE; 13% IS USED IN THE PETROLEUM, TEXTILE, SOAP, AND FOOD INDUSTRIES; 4% IS USED IN RAYON AND CELLOPHANE PRODUCTION; 8% IS USED IN OTHER APPLICATIONS (1974).

SRI

▸ from HSDB

CHEMICAL PROFILE: Caustic soda. Organic Chemicals, 30%; Inorganic Chemicals, 20%; Pulp & Paper, 20%; Exports, 10%; Soaps and Detergents, 5%; Petroleum, 5%; Textiles, 4%; Alumina, 3%; Other, 3% (1986).

CHEMICAL PROFILE: Caustic Soda, 1986

▸ from HSDB

CHEMICAL PROFILE: Caustic soda. Pulp and paper, 22%; organic chemicals, 20%; inorganic chemicals, 11%; soaps and detergents, 7%; petroleum, 7%; water treatment, 7%; textiles, 5%; alumina, 4%; other, 9%; exports, 8%.

Kavaler AR; Chemical Marketing Reporter 235 (25): 50 (1989)

▸ from HSDB

Direct application, 55% (pulp & paper, 24%; soaps and detergents, 10%; alumina, 6%; petroleum, 7%; textiles, 5%; water treatment, 5%; miscellaneous, 43%); organic chemicals 36% (propylene oxide, 23%; polycarbonates, 5%; ethyleneamines, 3%; epoxy resins, 3%; miscellaneous, 66%); inorganic chemicals, 9% (sodium/calcium hypochlorite, 24%; sulfur-containing compounds, 14%; sodium cyanide, 10%; miscellaneous 52%)

Kavaler AR; Chemical Marketing Reporter, June 1, 1998, p. 37 Chemical Profile: Caustic Soda

▸ from HSDB

11.8 U.S. Production

Aggregated Product Volume (EPA CDR 2016)

20,000,000,000 - 30,000,000,000 lb

https://www.epa.gov/chemical-data-reporting

▸ from EPA Chemicals under the TSCA

(1972) 9.27X10+12 GRAMS

SRI

▸ from HSDB

(1975) 8.7X10+12 GRAMS

SRI

▸ from HSDB

(1985) 9.24X10+12 g

Chem Eng News 64(16): 13(1986)

▸ from HSDB

(1990) 24.06 billion lb

Chem & Engineering News 70 (15): 17 (4/13/92)

▸ from HSDB

(1991) 23.43 billion lb

Chem & Engineering News 71 (15): 11 (4/12/93)

▸ from HSDB

(1992) 24.50 billion lb

Chem & Engineering News 72 (15): 13 (4/11/94)

▸ from HSDB

(1993) 25.71 billion lb

Chem & Engineering News 72 (15): 13 (4/11/94)

▸ from HSDB

CHEMICAL PROFILE: Caustic soda. Demand: 1988: 12.3 million tons (33,700 tons per day); 1989: 12.5 million tons (34,250 tons per day); 1993 /projected/: 13.4 million tons (36,700 tons per day). (Includes exports, but not imports, which totaled 858,000 tons last year.)

Kavaler AR; Chemical Marketing Reporter 235 (25): 50 (1989)

▸ from HSDB

Annual production capacity estimate as of 4/1/97: 14.3 million short tons.

SRI. 1997 Directory of Chemical Producers -United States of America. Menlo Park, CA: SRI International 1997., p. 891-2

▸ from HSDB

Demand: (1996) 13.9 million tons; (1997) 14.2 million tons (figures are for liquid material and include amounts dried, Includes exports, which amounted to 2 million short tons in 1996, but not imports, which were 540,000 tons).

Kavaler AR; Chemical Marketing Reporter, June 1, 1998, p. 37, Chemical Profile: Caustic Soda

▸ from HSDB

Production volumes for non-confidential chemicals reported under the Inventory Update Rule. [See Table #1074]

US EPA; Non-confidential Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Sodium hydroxide (1310-73-2). Available from, as of October 11, 2011: ***http://www.epa.gov/oppt/iur/tools/data/2002-vol.html***

▸ from HSDB

Table #1074

Year	Production Range (pounds)
1986	>100 million - 500 million
1990	>1 million - 10 million
1994	>1 million - 10 million
1998	>100 million - 500 million
2002	>100 million - 500 million

▸ from HSDB

Production volume for non-confidential chemicals reported under the 2006 Inventory Update Rule. Chemical: Sodium hydroxide. Aggregated National Production Volume: 1 billion pounds and greater.

US EPA; Non-Confidential 2006 Inventory Update Reporting. National Chemical Information. Sodium hydroxide (1310-73-2). Available from, as of October 11, 2011: ***http://cfpub.epa.gov/iursearch/index.cfm?s=chem&err=t***

▸ from HSDB

11.9 U.S. Imports

(1972) 9.53X10+10 GRAMS

SRI

▸ from HSDB

(1975) 9.8X10+10 GRAMS

SRI

▸ from HSDB

(1984) 4.78X10+11 g

BUREAU OF THE CENSUS. U.S. IMPORTS FOR CONSUMPTION AND GENERAL IMPORTS 1984 p.1-351

▸ from HSDB

1996: 540,000 tons

Kavaler AR; Chemical Marketing Reporter, June 1, 1998, p. 37, Chemical Profile: Caustic Soda

▸ from HSDB

11.10 U.S. Exports

(1972) 1.1X10+12 GRAMS

SRI

▸ from HSDB

(1975) 1.00X10+12 GRAMS

SRI

▸ from HSDB

(1984) 1.14X10+12 g

BUREAU OF THE CENSUS. U.S. EXPORTS, SCHEDULE E, 1984 p.2-92

▸ from HSDB

1996: 2 million tons.

Kavaler AR; Chemical Marketing Reporter, June 1, 1998, p. 37, Chemical Profile: Caustic Soda

▸ from HSDB

11.11 Manufacturers

American Azide Corp., 3770 Howard Hughes Parkway, Suite 300, Las Vegas, NV 89109, (702) 735-2200; Production site: 10622 West 6400 North, P.O. Box 629, Cedar City, UT 84721

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Bayer MaterialScience LLC, 100 Bayer Rd., Pittsburgh, PA 15205-9741, (800) 662-2927; Production site: 8500 West Bay Rd., Baytown, TX 77521

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Bleachtech LLC, 8895 Ryan Rd., Seville, OH 44273, (330) 769-5300; Production site: Seville, OH 44273

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

The Dow Chemical USA, 2030 Dow Center, Midland, MI 48642, (989) 636-1000; Production sites: 2301 N. Brazosport Blvd., Freeport, TX 77541; 21255 Highway 1, Plaquemine, LA 70764

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Equa-Chlor LLC, 3541 Industrial Way, Longview, WA 98632, (360) 636-2123; Production site: 3541 Industrial Way, Longview, WA 98632

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

ERCO Worldwide (USA) Inc., 101 Highway 73 South, Nekoosa, WI 54457, (715) 887-4000; Production site: State Highway 73 South, P.O. Box 161, Port Edwards, WI 54469

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

FMC Corporation, 1735 Market St., Philadelphia, PA 19103, (215) 299-6000; Industrial Chemicals Group, Alkali Chemicals Division; Production site: Highway 374, P.O. Box 872, Green River, WY 82935

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Formosa Plastics Corp USA, 9 Peach Tree Rd., Livingston, NJ 07039, (973) 922-2090; Production sites: P.O. Box 271, Gulf States Rd., Baton Rouge, LA 70821; P.O. Box 700, 201 Formosa Dr., Point Comfort, TX 77978

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Georgia Gulf Corp., 115 Perimeter Center Place, Suite 460, Atlanta, GA 30346, (770) 395-4500; Production site: 26100 Louisiana Hwy. 405, P.O. Box 629, Plaquemine, LA 70765

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Kuehne Chemical Corp., 86 N. Hackensack Ave., South Kearny, NJ 07032, (973) 589-0700; Production site: 1645 River Rd., P.O. Box 294, Delaware City, DE 19706

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Occidental Chemical Corp., Occidental Tower, 5005 LBJ Freeway, Dallas, TX 75244, (972) 404-3800; Chloro-Vinyls Group; Production sites: Convent, LA 70723; Corpus Christi, TX 78400; Geismar, LA 70734; Hahnville, LA 70057; La Porte, TX 77571; Niagara Falls, NY 14303; Wichita, KS 67215

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Olin Corporation, 190 Carondelet Plaza, Suite 1530, Clayton, MO 63105-3443, (314) 480-1400; Olin Chlor Alkali Products Div., Production sites: Augusta, GA 30906-2139; Charleston, TN 37310-0248; Henderson, NV 89015; McIntosh, AL 36553-0028; Niagara Falls, NY 14302-0748; St. Gabriel, LA 70776

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

PPG Industries, Inc., One PPG Place, Pittsburgh, PA 15272, (412) 434-3131; Chemicals Group; Production sites: Lake Charles, LA 70601; Natrium, WV 26155

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

SABIC Innovative Plastics, 1 Plastics Avenue, Pittsfield, MA 01201, (413) 448-7110; Production site: Burkville, AL 36752; Mount Vernon, IN 47620

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Shintech Inc., 3 Greenway Plaza, Suite 1150, Houston, TX 77046, (713) 965-0713; Production site: 26270 Highway 405, Plaquemine, LA 70764, (225) 685-1021

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Trinity Manufacturing, INC., 11 E.V. Hogan Dr., P.O. Box 1519, Hamlet, NC 28345, (910) 582-5650; Production site: Hamlet, NC 28345

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Westlake Vinyls, Inc., Westlake Center, 2801 Post Oak Blvd., Houston, TX 77056, (713) 960-9111; Production site: 230 Johson Riley Rd., P.O. Box 1027, Calvert City, KY 42029

SRI Consulting, 2010 Directory of Chemical Producers. Menlo Park, CA. 2010, p. 857

▸ from HSDB

Sodium Hydroxide - Producer and Manufacture Data (2006) [See Table #1072]

*US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of Sept 9, 2011: **http://cfpub.epa.gov/iursearch/index.cfm***

▸ from HSDB

Table #1072

Company	Site	City State Zip	Manufacture	Import

Company	Site	City State Zip	Manufacture	Import
ATI Wah Chang	ATI Wah Chang	Albany OR 97321	No	Yes
Alcan International Network U.S.A. Inc.	Alcan International Network U.S.A. Inc.	Stamford CT 06902	No	Yes
Alcoa Inc.	Alcoa Corporate Center	Pittsburgh PA 15212	No	Yes
Barrick Gold Corporation	Barrick Gold Corp - Bald Mountain Mine	Ely NV 89301	No	Yes
Barrick Gold Corporation	Barrick Goldstrike Mines Inc.	Carlin NV 89822	No	Yes
Barrick Turquoise Ridge Inc.	Turquoise Ridge Joint Venture	Golconda NV 89414	No	Yes
Basic Chemicals Company, LLC	Basic Chemicals Co - Geismar	Geismar LA 70734	Yes	No
Basic Chemicals Company, LLC	Basic Chemicals Co - Wichita Plant	Wichita KS 67215	Yes	No
Bayer MaterialScience	Bayer MaterialScience - Pittsburgh	Pittsburgh PA 15205	No	Yes
Bayer MaterialScience	Bayer MaterialScience - Baytown	Baytown TX 77520	Yes	No
CITGO Asphalt Refining Company	CITGO Asphalt Refining - Savannah Refinery	Savannah GA 31408	No	Yes
Canexus U.S., Inc.	Canexus - Houston	Houston TX 77067	No	Yes
Delta Chemical Corporation	Delta Chemical Corp - Baltimore	Baltimore MD 21226	No	Yes
Domtar, Inc.	Domtar Maine Corp.	Baileyville ME 04694	No	Yes
EMD Chemicals, Inc.	EMD Chemicals - Cincinnati	Cincinnati OH 45212	No	Yes
Equa-Chlor Marketing, LLC	Equa-Chlor, LLC	Longview WA 98632	No	Yes
Erco Worldwide, a division of Superior Plus LP.	Erco Worldwide - Nekoosa	Nekoosa WI 54457	Yes	No
Erco Worldwide, a division of Superior Plus LP.	Erco Worldwide - Saskatoon	Saskatoon CN S7K 3R3 Canada	No	Yes
FMC Corporation	FMC Corp - Westvaco Plant	Green River WY 82935	Yes	No
FMC Wyoming Corporation	FMC Wyoming Corp - Westvaco Plant	Green River WY 82935	Yes	No
FMC Wyoming Corporation	FMC Wyoming Corp - Granger Plant	Granger WY 82934	Yes	No
Fairbanks Gold Mining Inc.	Fairbanks Gold Mining - Fort Knox Mine	Fairbanks AK 99712	No	Yes
Finch Pruyn & Co., Inc.	Finch Pruyn & Co., Inc.	Glens Falls NY 12801	No	Yes
Ford Motor Company	Ford Motor Co - Sterling Plant	Sterling Heights MI 48310	No	Yes
Formosa Plastics Corporation	Formosa Plastics Corp - Livingston Headquarters	Livingston NJ 07039	No	Yes
Formosa Plastics Corporation	Formosa Plastics Corp - Texas	Point Comfort TX 77978	Yes	No
GE Plastics Mt.Vernon, Inc.	GE Plastics Mt.Vernon, Inc.	Mt. Vernon IN 47620-9367	Yes	No
General Chemical Performance Products, LLC	General Chem Perform Prods - Reheis Interm - Midlothian	Midlothian TX 76065	Yes	No
General Electric Company	GE Plastics	Burkville AL 36752-4007	Yes	No
Georgia Gulf Chemicals and Vinyls, LLC	Georgia Gulf Chemicals and Vinyls - Plaquemine Plant	Plaquemine LA 70765-0629	Yes	No
Golden Sunlight Mines, Inc.	Golden Sunlight Mine	Whitehall MT 59759	No	Yes
Ineos Chlor Americas, Inc	Ineos Chlor Americas, Inc	Wilmington DE 19810	No	Yes
JCI Jones Chemcials, Inc.	JCI Jones Chemicals - Headquarters	Sarasota FL 34236		

Company	Site	City State Zip	Manufacture	Import
JohnsonDiversey, Inc	JohnsonDiversey, Inc	Sturtevant WI 53177-0902	No	Yes
K.G. International, Inc.	K.G. International, Inc.	Miami FL 33166	No	Yes
Kinross Gold USA Inc.	Kinross Gold - Round Mountain Gold Corporation	Round Mountain NV 89045	No	Yes
Konica Minolta Graphic Imaging U.S.A., Inc.	Konica Minolta Graphic imaging U.S.A., Inc.	Glen Cove NY 11542	No	Yes
Lonza, Inc.	Lonza - Williamsport	Williamsport PA 17701	Yes	No
Los Angeles Chemical Company	Los Angeles Chemical Co. Huntington Beach, CA	Huntington Beach CA 92649	No	Yes
Merichem Chemicals & Refinery Services, LLC	Merichem Chemicals & Refinery Services - Houston	Houston TX 77023-5013	No	Yes
Mitsubishi International Corporation	Mitsubishi International Corp - Houston	Houston TX 77010-2009	No	Yes
Occidental Chemical Corporation	Occidental Chemical Corp - Taft Plant	Hahnville LA 70057-2608	Yes	No
Occidental Chemical Corporation	Occidental Chemical Corp - Niagara Falls	Niagara Falls NY 14302	Yes	No
Occidental Chemical Corporation	Occidental Chemical Corp - Ingleside	Gregory TX 78359	Yes	No
Occidental Chemical Corporation	Occidental Chemical Corp - Delaware City	New Castle DE 19720	Yes	No
Occidental Chemical Corporation	Occidental Chemical Corp - Convent	Convent LA 70723	Yes	No
Oxy Vinyls, LP	Oxy Vinyls - Battleground Plant	La Porte TX 77571	Yes	No

▸ from HSDB

Sodium Hydroxide - Producer and Manufacture (2006) [See Table #1073]

US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of Sept 8, 2011: ***http://cfpub.epa.gov/iursearch/index.cfm***

▸ from HSDB

Table #1073

Company	Site	City State Zip	Manufacture	Import
PPG Industries, Inc.	PPG Industries - Lake Charles	Lake Charles LA 70602	Yes	No
PPG Industries, Inc.	PPG Industries - New Martinsville	New Martinsville WV 26155	Yes	No
Pioneer Americas LLC	Pioneer Americas - CN CargoFlo	Warren MI 48089	No	Yes
Pioneer Americas LLC	Pioneer Americas - CSXT Transflo	Albany NY 12205	No	Yes
Pioneer Americas LLC	Pioneer Americas - CSXT Transflo	Buffalo NY 14206	No	Yes
Pioneer Americas LLC	Pioneer Americas - CSXT Transflo	Elizabeth NJ 07201	No	Yes
Pioneer Americas LLC	Pioneer Americas - Henderson	Henderson NV 89015	Yes	No
Pioneer Americas LLC	Pioneer Americas - Kinder Morgan	Richmond CA 94804	No	Yes
Pioneer Americas LLC	Pioneer Americas - Kinder Morgan Liquids Terminal	Argo IL 60501	No	Yes

Company	Site	City State Zip	Manufacture	Import
Pioneer Americas LLC	Pioneer Americas - Safe Handling	Auburn ME 04211	No	Yes
Pioneer Americas LLC	Pioneer Americas - Seeler Industries	Joliet IL 60435	No	Yes
Pioneer Americas LLC	Pioneer Americas - St. Gabriel	St. Gabriel LA 70776	Yes	No
Pioneer Americas LLC	Pioneer Americas - Tacoma Terminal	Tacoma WA 98421	No	Yes
Placid Refining Company, L.L.C.	Placid Refining Co - Port Allen Refinery	Port Allen LA 70767	Yes	No
Port Townsend Paper Corporation	Port Townsend Paper Mill	Port Townsend WA 98368	Yes	Yes
Quadra Chemicals, Inc.	Quadra Chemicals, Inc. - Portland, OR	Portland OR 97210	No	Yes
Reckitt Benckiser Inc	Reckitt Benckiser - Parsippany	Parsippany NJ 07054	No	Yes
Rhodia Inc	Rhodia Inc - Cranbury	Cranbury NJ 08512	No	Yes
SDW Holdings Corporation	S.D. Warren Co. (Sappi Fine Paper North America) - Skowhegan	Skowhegan ME 04976	No	Yes
Solvay Chemicals, Inc.	Solvay Chemicals - Corporate Office	Houston TX 77098	No	Yes
Syngenta Crop Protection, Inc.	Syngenta Crop Protection - Pasadena	Pasadena TX 77507	Yes	No
TR International, Incorporated	TR International Inc - Seattle	Seattle WA 98101	No	Yes
Tembec USA LLC	Tembec USA - St Francisville Operations St.	Francisville LA 70775	Yes	No
Tesoro Refining and Marketing Company	Tesoro Refining & Marketing Co - Anacortes	Anacortes WA 98221	Yes	No
Texas Molecular LP	TM Chemicals, LP	Deer Park TX 77536	Yes	No
The Dow Chemical Company	Dow Chemical - Headquarters	Midland MI 48674	No	Yes
The Dow Chemical Company	Dow Chemical - Plaquemine	Plaquemine LA 70764	Yes	No
Ulrich Chemical, Inc.	Ulrich Chemical, Inc - Indianapolis	Indianapolis IN 46226	Yes	No
Ulrich Chemical, Inc.	Ulrich Chemical, Inc - Louisville	Louisville KY 40216	Yes	No
Ulrich Chemical, Inc.	Ulrich Chemical, Inc - Fort Wayne	Fort Wayne IN 46803	Yes	No
Ulrich Chemical, Inc.	Ulrich Chemical, Inc - Evansville	Evansville IN 47711	Yes	No
Ulrich Chemical, Inc.	Ulrich Chemical, Inc - Terre-Haute	Terre-Haute IN 47802	Yes	No
United Refining Company	United Refining Company - Vulcan Asphalt Facility	Cordova AL 35550	No	Yes
United Refining Company	United Refining Company - Warren	Warren PA 16365	No	Yes
Univar USA Inc.	Univar USA Inc - Redmond	Redmond WA 98052	No	Yes
Vulcan Materials Company	Vulcan Materials Co - Geismar Plant	Geismar LA 70734	Yes	No
Vulcan Materials Company	Vulcan Materials Co - Port Edwards Plant	Port Edwards WI 54469	Yes	No
Vulcan Materials Company	Vulcan Materials Co - Wichita Plant	Wichita KS 67215	Yes	No
Westlake Chemical Corporation	Westlake Vinyls, Inc.	Calvert City KY 42029	Yes	No

▸ from HSDB

11.12 General Manufacturing Information

Industry Processing Sectors

- Adhesive manufacturing
- Agriculture, forestry, fishing and hunting
- All other basic inorganic chemical manufacturing
- All other basic organic chemical manufacturing
- All other chemical product and preparation manufacturing
- Computer and electronic product manufacturing
- Construction
- Electrical equipment, appliance, and component manufacturing
- Fabricated metal product manufacturing
- Food, beverage, and tobacco product manufacturing
- Mining (except oil and gas) and support activities
- Miscellaneous manufacturing
- Nonmetallic mineral product manufacturing (includes clay, glass, cement, concrete, lime, manufacturing.
- Oil and gas drilling, extraction, and support activities
- Organic fiber manufacturing
- Paint and coating manufacturing
- Paper manufacturing
- Pesticide, fertilizer, and other agricultural chemical manufacturing
- Pet Care Products
- Petrochemical manufacturing
- Petroleum lubricating oil and grease manufacturing
- Petroleum refineries
- Pharmaceutical and medicine manufacturing
- Plastic material and resin manufacturing

from EPA Chemicals under the TSCA

EPA TSCA Commercial Activity Status

Sodium hydroxide (Na(OH)): ACTIVE

https://www.epa.gov/tsca-inventory

from EPA Chemicals under the TSCA

All U.S. production, except for that in Granger and Green River, WY, is by brine electrolysis.

SRI. 1997 Directory of Chemical Producers -United States of America. Menlo Park, CA: SRI International 1997., p. 892

from HSDB

Chlorine and sodium hydroxide are usually coproduced /by brine electrolysis/ in a ratio of 1 ton of chlorine to 1.1 tons of sodium hydroxide.

SRI. 1998 Directory of Chemical Producers -United States of America. SRI International, Menlo Park, CA. 1998., p. 892

from HSDB

Caustic soda (NaOH) and chlorine are coproducts and consequently caustic soda production has been limited by chlorine demand. Increased demand for caustic soda over that of chlorine will be presumably addressed by a switch to soda ash (sodium carbonate) where possible.

Kirk-Othmer Encyclopedia of Chemical Technology. 4th ed. Volumes 1: New York, NY. John Wiley and Sons, 1991-Present., p. V1: 939 (1991)

from HSDB

Produced commercially in two forms: a 50 wt % solution (the most common form) and in the solid (caustic soda) as prills, flakes, or cast shapes.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 347 (1993)

▸ from HSDB

The relative energy requirements for the production of sodium hydroxide by the three electrolytic processes are Amalgam:Diaphragm:Membrane at 92:100:75 %.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 348 (1993)

▸ from HSDB

In 1990, sodium hydroxide production among the three most widely used processes was: United States (Amalgam 18%, Diaphram 76%, Membrane 6%); Canada (Amalgam 15%, Diaphram 81%, Membrane 4%); Western Europe (Amalgam 65%, Diaphram 29%, Membrane 6%); Japan (Amalgam 0%, Diaphram 20%, Membrane 80%).

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA24: 347 (1993)

▸ from HSDB

The diaphram cell process (Griesheim cell, 1985, mercury cell (amalgam) process (Castner-Kellner cell 1892) and membrane cell process (1970) represent a different method of keeping the chlorine produced at the anode separate from the caustic soda and hydrogen produced, directly or indirectly, at the cathode. In the mercury cell process, sodium amalgam is produced at the cathode and reacted in water in a separate reactor, the decomposer. In the diaphragm cell process, the anode and cathode areas are separated by a permeable asbestos-based diaphragm. In the membrane cell process, the anode and cathode are separated by a cation-permeable ion-exchange membrane.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA6: 406 (1986)

▸ from HSDB

A survey of household materials involved in serious poisonings in children aged under 5 yr was conducted to identify substances that would best be packaged with safety closures. The substances identified as causing the most serious side effects and for which safety closures may be indicated included ... sodium hydroxide (caustic soda).

Craft AW et al; Br Med J 288(Mar 3): 682 (1984)

▸ from HSDB

11.13 Sampling Procedures

ANALYTE: SODIUM HYDROXIDE; MATRIX: AIR; PROCEDURE: FILTER COLLECTION, EXTRACTION WITH AQUEOUS ACID.

U.S. Department of Health, Education Welfare, Public Health Service. Center for Disease Control, National Institute for Occupational Safety Health. NIOSH Manual of Analytical Methods. 2nd ed. Volumes 1-7. Washington, DC: U.S. Government Printing Office, 1977-present., p. V4 S381-1

▸ from HSDB

Workplace monitoring: Sampling and analysis may be performed by collection of sodium hydroxide in a glass bubble containing hydrochloric acid, followed by subsequent titration.

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2

▸ from HSDB

Detector tubes certified by NIOSH under 42 CFR part 84 or other direct-reading devices calibrated to measure sodium hydroxide may be used.

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2

▸ from HSDB

12 Identification

12.1 Analytic Laboratory Methods

Method: NIOSH 7401, Issue 2; Procedure: acid-base titration; Analyte: hydroxide (alkalinity); Matrix: air; Detection Limit: 0.03 mg/sample (as NaOH).

CDC; NIOSH Manual of Analytical Methods, 4th ed. Alkaline Dusts (1310-73-2). Available from, as of October 12, 2011: http://www.cdc.gov/niosh/docs/2003-154/

▸ from HSDB

12.2 OSHA Chemical Sampling

AAS/AES - OSHA ID-121 (fully validated)

▸ from Occupational Safety and Health Administration (OSHA)

12.3 NIOSH Analytical Methods

ALKALINE DUSTS, NaOH, KOH, LiOH, and basic salts 7401

▸ from NIOSH Manual of Analytical Methods

13 Safety and Hazards

13.1 Hazards Identification

13.1.1 GHS Classification

Showing 1 of 5 View More

Pictogram(s)	 Corrosive
Signal	Danger
GHS Hazard Statements	H314: Causes severe skin burns and eye damage [Danger Skin corrosion/irritation]
Precautionary Statement Codes	P260, P264, P280, P301+P330+P331, P303+P361+P353, P304+P340, P305+P351+P338, P310, P321, P363, P405, and P501 (The corresponding statement to each P-code can be found at the GHS Classification page.)

▸ from EU REGULATION (EC) No 1272/2008

13.1.2 NFPA Hazard Classification

Showing 1 of 2 View More

NFPA 704 Diamond	 3-0-1
NFPA Health Rating	3 - Materials that, under emergency conditions, can cause serious or permanent injury.
NFPA Fire Rating	0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.
NFPA Instability Rating	1 - Materials that in themselves are normally stable but that can become unstable at elevated temperatures and pressures.

▸ from HSDB

13.1.3 EPA Safer Chemical

Chemical: Sodium hydroxide

● Green circle - The chemical has been verified to be of low concern based on experimental and modeled data.

▸ from EPA Safer Choice

13.1.4 Health Hazard

Causes severe burns of eyes, skin, and mucous membranes. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

Strong corrosive action on contacted tissues. INHALATION: dust may cause damage to upper respiratory tract and lung itself, producing from mild nose irritation to pneumonitis. INGESTION: severe damage to mucous membranes; severe scar formation or perforation may occur. EYE CONTACT: produces severe damage. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

13.1.5 Fire Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]: Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2016)

U.S. Department of Transportation, Transport Canada, and Secretariat of Communications and Transport of Mexico, with collaboration from Argentina's Centro de Información Química para Emergencias. 2016 Emergency Response Guidebook. ***https://www.phmsa.dot.gov/hazmat/outreach-training/erg*** *(accessed April 26, 2016).*

▸ from CAMEO Chemicals

Not combustible. Contact with moisture or water may generate sufficient heat to ignite combustible materials. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.

▸ from ILO International Chemical Safety Cards (ICSC)

Corrosive, Reactive - 1st degree

▸ from NJDOH RTK Hazardous Substance List

13.1.6 Hazards Summary

At room temperature, sodium hydroxide is a white crystalline odorless solid that absorbs moisture from the air. It is a manufactured substance. When dissolved in water or neutralized with acid it liberates substantial heat, which may be sufficient to ignite combustible materials. Sodium hydroxide is very corrosive. It is generally used as a solid or a 50% solution. Other common names include caustic soda and lye. Sodium hydroxide is used to manufacture soaps, rayon, paper, explosives, dyestuffs, and petroleum products. It is also used in processing cotton fabric, laundering and bleaching, metal cleaning and processing, oxide coating, electroplating, and electrolytic extracting. It is commonly present in commercial drain and oven cleaners.

▸ from CDC-ATSDR Toxic Substances Portal

13.1.7 Fire Potential

Not combustible.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

▸ from HSDB

13.1.8 Skin, Eye, and Respiratory Irritations

Liquid or solid sodium hydroxide is a severe skin irritant. It causes second and third degree burns on short contact and is very injurious to the eyes.

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

▸ from HSDB

HAZARD WARNING: The irritating nature of the aerosol on the mucous membranes is presumed to be adequate warning to maintain air concn at tolerable levels.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.74 (Date)

▸ from HSDB

Irritating to skin, eyes, and respiratory system.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

▸ from HSDB

13.1.9 EPA Hazardous Waste Number

D002; A waste containing sodium hydroxide may (or may not) be characterized a hazardous waste following testing for corrosivity characteristics as prescribed by the Resource Conservation and Recovery Act (RCRA) regulations.

▸ from HSDB

13.2 Safety and Hazard Properties

13.2.1 Flammable Limits

Flammability

Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.

▸ from The National Institute for Occupational Safety and Health (NIOSH)

13.2.2 OSHA Standards

Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 2 mg/cu m.

29 CFR 1910.1000 (USDOL); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: ***http://www.ecfr.gov***

▸ from HSDB

Vacated 1989 OSHA PEL Ceiling limit 2 mg/cu m is still enforced in some states.

NIOSH. NIOSH Pocket Guide to Chemical Hazards. DHHS (NIOSH) Publication No. 97-140. Washington, D.C. U.S. Government Printing Office, 1997., p. 371

▸ from HSDB

13.2.3 NIOSH Recommendations

Recommended Exposure Limit: 15 Minute Ceiling Value: 2 mg/cu m.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

13.3 First Aid Measures

13.3.1 First Aid

(Act quickly) EYES: flush with water at once for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2016)

National Institute of Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards (full website version). ***https://www.cdc.gov/niosh/npg*** *(accessed August 2016).*

▸ from CAMEO Chemicals

(See procedures)

Eye:Irrigate immediately - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin:Water flush immediately - If this chemical contacts the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly.

Breathing:Respiratory support

Swallow:Medical attention immediately - If this chemical has been swallowed, get medical attention immediately.

▸ from The National Institute for Occupational Safety and Health (NIOSH)

13.3.2 Inhalation First Aid

Fresh air, rest. Refer immediately for medical attention.

▸ from ILO International Chemical Safety Cards (ICSC)

13.3.3 Skin First Aid

Remove contaminated clothes. Rinse skin with plenty of water or shower for at least 15 minutes. Refer immediately for medical attention.

▸ from ILO International Chemical Safety Cards (ICSC)

13.3.4 Eye First Aid

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

▸ from ILO International Chemical Safety Cards (ICSC)

13.3.5 Ingestion First Aid

Rinse mouth. Do NOT induce vomiting. If within a few minutes after ingestion, one small glass of water may be given to drink. Refer immediately for medical attention.

▸ from ILO International Chemical Safety Cards (ICSC)

13.4 Fire Fighting

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]: SMALL FIRE: Dry chemical, CO2 or water spray. LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

U.S. Department of Transportation, Transport Canada, and Secretariat of Communications and Transport of Mexico, with collaboration from Argentina's Centro de Información Química para Emergencias. 2016 Emergency Response Guidebook. ***https://www.phmsa.dot.gov/hazmat/outreach-training/erg*** *(accessed April 26, 2016).*

▸ from CAMEO Chemicals

In case of fire in the surroundings, use appropriate extinguishing media.

▸ from ILO International Chemical Safety Cards (ICSC)

13.4.1 Fire Fighting Procedures

Extinguish fire using agent suitable for surrounding fire. Use water spray to keep fire-exposed containers cool.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

▸ from HSDB

If material on fire or involved in fire: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use "alcohol" foam, dry chemical or carbon dioxide. Keep run-off water out of sewers and water sources.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 823

▸ from HSDB

13.5 Accidental Release Measures

13.5.1 Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]: As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids. SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above. FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

*U.S. Department of Transportation, Transport Canada, and Secretariat of Communications and Transport of Mexico, with collaboration from Argentina's Centro de Información Química para Emergencias. 2016 Emergency Response Guidebook. **https://www.phmsa.dot.gov/hazmat/outreach-training/erg** (accessed April 26, 2016).*

▸ from CAMEO Chemicals

13.5.2 Spillage Disposal

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered plastic containers. Carefully collect remainder. Then store and dispose of according to local regulations.

▸ from ILO International Chemical Safety Cards (ICSC)

13.5.3 Cleanup Methods

On/in soil (solid): Construct barriers to convert or divert to impervious surface. Promptly shovel into steel containers.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.2 (1981)

▶ from HSDB

Soil, Liquid: Absorb small amounts of spill with sand, vermiculite or other inert absorbant material; Shovel into steel containers. May also remove material with vacuum equipment.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.2 (1981)

▶ from HSDB

Environment considerations - Land spill:: Dig a pit, pond, lagoon, or holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash of cement powder.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 823

▶ from HSDB

Environmental considerations - Water spill: Use natural barriers or oil spill control booms to limit spill travel. Neutralize with dilute acid.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 823

▶ from HSDB

Perlite and Cellosive WP3H (hydroxyethyl cellulose) have been tested and recommended for vapor suppression and/or containment of 50% sodium hydroxide solutions.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.91 (1981)

▶ from HSDB

Keep water away from release. Stop or control the leak, if this can be done without undue risk. Prompt cleanup and removal are necessary. Shovel into suitable dry container. Control runoff and isolate discharged material for proper disposal.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

▶ from HSDB

13.5.4 Disposal Methods

SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal and plant life; and conformance with environmental and public health regulations.

▶ from HSDB

Following neutralization either at the spill site or at a waste management facility, the resultant sludge can be disposed of in a secure landfill.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.92 (1981)

▸ from HSDB

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.

▸ from HSDB

Put into large vessel containing water. Neutralize with HCL /hydrochloric acid/. Discharge into the sewer with sufficient water. Recommendable methods: Neutralization & discharge to sewer. Peer review: Dilute greatly (< pH 9) before discharge. (Peer-review conclusions of an IRPTC expert consultation (May 1985))

United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations Environmental Programme, Dec. 1985., p. 280

▸ from HSDB

13.5.5 Preventive Measures

SRP: The scientific literature for the use of contact lenses by industrial workers is inconsistent. The benefits or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place.

▸ from HSDB

Nickel is the preferred metal for handling caustic soda at all concentrations and temperatures. However, the high cost and limited availability of nickel precludes its use for most applications. Mild steel is adequate for almost all caustic-handling applications. Plastics and plastic-lined steel are now available as construction materials. Fiberglass reinforced plastic tanks of Derakane vinyl ester resin are suitable for many applications. Polypropane is commonly used for lining pipe for protection against mechanical damage.

Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. 1:858

▸ from HSDB

Any dilutions of caustic from concentrations greater than 25% should be done cautiously.

Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. 1:849

▸ from HSDB

Personnel protection: Keep upwind. Avoid breathing vapors. ... Avoid bodily contact with the material.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 823

▸ from HSDB

If material not on fire and not involved in fire: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 823

▸ from HSDB

The worker should immediately wash the skin when it becomes contaminated.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Work clothing that becomes wet or significantly contaminated should be removed and replaced.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Local ventilation should be provided to reduce exposure levels to acceptable levels.

Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology. 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 773

▸ from HSDB

SRP: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. Ensure that the local ventilation moves the contaminant away from the worker.

▸ from HSDB

SRP: Contaminated protective clothing should be segregated in such a manner so that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. The completeness of the cleaning procedures should be considered before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at the end of shift, but should remain at employee's place of work for cleaning.

▸ from HSDB

13.6 Handling and Storage

13.6.1 Nonfire Spill Response

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. (ERG, 2016)

U.S. Department of Transportation, Transport Canada, and Secretariat of Communications and Transport of Mexico, with collaboration from Argentina's Centro de Información Química para Emergencias. 2016 Emergency Response Guidebook. ***https://www.phmsa.dot.gov/hazmat/outreach-training/erg*** *(accessed April 26, 2016).*

▸ from CAMEO Chemicals

13.6.2 Safe Storage

Separated from food and feedstuffs, strong acids and metals. Store only in original container. Dry. Well closed. Store in an area without drain or sewer access.

▸ from ILO International Chemical Safety Cards (ICSC)

13.6.3 Storage Conditions

CONTAINERS SHOULD BE STORED IN ROOMS WITH TRAPPED FLOOR DRAINS TOWARDS WHICH FLOORS SHOULD BE SLANTED. WHERE FLOOR DRAINS ARE NOT PROVIDED, CURBS OR DRAINED GUTTER, COVERED WITH ... GRILL, SHOULD BE CONSTRUCTED @ DOOR OPENINGS.

International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983., p. 116

▸ from HSDB

Volumetric sodium hydroxide soln used in laboratory must be protected from air to avoid formation of carbonate.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1485

▸ from HSDB

Store in a cool, dry, well-ventilated location. Separate from organic and oxidizing materials, acids, metal powders. Immediately remove and properly dispose of any spilled material.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

- from HSDB

13.7 Exposure Control and Personal Protection

13.7.1 Recommended Exposure Limit (REL)

REL-C (Ceiling)

2 mg/m^3

- from Occupational Safety and Health Administration (OSHA)

C 2 mg/m^3

- from The National Institute for Occupational Safety and Health (NIOSH)

13.7.2 Permissible Exposure Limit (PEL)

PEL-TWA (8-Hour Time Weighted Average)

2 mg/m^3

- from Occupational Safety and Health Administration (OSHA)

TWA 2 mg/m^3See Appendix G

- from The National Institute for Occupational Safety and Health (NIOSH)

13.7.3 Immediately Dangerous to Life or Health (IDLH)

IDLH

10 mg/m3 (NIOSH, 2016)

National Institute of Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards (full website version). ***https://www.cdc.gov/niosh/npg*** *(accessed August 2016).*

- from CAMEO Chemicals

10 mg/cu m

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

- from HSDB

10 mg/m^3

from Occupational Safety and Health Administration (OSHA)

10 mg/m^3

See: 1310732

from The National Institute for Occupational Safety and Health (NIOSH)

13.7.4 Threshold Limit Values (TLV)

Ceiling Limit: 2 mg/cu m.

American Conference of Governmental Industrial Hygienists; 2011 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices . Cincinnati, OH 2011, p. 53

from HSDB

Threshold Limit Values

2 mg/m3 (ceiling value)

from ILO International Chemical Safety Cards (ICSC)

TLV-C (Ceiling)

2 mg/m^3 [1992]

from Occupational Safety and Health Administration (OSHA)

13.7.5 Other Standards Regulations and Guidelines

Australia: 2 mg/cu m, peak limitation (1990); Federal Republic of Germany: 2 mg/cu m, short-term level 4 mg/cu m, 5 min, 8 times per shift (1990); Sweden: 2 mg/cu m ceiling (1990); United Kingdom: 10 min STEL 2 mg/cu m (1991)

American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 1417

from HSDB

Emergency Response Planning Guidlines (ERPGs) for sodium hydroxide: [See Table #1078]

American Industrial Hygiene Association. 2010 Emergency Response Planning Guidelines (ERPG) Workplace Environmental Exposure Level (WEEL). American Industrial Hygiene Association Guideline Foundation. Fairfax, VA 2010., p. 26

from HSDB

Table #1078

ERPG	Maximum Airborne Concentration

ERPG	Maximum Airborne Concentration
The ERPG-1: The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor.	0.5 mg/cu m
The ERPG-2: The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.	5 mg/cum
The ERPG-3: The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.	50 mg/cu m

▸ from HSDB

13.7.6 Inhalation Risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.7 Effects of Short Term Exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.8 Effects of Long Term Exposure

Repeated or prolonged contact with skin may cause dermatitis.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.9 Allowable Tolerances

Residues of sodium hydroxide are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: neutralizer. Limit: none.

*40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: **http://www.ecfr.gov***

▸ from HSDB

Residues of sodium hydroxide are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: neutralizer. Limit: none.

*40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: **http://www.ecfr.gov***

▸ from HSDB

13.7.10 Personal Protective Equipment (PPE)

Hazards from spills and leaks should be minimized by an adequate supply of water for washing-down. ... Adequate ventilation should be provided in areas where caustic ... soda mist or dust is present. ... For the protection of the eyes, safety goggles should be worn, as well as face shields, if complete face protection is necessary. Eyewash fountains and safety showers must be available at any location where eye and/or skin contact can occur. Protection against mist or dust of this compound can be provided by filter or dust-type respiratory protective equipment. ... Safety shoes ... are recommended.

International Labour Office. Encyclopedia of Occupational Health and Safety. Vols. I&II. Geneva, Switzerland: International Labour Office, 1983., p. 116

▸ from HSDB

Respirator selection: 100 mg/cu m: a) High-efficiency particulate respirator with a full facepiece, b) Supplied air respirator with a full facepiece, helmet, or hood. , c) Self-contained breathing apparatus with a full facepiece. 200 mg/cu m: a) Powered air-purifying respirator with a high-efficiency filter with a full facepiece, or b) Type C SA with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous- flow mode. . Escape: a) Dust and mist respirator, except single-use respirators with full facepiece, or b) Self-contained breathing apparatus with a full facepiece.

NIOSH; Pocket Guide to Chemical Hazards p.167 (1981) DHEW (NIOSH) Pub No. 78-210

▸ from HSDB

Sodium hydroxide: Chemical protective clothing composed of natural rubber, neoprene, nitrile, or styrene/butadiene (SBR)-coated fabric is highly recommended, having break through times greater than one hour. Butyl rubber, neoprene and SBR, polyethylene, chlorinated polyurethane, or polyvinyl alcohol may be used but data suggests break through times of approximately an hour or more.

ACGIH; Guidelines Select of Chem Protect Clothing Volume #1 Field Guide p.67 (1983)

▸ from HSDB

Sodium hydroxide, 30-70%: Chemical protective clothing composed of natural rubber, neoprene, nitrile, or polyvinyl chloride (PVC) is highly recommended, having break through times greater than one hour. Butyl rubber, nitrile/PVC, polyethylene, chlorinated polyethylene, or styrene/butadiene coated approximately an hour or more. Some data for polyvinyl alcohol (usually from immersion tests) suggest break through times greater than one hour are not likely.

ACGIH; Guidelines Select of Chem Protect Clothing Volume #1 Field Guide p.67 (1983)

▸ from HSDB

Wear appropriate personal protective clothing to prevent skin contact.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Wear appropriate eye protection to prevent eye contact.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance; this is irrespective of the recommendation involving the wearing of eye protection.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.]

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Respirator Recommendations: Up to 10 mg/cu m: [See Table #1075]

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Table #1075

Assigned Protection Factor (APF)	Respirator Recommendations
APF = 25	Any supplied-air respirator operated in a continuous-flow mode. Substance causes eye irritation or damage; eye protection needed.
APF = 50	Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
APF = 25	Any powered, air-purifying respirator with a high-efficiency particulate filter. Substance causes eye irritation or damage; eye protection needed.
APF = 50	Any self-contained breathing apparatus with a full facepiece.
APF = 50	Any supplied-air respirator with a full facepiece.

▸ from HSDB

Respirator Recommendations: Emergency or planned entry into unknown concentrations or IDLH conditions: [See Table #1076]

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Table #1076

Assigned Protection Factor (APF)	Respirator Recommendations
APF = 10,000	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
APF = 10,000	Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

▸ from HSDB

Respirator Recommendations: Escape: [See Table #1077]

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) Publication No. 2005-151 (2005)

▸ from HSDB

Table #1077

Assigned Protection Factor (APF)	Respirator Recommendations
APF = 50	Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Any appropriate escape-type, self-contained breathing apparatus.

▸ from HSDB

Emergency response personal protective equipment: wear special protective clothing and positive pressure self-contained breathing apparatus. Butyl rubber, natural rubber, Neoprene, nitrile rubber, polyethylene, polyvinyl chloride, Teflon, Viton, or Saranex barrier recommended.

National Fire Protection Association; Fire Protection Guide to Hazardous Materials. 14TH Edition, Quincy, MA 2010, p. 49-136

▸ from HSDB

(See protection codes)

Skin:Prevent skin contact - Wear appropriate personal protective clothing to prevent skin contact.

Eyes:Prevent eye contact - Wear appropriate eye protection to prevent eye contact.

Wash skin:When contaminated

Remove:When wet or contaminated

Change:Daily - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

Provide:Eyewash, Quick drench

▸ from The National Institute for Occupational Safety and Health (NIOSH)

13.7.11 Respirator Recommendations

NIOSH/OSHA

Up to 10 mg/m^3:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode/

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

Click here for information on selection of N, R, or P filters.

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

Click here for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

- from The National Institute for Occupational Safety and Health (NIOSH)

13.7.12 Fire Prevention

NO contact with water. NO contact with incompatible materials: See Chemical Dangers

- from ILO International Chemical Safety Cards (ICSC)

13.7.13 Exposure Prevention

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

- from ILO International Chemical Safety Cards (ICSC)

13.7.14 Inhalation Prevention

Use local exhaust or breathing protection.

- from ILO International Chemical Safety Cards (ICSC)

13.7.15 Skin Prevention

Protective gloves. Protective clothing.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.16 Eye Prevention

Wear face shield or eye protection in combination with breathing protection.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.17 Ingestion Prevention

Do not eat, drink, or smoke during work.

▸ from ILO International Chemical Safety Cards (ICSC)

13.7.18 Protective Equipment and Clothing

Wide-brimmed hat; safety goggles with rubber side shields; tight-fitting cotton clothing; rubber gloves under shirt cuffs; rubber boots and apron. (USCG, 1999)

U.S. Coast Guard. 1999. Chemical Hazard Response Information System (CHRIS) - Hazardous Chemical Data. Commandant Instruction 16465.12C. Washington, D.C.: U.S. Government Printing Office.

▸ from CAMEO Chemicals

Skin: Wear appropriate personal protective clothing to prevent skin contact. Eyes: Wear appropriate eye protection to prevent eye contact. Wash skin: The worker should immediately wash the skin when it becomes contaminated. Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced. Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. Provide: Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance; this is irrespective of the recommendation involving the wearing of eye protection. Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2016)

*National Institute of Occupational Safety and Health. NIOSH Pocket Guide to Chemical Hazards (full website version). **https://www.cdc.gov/niosh/npg** (accessed August 2016).*

▸ from CAMEO Chemicals

13.8 Stability and Reactivity

13.8.1 Air and Water Reactions

Slowly absorbs carbon dioxide from the air to give solid products as crusts or precipitates. Water soluble. Dilution with water liberates heat, possibly enough to cause local boiling and spattering.

from CAMEO Chemicals

Soluble in water. Dissolution can liberate enough heat to cause steaming and spattering and ignite adjacent combustible material [Haz. Chem. Data 1966].

from CAMEO Chemicals

13.8.2 Reactive Group

Bases, Strong

Water and Aqueous Solutions

from CAMEO Chemicals

Bases, Strong

from CAMEO Chemicals

13.8.3 Reactivity Alerts

Water-Reactive

from CAMEO Chemicals

13.8.1 CSL Reaction Information

CSL No	CSL00077
Reactants/Reagents	METHANOL; 5-METHYLISOXAZOLE; SODIUM HYDROXIDE
GHS Category	Explosive
Warning Message	potentially explosive
Source Reference	User-Reported
CSL Status	Approved
Modified Date	8/7/2018

from Pistoia Alliance Chemical Safety Library

CSL No	CSL00112
Reactants/Reagents	ACETONITRILE; SODIUM HYDROXIDE

Warning Message	Acetonitrile can be hydrolyzed exothermally in the presence of strong aqueous base, such as NaOH or KOH, starting at ~60oC. The reaction can potentially escalate into a runaway reaction if the generated heat is not removed (such as during a loss of cooling incident).
Source Reference	User-Reported
CSL Status	Approved
Modified Date	2/27/2018

▶ from Pistoia Alliance Chemical Safety Library

CSL No	CSL00125
Reactants/Reagents	FORMALDEHYDE; SODIUM HYDROXIDE
Reaction Class	oxidation
Function Group	ALDEHYDE
GHS Category	Explosive,Flammable
Warning Message	Formaldehyde, sodium hydroxide hazard
Source Reference	C&EN
CSL Status	Approved
Additional Info	solutions of organic acid sodium salts that contains residual formaldehyde, as result, they did generate hydrogen gas in a steady fashion, and if stored in a confined space, it would be possible to exceed the lower explosive limit
Modified Date	5/31/2018

▶ from Pistoia Alliance Chemical Safety Library

13.8.4 Reactivity Profile

SODIUM HYDROXIDE SOLUTION refers to an aqueous solution of sodium hydroxide. Strongly basic. Reacts rapidly and exothermically with organic and inorganic acids, with organic and inorganic acid anhydrides, including oxides of nonmetals such as sulfur dioxide, sulfur trioxide, phosphorus trioxide, phosphorus pentaoxide, and with organic and inorganic acid chlorides. May react explosively with maleic anhydride [MCA Case History 622 1960]. Attacks aluminum and zinc with evolution of hydrogen, a flammable gas. May initiate polymerization in polymerizable organic materials: a violent polymerization results if acetaldehyde contacts alkaline materials such as sodium hydroxide; an extremely violent polymerization results from contact of acrolein with alkaline materials such as sodium hydroxide [Chem. Safety Data Sheet SD-85 1961]. A violent explosion resulted when a quantity of pentol was accidentally brought in contact with a caustic cleaning solution chemically similar to aqueous sodium hydroxide [MCA Case History 363 1964]. Aqueous solutions of reducing sugars other than sucrose, when heated (above 84°C.), evolve toxic levels of carbon monoxide in the presence of alkalis or alkaline salts, such as sodium phosphate (also potassium hydroxide, sodium hydroxide, calcium hydroxide, etc.) [Bretherick 5th ed. 1995]. Hot and/or concentrated NaOH can cause hydroquinone to decompose exothermically at elevated temperature. (NFPA Pub. 491M, 1975, 385)

▶ from CAMEO Chemicals

SODIUM HYDROXIDE (Caustic Soda) is a strong base. Reacts rapidly and exothermically with acids, both organic and inorganic. Readily absorbs moisture from the air to give caustic semi-solids that attack aluminum and zinc with the evolution of flammable hydrogen gas. Catalyzes the polymerization of acetaldehyde and other polymerizable compounds; these reactions can occur violently, for example, acrolein polymerizes with extreme violence when put in contact with alkaline materials such as sodium hydroxide [Chem. Safety Data Sheet SD-85 1961]. Reacts with great violence with phosphorus pentaoxide when initiated by local heating [Mellor 8 Supp.3:406 1971].

Contact (as a drying agent) with tetrahydrofuran, which often contains peroxides, may be hazardous---explosions have occurred in such a use of the chemically similar potassium hydroxide [NSC Newsletter Chem. Soc. 1967]. Mixing with any of the following substances in a closed container caused the temperature and pressure to increase: glacial acetic acid, acetic anhydride, acrolein, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrochloric acid (36%), hydrofluoric acid (48.7%), nitric acid (70%), oleum, propiolactone, sulfuric acid (96%) [NFPA 1991]. Accidental contact between a caustic cleaning solution (probably containing sodium hydroxide) and Pentol caused a violent explosion. [MCA Case History 363(1964)]. Heating with a mixture of methyl alcohol and trichlorobenzene during an attempted synthesis led to a sudden increase in pressure and an explosion [MCA Guide for Safety Appendix 3 1972]. Hot and/or concentrated NaOH can cause hydroquinone to decompose exothermically at elevated temperature. (NFPA Pub. 491M, 1975, 385)

▸ from CAMEO Chemicals

13.9 Transport Information

13.9.1 DOT Emergency Guidelines

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Fire or Explosion: Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▸ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Health: TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▸ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Public Safety: CALL Emergency Response Telephone Number ... As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate enclosed areas. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▸ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Protective Clothing: Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▶ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Evacuation: ... Fire: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▶ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Fire: Small fires: Dry chemical, CO2 or water spray. Large fires: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire control water for later disposal; do not scatter the material. Fire involving tanks or car/trailer loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▶ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ Spill or Leak: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▶ from HSDB

/GUIDE 154: SUBSTANCES - TOXIC AND/OR CORROSIVE (NON-COMBUSTIBLE)/ First Aid: Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim warm and quiet. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. /Sodium hydroxide, bead; Sodium hydroxide, dry; Sodium hydroxide, flake; Sodium hydroxide, granular; Sodium hydroxide, solid; Sodium hydroxide solution/

U.S. Department of Transportation. 2008 Emergency Response Guidebook. Washington, D.C. 2008

▸ from HSDB

13.9.2 Shipment Methods and Regulations

No person may /transport,/ offer or accept a hazardous material for transportation in commerce unless that person is registered in conformance ... and the hazardous material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./

*49 CFR 171.2; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of November 22, 2011: **http://www.ecfr.gov***

▸ from HSDB

The International Air Transport Association (IATA) Dangerous Goods Regulations are published by the IATA Dangerous Goods Board pursuant to IATA Resolutions 618 and 619 and constitute a manual of industry carrier regulations to be followed by all IATA Member airlines when transporting hazardous materials.

International Air Transport Association. Dangerous Goods Regulations. 47th Edition. Montreal, Quebec Canada. 2006., p. 255

▸ from HSDB

The International Maritime Dangerous Goods Code lays down basic principles for transporting hazardous chemicals. Detailed recommendations for individual substances and a number of recommendations for good practice are included in the classes dealing with such substances. A general index of technical names has also been compiled. This index should always be consulted when attempting to locate the appropriate procedures to be used when shipping any substance or article.

International Maritime Organization. International Maritime Dangerous Goods Code. London, UK. 2004., p. 89

▸ from HSDB

13.9.3 DOT ID and Guide

1823 154

▸ from DOT Emergency Response Guidebook

1823 154(dry, solid)

1824 154(solution)

▸ from The National Institute for Occupational Safety and Health (NIOSH)

13.9.4 DOT Label

Corrosive

▸ from CAMEO Chemicals

13.9.5 Packaging and Labelling

Do not transport with food and feedstuffs.

- from ILO International Chemical Safety Cards (ICSC)

13.9.6 EC Classification

Symbol: C; R: 35; S: (1/2)-26-37/39-45

- from ILO International Chemical Safety Cards (ICSC)

13.9.7 UN Classification

UN Hazard Class: 8; UN Pack Group: II

- from ILO International Chemical Safety Cards (ICSC)

13.10 Regulatory Information

13.10.1 Clean Water Act Requirements

Sodium hydroxide is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

40 CFR 116.4 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: http://www.ecfr.gov

- from HSDB

13.10.2 CERCLA Reportable Quantities

Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 1000 lb or 454 kg. The toll free number of the NRC is (800) 424-8802. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV.D.3.b).

40 CFR 302.4 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: http://www.ecfr.gov

- from HSDB

13.10.3 FIFRA Requirements

Residues of sodium hydroxide are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. Use: neutralizer. Limit: none.

40 CFR 180.910 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: ***http://www.ecfr.gov***

▸ from HSDB

Residues of sodium hydroxide are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. Use: neutralizer. Limit: none.

40 CFR 180.930 (USEPA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: ***http://www.ecfr.gov***

▸ from HSDB

The Agency has completed its review of all available information, and has determined that the data are sufficient to support reregistration of products containing sodium hydroxide. ... The Agency therefore finds that products containing sodium hydroxide as an active ingredient are eligible for reregistration. ... Although the Agency has found that certain products containing sodium hydroxide are eligible for registration, it should be understood that the Agency may take appropriate regulatory action, and/or require the submission of additional data to support the registration of products containing sodium hydroxide, if new information comes to the Agency's attention or if the data requirements for reregistration (or the guidelines for generating such data) change.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Sodium Hydroxide p.9 (September 1992). Available from, as of October 10, 2011: ***http://www.epa.gov/pesticides/reregistration/status.htm***

▸ from HSDB

As the federal pesticide law FIFRA directs, EPA is conducting a comprehensive review of older pesticides to consider their health and environmental effects and make decisions about their continued use. Under this pesticide reregistration program, EPA examines newer health and safety data for pesticide active ingredients initially registered before November 1, 1984, and determines whether the use of the pesticide does not pose unreasonable risk in accordance to newer saftey standards, such as those described in the Food Quality Protection Act of 1996. Pesticides for which EPA had not issued Registration Standards prior to the effective date of FIFRA '88 were divided into three lists based upon their potential for human exposure and other factors, with List B containing pesticides of greater concern than those on List C, and with List C containing pesticides of greater concern than those on List D. Sodium hydroxide is found on List D. Case No: 4065; Pesticide type: fungicide, herbicide, antimicrobial; Case Status: RED Approved 09/92; OPP has made a decision that some/all uses of the pesticide are eligible for reregistration, as reflected in a Reregistration Eligibility Decision (RED) document .; Active ingredient (AI): sodium hydroxide; Data Call-in (DCI) Date(s): 09/30/92; AI Status: OPP has completed a Reregistration Eligibility Decision (RED) document for the case/AI.

United States Environmental Protection Agency/ Prevention, Pesticides and Toxic Substances; Status of Pesticides in Registration, Reregistration, and Special Review. (1998) EPA 738-R-98-002, p. 326

▸ from HSDB

13.10.4 FDA Requirements

Substance added directly to human food affirmed as generally recognized as safe (GRAS).

21 CFR 184.1763 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: ***http://www.ecfr.gov***

▸ from HSDB

Sodium hydroxide used as a general purpose food additive in animal drugs, feeds, and related products is generally recognized as safe when used in accordance with good manufacturing or feeding practice.

*21 CFR 582.1763 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of October 9, 2011: **http://www.ecfr.gov***

▸ from HSDB

13.11 Other Safety Information

13.11.1 Other Hazardous Reactions

Corrosion is a problem at temperatures above 60 degrees C, therefore, the use of steel for caustic-handling is not recommended at elevated temperatures. Stress cracking may also occur when caustic soda solution concentrations exceed 20% at temperatures in excess of 60 degrees C.

Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. 1:859

▸ from HSDB

13.11.2 History and Incidents

This article reports a chemical burn incident that occurred on August 7th, 2005, when a Matsa typhoon hit Shanghai, China. This is the largest chemical burn incident reported in the literature for 20 years in China, involving 118 alkali burn patients who were rescued by the Burn Department of Shanghai Changhai Hospital independently.The scene of the incident was investigated, and the clinical, emergency and hospitalized data of the patients were summarized.The main injurious chemical was a water solution of sodium hydroxide and ammonium chloride. The 118 victims were mostly young men with 5%TBSA deep thickness burn of both lower extremities, including 31 patients who had additional light coughing. Of 58 patients who were finally hospitalized, 42 patients received surgical treatment. Most of these patients recovered within 1 month. There were no deaths. ...

Ma B et al; Burns. 33 (5): 565-71 (2007)

PMID:17513055

▸ from HSDB

Over a six-month period, the New Jersey Poison Information System received 61 calls related to exposures to alkaline corrosives. Seven of these calls related to a new oven-cleaner product, oven-cleaner pads. These pads are sealed in a protective plastic wrap and contain lye in excess of 5%. ... Five of the callers sustained injuries from their exposure, and three of these sustained burns, one in the oral cavity and one in the eye. None suffered permanent sequelae, but the potential for such is considerable. The method of application, concn of base, and prolonged exposure to a widely covered area may make this product particularly hazardous. /Alkaline corrosives/

Vilogi J et al; Am J Emerg Med 3 (5): 412-4 (1985)

PMID:4041192

▸ from HSDB

13.11.3 Special Reports

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) (1981)

- from HSDB

NIOSH; Criteria Document: Sodium Hydroxide (1975) DHEW Pub. NIOSH 76-105

- from HSDB

14 Toxicity

14.1 Toxicological Information

14.1.1 NIOSH Toxicity Data

- from The National Institute for Occupational Safety and Health (NIOSH)

14.1.2 Evidence for Carcinogenicity

Not listed

- from Occupational Safety and Health Administration (OSHA)

14.1.3 Health Effects

Health Effect Code(s)

HE4 - Acute Toxicity---Short-term high risk effects

HE14 - Irritation-Eyes, Nose, Throat, Skin---Marked

▸ from Occupational Safety and Health Administration (OSHA)

14.1.4 Exposure Routes

Serious local effects by all routes of exposure.

▸ from ILO International Chemical Safety Cards (ICSC)

inhalation, ingestion, skin and/or eye contact

▸ from The National Institute for Occupational Safety and Health (NIOSH)

14.1.5 Symptoms

irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair

▸ from The National Institute for Occupational Safety and Health (NIOSH)

14.1.6 Inhalation Symptoms

Cough. Sore throat. Burning sensation. Shortness of breath.

▸ from ILO International Chemical Safety Cards (ICSC)

14.1.7 Skin Symptoms

Redness. Pain. Serious skin burns. Blisters.

▸ from ILO International Chemical Safety Cards (ICSC)

14.1.8 Eye Symptoms

Redness. Pain. Blurred vision. Severe burns.

▸ from ILO International Chemical Safety Cards (ICSC)

14.1.9 Ingestion Symptoms

Abdominal pain. Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Shock or collapse.

▸ from ILO International Chemical Safety Cards (ICSC)

14.1.10 Target Organs

Eyes, skin, respiratory system

▸ from The National Institute for Occupational Safety and Health (NIOSH)

14.1.11 Acute Effects

▸ from ChemIDplus

14.1.12 Interactions

An experimental study was conducted to investigate the effects of erythropoietin on the acute phase of esophageal burn damage induced by sodium hydroxide. A standard esophageal alkaline burn was produced by the application of 10% sodium hydroxide to the distal esophagus in an in vivo rat model. Fifty-six female rats were allocated into three groups: Group BC (baseline control, n = 8) rats were uninjured and untreated, Group PC (positive control, n = 24) rats were injured but untreated and Group EPO (erythropoietin-treated, n = 24) rats were injured and given subcutaneous erythropoietin (1,000 IU/kg per day), 15 min, 24, and 48 hr after administration of the NaOH solution. Six animals from Group PC and six from Group EPO were killed at 4, 24, 48, and 72 hr after application of NaOH to the esophagus. All of animals in Group BC were killed 4 hr after exposure to 0.9% NaCl. Oxidative damage was assessed by measuring levels of malondialdehyde (MDA) and nitric oxide (NO), and activities of superoxide dismutase (SOD) and catalase (CAT) in homogenized samples of esophageal tissue. Histologic damage to esophageal tissue was scored by a single pathologist blind to groups. MDA levels in the BC and EPO groups were significantly lower than those in the PC group ($p < 0.05$). CAT and SOD activities, and NO levels in the BC and EPO groups were significantly higher than in the PC group ($p < 0.05$). Esophageal tissue damage measured at 4, 24, 48, and 72 hr after NaOH application was significantly less in the EPO group than in the PC group ($p < 0.05$). When administered early after an esophageal burn induced by 10% sodium hydroxide in this rat model, erythropoietin significantly attenuated oxidative damage, as measured by biochemical markers and histologic scoring.

Bakan V et al; Pediatr Surg Int. 26 (2): 195-201 (2010)

PMID:19760200

▸ from HSDB

SRP4: Interacts with acid salts to form bases.

▸ from HSDB

... Esophageal burns were induced in male rats by the administration of 10% sodium hydroxide. Lipid peroxidation (LPO) products were then measured at the following times: 0, 1, 6, 24, 48 and 72 hr after treatment. Tissue hydroxyproline (HP) concentrations in the injured area were assessed at 14 days after the administration of sodium hydroxide. The groups received either systemic melatonin or normal saline. There were two, non-ischemic, sham control groups treated with or without melatonin. LPO products, malondialdehyde (MDA) and 4-hydroxyalkenal (4-HDA), increased immediately after the administration of sodium hydroxide; this indicates the participation of free radicals in the development of damage. Melatonin diminished the oxidative response and the amount of HP in the late phase of the lesion. Melatonin reduced oxidative damage in the early phase of the esophageal burns induced by sodium hydroxide.

Larios-Arceo F et al; J Pineal Res. 45 (2): 219-23 (2008)

PMID:18373556

▸ from HSDB

/SRP: Experimental/ The gastric damaging effects of necrotizing concn of sodium hydroxide were strongly reduced by paracetamol. ... Paracetamol might be protective by stimulating the biosynthesis of prostaglandins in the stomach wall.

Van Kolfschoten AA et al; Toxicol Appl Pharmacol 69 (1): 37-42 (1983

▸ from HSDB

PROTECTION AGAINST DAMAGE FROM LOCALLY APPLIED SODIUM HYDROXIDE HAS BEEN SHOWN TO BE POSSIBLE UNDER EXPTL CONDITIONS IN RABBIT CORNEAS BY INJECTION OF ANIMAL'S SERUM INTO CORNEA TO INCR ITS LOCAL BUFFERING CAPACITY.

Grant, W. M. Toxicology of the Eye. 2nd ed. Springfield, Illinois: Charles C. Thomas, 1974., p. 931

▸ from HSDB

Immediate first aid: Remove patient from contact with the material. Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Inorganic Bases/Alkaline Corrosives and Related Compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 191

▸ from HSDB

14.1.13 Toxicity Summary

Human poisoning cases indicate that a dose of 10 grams orally is fatal [L1970]. Sodium hydroxide is toxic by oral ingestion [L1965]. Sodium hydroxide is corrosive to all tissues. Concentrated vapors lead to serious damage to the eyes and respiratory system. Oral ingestion of sodium hydroxide, which occurs frequently in children, causes severe tissue necrosis, with stricture formation of the esophagus, often resulting in death. Contact with the skin may result in contact dermatitis, hair loss, as well as necrosis due to severe irritation [L1972]. Increased incidence of esophageal carcinoma after severe intoxication with sodium hydroxide has been reported in man. In animal studies, long-term dermal contact with substances leading to pH changes in the skin causes the development of tumors, as a result of severe tissue irritation and reparative cell growth [L1977]. Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes [MSDS]. Tumors are not to be expected if the effects of irritation are prevented [L1977]. To date, there are no relevant studies of the prenatal toxic effects of sodium hydroxide [L1977].

▸ from DrugBank

14.1.14 Antidote and Emergency Treatment

/EXPERIMENTAL/ An experimental study was conducted to investigate the effects of erythropoietin on the acute phase of esophageal burn damage induced by sodium hydroxide. A standard esophageal alkaline burn was produced by the application of 10% sodium hydroxide to the distal esophagus in an in vivo rat model. Fifty-six female rats were allocated into three groups: Group BC (baseline control, n = 8) rats were uninjured and untreated, Group PC (positive control, n = 24) rats were injured but untreated and Group EPO (erythropoietin-treated, n = 24) rats were injured and given subcutaneous erythropoietin (1,000 IU/kg per day), 15 min, 24, and 48 hr after administration of the NaOH solution. Six animals from Group PC and six from Group EPO were killed at 4, 24, 48, and 72 hr after application of NaOH to the esophagus. All of animals in Group BC were killed 4 hr after exposure to 0.9% NaCl. Oxidative damage was assessed by measuring levels of malondialdehyde (MDA) and nitric oxide (NO), and activities of superoxide dismutase (SOD) and catalase (CAT) in homogenized samples of esophageal tissue. Histologic damage to esophageal tissue was scored by a single pathologist blind to groups. MDA levels in the BC and EPO groups were significantly lower than those in the PC group ($p < 0.05$). CAT and SOD activities, and NO levels in the BC and EPO groups were significantly higher than in the PC group ($p < 0.05$). Esophageal tissue damage measured at 4, 24, 48, and 72 hr after NaOH application was significantly less in the EPO group than in the PC group ($p < 0.05$). When administered early after an esophageal burn induced by 10% sodium hydroxide in this rat model, erythropoietin significantly attenuated oxidative damage, as measured by biochemical markers and histologic scoring.

Bakan V et al; Pediatr Surg Int. 26 (2): 195-201 (2010)

PMID:19760200

▸ from HSDB

/EXPERIMENTAL/ ... Esophageal burns were induced in male rats by the administration of 10% sodium hydroxide. Lipid peroxidation (LPO) products were then measured at the following times: 0, 1, 6, 24, 48 and 72 hr after treatment. Tissue hydroxyproline (HP) concentrations in the injured area were assessed at 14 days after the administration of sodium hydroxide. The groups received either systemic melatonin or normal saline. There were two, non-ischemic, sham control groups treated with or without melatonin. LPO products, malondialdehyde (MDA) and 4-hydroxyalkenal (4-HDA), increased immediately after the administration of sodium hydroxide; this indicates the participation of free radicals in the development of damage. Melatonin diminished the oxidative response and the amount of HP in the late phase of the lesion. Melatonin reduced oxidative damage in the early phase of the esophageal burns induced by sodium hydroxide.

Larios-Arceo F et al; J Pineal Res. 45 (2): 219-23 (2008)

PMID:18373556

▸ from HSDB

When caustic soda comes into contact with the skin it does not usually cause immediate pain, but it does start to cause immediate damage. It fails to coagulate protein which would serve to prevent further penetration. Thus, upon contact with eyes, washing with water must be started within 10 seconds and continued for at least 15 minutes to prevent permanent injury. Following contact with skin, washing with water must be started immediately to prevent corrosive chemical burns.

Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. 1:861

▸ from HSDB

/SRP: Experimental/ Alkali-burned corneas were treated with 2% ascorbic acid. Topical applications and subconjunctival injections were given for 32 days. Treatment with ascorbic acid significantly decreased the incidence of corneal ulcerations and perforations compared to the control group that received the vehicle. These results confirm previous studies and strongly suggest that ascorbic acid presents a potential for use in the alkali-burned human eye.

Pertoutsos G and Pouliguen Y; Ophthalmic Res 16 (4): 185-89 (1984)

PMID:6472797

▸ from HSDB

/SRP: Experimental/ ... The effect of cimetidine administered intraperitoneally in doses of 2.5, 10, and 50 mg/kg, on: (1) The gastric acid secretory responses in 1 and 4 hr pylorous-ligated rats, and (2) the rat gastric mucosal lesions induced by intragastric administration of ... 0.2 M NaOH ... is discussed. It was found that ... all doses of cimetidine significantly prevented the gastric lesion development induced by different necrotizing agents ... (0.2 M NaOH). The cytoprotecting dose of cimetidine was of 2.5 mg/kg. The duration of cimetidine-induced cytoprotection was 1 hr long before the administration of the necrotizing agent. These results suggest a real cimetidine-induced gastric cytoprotection.

Mor'on F et al; Arch Int Pharmacodyn Ther 265 (2): 309-19 (1983)

PMID:6651413

▸ from HSDB

/SRP: Experimental/ An experimental study on morniflumate, the beta-morpholinoethyl ester of niflumic acid, was undertaken in the rat to test its gastroprotective and "cytoprotective" properties and to assess its effects on gastric secretion and on the prostaglandin contents in the stomach wall. Morniflumate induced intense anad usually dose-dependent inhibition of the ... gastric necrotic lesions caused by ... NaOH 0.2 mol/l. ... Morniflumate also exerted marked inhibition of gastric acid secretion both in normal and in pylorus-ligated rats. The compound raised the concn of "cytoprotective" prostaglandins in the glandular portion of the stomach but did not reverse the synthesis-block effect of the ulcerogenic nonsteroidal anti-inflammatory drugs whose gastric effects it inhibited.

Schiantarelli P et al; Arzneimittelforsch 34 (8): 885-90 (1984)

PMID:6333880

▸ from HSDB

/SRP: Experimental/ The gastric damaging effects of necrotizing concn of sodium hydroxide were strongly reduced by paracetamol. ... Paracetamol might be protective by stimulating the biosynthesis of prostaglandins in the stomach wall.

Van Kolfschoten AA et al; Toxicol Appl Pharmacol 69 (1): 37-42 (1983

▸ from HSDB

PROTECTION AGAINST DAMAGE FROM LOCALLY APPLIED SODIUM HYDROXIDE HAS BEEN SHOWN TO BE POSSIBLE UNDER EXPTL CONDITIONS IN RABBIT CORNEAS BY INJECTION OF ANIMAL'S SERUM INTO CORNEA TO INCR ITS LOCAL BUFFERING CAPACITY.

Grant, W. M. Toxicology of the Eye. 2nd ed. Springfield, Illinois: Charles C. Thomas, 1974., p. 931

▶ from HSDB

Immediate first aid: Remove patient from contact with the material. Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Inorganic Bases/Alkaline Corrosives and Related Compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 191

▶ from HSDB

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 6 to 12 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport ... . Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patent can swallow, has a strong gag reflex, and does not drool ... . Do not attempt to neutralize. Cover skin burns with dry sterile dressings after decontamination ... . /Inorganic Bases/Alkaline Corrosives and Related Compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 191-2

▶ from HSDB

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Early intubation, at the first signs of upper airway obstruction, may be necessary. Positive-pressure ventilation techniques with a bag valve mask device may be beneficial. Consider drug therapy for pulmonary edema ... . Monitor cardiac rhythm and treat arrhythmias as necessary ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) or lactated Ringer's (LR) if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Inorganic Bases/Alkaline Corrosives and Related Compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 192

▶ from HSDB

14.1.15 Medical Surveillance

The skin, eyes, and respiratory tract should receive special attention in any placement or periodic examination. NIOSH recommends that workers subject to sodium hydroxide exposure have comprehensive preplacement medical examinations. Medical examinations shall be made available promptly to all workers with signs or symptoms of skin, eye, or upper respiratory tract irritation resulting from exposure to sodium hydoxide.

Sittig M; Handbook of Toxic and Hazardous Chemicals p.606 (1981)

▶ from HSDB

14.1.16 Human Toxicity Excerpts

/HUMAN EXPOSURE STUDIES/ ... Esophageal motor function in 21 children (7.5 +/- 2.9 years) with caustic strictures /was assessed/. /All patients had ingested sodium hydroxide./ Esophageal manometry was performed using a water-infusion system interfaced with a polygraph and displayed on a computer screen. The data were compared with those obtained from 9 healthy children. Radionuclide transit was determined by studying deglutition of a single bolus of (99m)Tc-pertechnetate in 10 mL of water. Non-peristaltic low-amplitude and long-duration waves were the most common findings detected in patients with strictures longer than 20% of esophageal length (N = 11). Compared with the control group, these patients presented lower mean amplitude and longer mean duration of waves (24.4 +/- 11.2 vs 97.9 +/- 23.7 mmHg, $P < 0.05$, and 6.7 +/- 2.4 vs 1.6 +/- 0.1 s, $P < 0.05$, respectively). Six patients presented low-amplitude waves just below the constricted site. Ten children presented delayed esophageal transit. There was an association between dysphagia and abnormalities on manometry ($P = 0.02$) and between symptoms and scintigraphy data ($P = 0.01$). Dysphagia in caustic strictures is due to esophageal motility abnormalities, which are closely related to the scarred segment.

Da-Costa-Pinto EA et al; Braz J Med Biol Res. 37 (11): 1623-30 (2004)

PMID:15517076

▸ from HSDB

/HUMAN EXPOSURE STUDIES/ ... The irritant effects and barrier disruption properties of ... sodium hydroxide (NaOH), particularly in combination with an anionic detergent, sodium lauryl sulphate (SLS) /were quantified/. In a tandem repeated irritation test, the irritants were applied for 30 min twice daily for 4 days to the skin of the mid-back of 19 healthy volunteers of both sexes. ... Used bioengineering techniques for measurement of transepidermal water loss (TEWL) and skin colour reflectance, as well as visual scoring. ... NaOH induced a strong reaction when applied occlusively and nonocclusively as well as in combination with SLS, with an early onset of the inflammatory signs, leading to discontinuation of the application on the third day in most of the test fields. Notably, the irritant effect of NaOH was not as marked when applied sequentially with SLS.

Fluhr JW et al; Br J Dermatol. 151 (5): 1039-48 (2004)

PMID:15541082

▸ from HSDB

/HUMAN EXPOSURE STUDIES/ A human skin irritation test with 0.5 % NaOH was performed using exposure periods of 15, 30 and 60 min. The treatment sites were assessed 24, 48 and 72 hr after patch removal. The results showed that after a maximum exposure of 60 min, 61 % of the volunteers (20 of 33) showed a positive skin irritation reaction.

*Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.14 (March 2002). Available from, as of October 4, 2011: **http://www.inchem.org/pages/sids.html***

▸ from HSDB

/HUMAN EXPOSURE STUDIES/ A NaOH concentration of 0.5 % was tested within an interlaboratory evaluation of a human patch test for the identification of skin irritation hazard /after 1 hr exposure/. A 25 mm Plain Hill Top Chamber containing a Webril pad was used and the treatment sites were assessed for irritation using a four-point scale at 24, 48 and 72 hr after initiation of exposure. NaOH 0.5 % was irritating for 55 % of the volunteers.

*Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.14 (March 2002). Available from, as of October 4, 2011: **http://www.inchem.org/pages/sids.html***

▸ from HSDB

/HUMAN EXPOSURE STUDIES/ Four different patch systems, Finn chamber, Hill Top patch, Van der Bend chamber and Webril patch, were used to determine the skin irritation response of 1 % NaOH. Webril and Hill top patches generated the greatest levels of response. Eleven of 14 and 5 of 14 volunteers showed a positive skin reaction after 30 minutes for Webril and Hill top patches, respectively. With Finn and Van der Bend chambers 5 of 14 and 7 of 14 volunteers showed a positive reaction after 4 hr, respectively, which shows that the reactivity was reduced with these systems.

Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.14 (March 2002). Available from, as of October 4, 2011: ***http://www.inchem.org/pages/sids.html***

▸ from HSDB

/SIGNS AND SYMPTOMS/ Caustic dusts are irritating to the upper respiratory system. ... prolonged exposure to high concentrations may cause discomfort and ulceration of nasal passages. /caustic dusts/

American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 1417

▸ from HSDB

/SIGNS AND SYMPTOMS/ SYMPTOMATOLOGY: INGESTION OF LYE CAUSES SWALLOWING TO BECOME PAINFUL & DIFFICULT ALMOST IMMEDIATELY. BURNING PAIN EXTENDS DOWN ESOPHAGUS TO STOMACH. CONTAMINATED AREAS OF LIPS, CHIN, TONGUE, & PHARYNX BECOME EDEMATOUS & COVERED WITH EXUDATE. PROFUSE SALIVATION. BECAUSE OF PHARYNGEAL AND ESOPHAGEAL EDEMA, IT MAY BECOME IMPOSSIBLE AFTER A FEW HOURS TO SWALLOW EVEN SALIVA. MUCOUS MEMBRANES ARE AT FIRST WHITE BUT LATER BROWN, EDEMATOUS, GELATINOUS, AND NECROTIC. VOMITUS IS THICK AND SLIMY DUE TO MUCUS; LATER IT MAY CONTAIN BLOOD AND SHREDS OF MUCOUS MEMBRANE. PULSE ... RAPID & FEEBLE; RESPIRATIONS ... FAST & SHALLOW; SKIN IS COLD & CLAMMY; COLLAPSE ENSUES. DEATH DUE TO SHOCK, ASPHYXIA FROM GLOTTIC EDEMA OR INTERCURRENT INFECTION (PNEUMONIA) COMMONLY OCCURS ON 2ND OR ... 3RD DAY. ASPIRATION PNEUMONITIS ... DESCRIBED. CONVALESCENCE MAY BE INTERRUPTED DURING FIRST WEEK BY ESOPHAGEAL PERFORATION OR PERHAPS EVEN GASTRIC PERFORATION. MEDIASTINITIS MAY PRESENT AS SEVERE SUBSTERNAL PAIN WITH FEVER. IF COMPLICATIONS DO NOT APPEAR, LIQUID AND SOFT FOOD CAN BE SWALLOWED WITH COMPARATIVE EASE WITHIN 5 TO 7 DAYS. WITHIN 5 TO 7 DAYS. ... IN MOST CASES THIS ABSENCE OF DISTRESS MARKS LATENT PERIOD AND THAT ESOPHAGEAL STRICTURES WILL DEVELOP WITHIN WEEKS OR MONTHS UNLESS EFFECTIVE TREATMENT IS INSTITUTED. /LYE/

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-66

▸ from HSDB

/SIGNS AND SYMPTOMS/ Skin contact; Levels of toxic effect: (1) There is not necessarily an immediate sensation of irritation or pain. (2) Primary irritant dermatitis. (3) Multiple small burns with temporary loss of hair. (4) Deterioration of keratin material. (5) Intracellular edema. (6) Severe burns, corrosion of tissue, and deep ulcerations.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.81 (1981)

▸ from HSDB

/SIGNS AND SYMPTOMS/ Contact with the eyes causes disintegration and sloughing of conjunctival and corneal epithelium, corneal opacification, marked edema, and ulceration; After 7 to 13 days either gradual recovery begins, or there is progression of ulceration and corneal opacification. Complications of severe eye burns are symblepharon (adhesion of the lid to the eyeball) with overgrowth of the cornea by a vascularized membrane, progressive or recurrent corneal ulceration, and permanent corneal opacification.

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2

▸ from HSDB

/SIGNS AND SYMPTOMS/ On the skin, solutions of about 25 to 50% cause the sensation of irritation within about 3 minutes; With solutions of 4% /NaOH/ this does not occur until after several hours. If not removed from the skin, severe burns with deep ulceration will occur; Exposure to the dust or mist may cause multiple small burns, with temporary loss of hair.

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2

▸ from HSDB

/CASE REPORTS/ ... /The study/ present the case of an elderly woman with dementia who developed severe alkaline tongue burn and edema after unintentional short contact with solid sodium hydroxide drain cleaner. ...

Yanturali S et al; Vet Hum Toxicol. 46 (6): 319-21 (2004)

PMID:15587249

▸ from HSDB

/CASE REPORTS/ A 31 year man had sodium hydroxide blown into his amblyopic left eye after an explosion caused by placing solid sodium hydroxide into a plugged drain. He washed the eye immediately in a shower and arrived at hospital within 5 minutes. On examination the cornea was opaque and the lower two thirds of the conjunctiva were ischemic. Topical irrigation was repeated and he was transferred to the operating room where intraocular irrigation was commenced. About 100-120 mL of Ringer's solution was used in this procedure over 90 minutes. At this time the cornea was slightly clearer. Methylprednisolone was given by retobulbar and subconjunctival injection. Continuous slow topical irrigation was continued for a further 24 hours. On the first post-operative day visual acuity was present to light, intraocular pressure was high and a cataract was present. Topical antibiotics, systemic and topical corticosteroids and carbonic anhydrase inhibitors were given. Two weeks after the injury aspiration-irrigation of the cataract was undertaken with an improvement in visual acuity. Acetylcysteine drops were used and a soft contact lens was put in place. He was discharged three weeks after the injury but returned three days later with severe pain, hypopyon and hyphema. The cornea ulcerated and perforated 27 days after the injury. The perforation was repaired with a corneoscleral free hand graft. Despite the presence of light perception the eye was enucleated at the patient's request 70 days after the injury.

IPCS; UK Poisons Information Document: Sodium Hydroxide (1310-73-2). Available from, as of October 5, 2011:
http://www.inchem.org/documents/ukpids/ukpids/ukpid26.htm

▸ from HSDB

/CASE REPORTS/ A 20 year old patient presented 2 hours after accidentally spraying herself in the face with an oven cleaner containing 4% sodium hydroxide. She had removed the excess liquid but did not irrigate the area. She did not experience any pain until nearly 2 hours later. On examination she was in moderate distress with no ocular involvement. The right side of her face was erythematous and blistering in a serpiginous pattern extending from the infraorbital rim to the body and angle of her mandible. The area of the right cheek had a bronze discoloration. The body surface area involved was about 2%. The area was irrigated for 60 minutes. Despite this the burn continued to show signs of third degree burn involvement. She was transferred to a burns unit and underwent surgical debridement and skin graft. Follow up six weeks later revealed good healing and no complications.

IPCS; UK Poisons Information Document: Sodium Hydroxide (1310-73-2). Available from, as of October 5, 2011:
http://www.inchem.org/documents/ukpids/ukpids/ukpid26.htm

▸ from HSDB

/CASE REPORTS/ A 14 year old boy took a sodium hydroxide solution (30%) in to his mouth. He immediately spat it out. He drank some milk and water and vomited. On arrival about 30 minutes later he had retrosternal pain and had difficulty swallowing. He was given antibiotics and steroids. Esophagoscopy was performed two days later and revealed mucosal lesions in the upper esophagus. He began to improve and was able to take mashed food orally. He then began to develop difficulty in swallowing and a X-ray on day 23 revealed a stricture at the level of the carina of trachea. On the 38th day esophagoscopy with dilatation of the stricture was performed. About 2 hr later he suffered immediate retrosternal pain. An X-ray showed perforation of the stricture. This was sewn up via a left side thoracotomy. Serious inflammatory changes were observed with mediastinal emphysema and a purulent pleuritis. A nasogastric tube and three drains were left in place. On the 44th day after ingestion profuse bleeding was observed through the nasogastric tube and drains were noted. He became shocked and the decision was made to operate. He suffered a cardiac arrest while general anaesthetic was being given. A right side thoracotomy showed a 4-5 mm rupture of the descending part of the aorta with bleeding into the left pleura. After cardiac massage, blood transfusion and repair of the rupture he stabilized. Part of the esophagus was removed due to inflammation. On day 52 another hemorrhage occurred. He was operated on again and the hemorrhage was seen to arise from the aortic rupture. The aorta wall was fragile and could not be repaired. The patient died on the operating table. A purulent mediastinitis, bilateral purulent pleuritis, lung atalectasis and pericarditis were observed at postmortem.

IPCS; UK Poisons Information Document: Sodium Hydroxide (1310-73-2). Available from, as of October 5, 2011: ***http://www.inchem.org/documents/ukpids/ukpids/ukpid26.htm***

▸ from HSDB

/CASE REPORTS/ A 16 month old female refused to drink and began drooling after ingesting the residue of a sodium hydroxide solution which the mother had been using for cleaning. She vomited several times with the vomitus containing a small amount of blood. The pharynx was red and there was slight bleeding of the upper gums. The chest was initially clear but 90 minutes after admission inspiratory and expiratory wheezes were present and a chest X-ray suggested aspiration pneumonia. At 15 hours post-ingestion laryngoscopy and esophagoscopy were performed. The false cords and epiglottis were found to be red and edematous. The cricopharyngeus was ulcerated and bleeding. The esophageal mucosa was bleeding and circumferential second and third degree burns were present. The child required intubation and ventilation and was started on methylprednisolone and ampicillin. Ventilatory support was necessary for three weeks. Subsequent laryngoscopy revealed laryngeal edema and burns which resulted in laryngeal stenosis. An esophagoscopy at five weeks post-ingestion revealed esophageal narrowing. A barium swallow showed multiple esophageal strictures and hypoperistalsis of the proximal segment of the esophagus. The child required nine esophageal dilatations, and was eventually able to take oral feedings. She was discharged one year after the ingestion.

IPCS; UK Poisons Information Document: Sodium Hydroxide (1310-73-2). Available from, as of October 5, 2011: ***http://www.inchem.org/documents/ukpids/ukpids/ukpid26.htm***

▸ from HSDB

/CASE REPORTS/ A 42-year-old female swallowed approximately 30 mL of 16 % NaOH in a suicide attempt. This resulted in a 9 cm stricture of the esophagus which was treated by gastric antral patch esophagoplasty.

Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.13 (March 2002). Available from, as of October 4, 2011: ***http://www.inchem.org/pages/sids.html***

▸ from HSDB

/CASE REPORTS/ ... 9 cases of liquid NaOH ingestion which resulted in esophageal and gastric injury. One person who ingested 10 g NaOH in water suffered transmural necrosis of the esophagus and stomach and died 3 days after admission to the hospital.

*Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.13 (March 2002). Available from, as of October 4, 2011: **http://www.inchem.org/pages/sids.html***

▸ from HSDB

/CASE REPORTS/ A fatal burn due to dermal NaOH exposure of a worker at an aluminum plant has been reported. He was found lying in a shallow pool of concentrated NaOH, which had been heated to approximately 95 deg C.

*Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.13 (March 2002). Available from, as of October 4, 2011: **http://www.inchem.org/pages/sids.html***

▸ from HSDB

/CASE REPORTS/ ... The inhalation of aerosols of 5 % NaOH by a 25-year-old women resulted in irreversible obstructive lung injury after working for one day in a poorly ventilated room. ...

*Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.13 (March 2002). Available from, as of October 4, 2011: **http://www.inchem.org/pages/sids.html***

▸ from HSDB

/CASE REPORTS/ A 28-year old member of an oil-well drilling crew sustained extensive splash burns of the left eye from NaOH and received emergency care from a general physician prior to being hospitalized. At the hospital, initial examination showed vision limited to light perception, corneal clouding to such an extent that iris markings were not discernable, necrosis of most of the bulbar conjunctiva, some sloughing in the nasal area of the cornea, blanched and necrotic cul-de-sac, and some involvement of the lids and adjacent skin. The treatment of the patient at the hospital consisted of daily debridement of necrotic areas, local atropine, antibiotics, steroids, systematic ACTH, vitamins, antacids, and proteolytic enzymes. The treatment produced some improvement with time so that usual, late sequelae such as vascular invasion and symblepharon did not occur, and the cornea cleared sufficiently within 7 weeks that vision returned to near normal.

Horowitz ID; Am J Ophthalmol 61: 340-341 (1966) as cited in NIOSH; Criteria Document: Sodium Hydroxide p.29 (1975) DHEW Pub. NIOSH 76-105

▸ from HSDB

/SURVEILLANCE/ 200 patients with suspected caustic ingestation were examined. No steroids were administered to the patients involved. Lesions in the esophagus were found in 93 patients. Thirty-two patients with deep circular burns had nasogastric tubes inserted immediately. Of these patients, 2 developed esophageal strictures, but subsequent dilatation was successful. No stricture formation was observed in the group of patients with noncircular lesions. This low percentage of stricture formation is due to the use of nasogastric tubes. Since neither the presence nor the severity of esophageal burns is predictable, an endoscopy should be performed in all suspected cases. In the absence of severe pharyngeal lesions, the use of a flexible fiberoptic endoscope is preferable because it also allows examination of the stomach and proximal part of the duodenum.

Wijburg FA et al; Ann Otol Rhinol Laryngol 94 (4 Part 1): 337-41 (1985)

PMID:4026118

▸ from HSDB

/ALTERNATIVE and IN VITRO TESTS/ Predicting the toxic potential of compounds to the ocular surface has depended on the Draize test for the past half century. Alternatives to Draize testing have recently been sought for a number of reasons. Stress gene expression has emerged as a means of quantifying cellular reaction and, thus, the toxic potential of the compound in question. This study examines the expression of the major stress response gene heme oxygenase-1 (HO-1) in a human corneal epithelial cell line (HCE-T) following challenges with a number of known ocular irritants. HCE-T was used to investigate the effect of ocular irritants on cell viability and HO-1 expression. Irritants tested included hydrogen peroxide, isopropyl alcohol, sodium hydroxide and trichloroacetic acid. HCE-T cells were grown to 80% confluency and treated with the listed irritants at a concentration range of 10-100 uM. Cell viability and northern blot analysis were performed following a 24 and 48 hr incubation period. HCE-T cells expressed HO-1 mRNA and HO activity similar to other human cell lines. Northern blot analysis demonstrated that levels of HO-1 mRNA transcripts increased regularly after exposure to the irritants in a concentration-dependent manner. Studies on the effect of various inhibitors and inducers of HO-1 on cell viability showed that inhibition of HO-1 potentiates the cytotoxic effect of ocular irritants. In contrast, pre-induction of HO-1 in HCE-T decreases the effect of various irritants on cell viability. These results are consistent with the idea that HO-1 mRNA levels may be used as an indicator of toxicity resulting from ocular irritants and that HCE-T cells respond to stress in a fashion similar to other human cell lines. This strategy for testing may be important in the development of an alternative to Draize testing. The results of this study also suggest that HO-1 may constitute a part of the protective defense mechanism against chemical injury.

Braunstein SG et al; Curr Eye Res. 19 (2): 115-22 (1999)

PMID:10420180

▸ from HSDB

/OTHER TOXICITY INFORMATION/ IN BIOPSY SPECIMENS FROM THE FOREARM VOLAR SURFACE SODIUM HYDROXIDE PRODUCED INTRACELLULAR EDEMA & INCREASED NUMBERS OF LAMELLAR GRANULES ON THE OUTER SURFACE OF THE UPPERMOST GRANULAR CELL LAYER.

NAGAO S ET AL; ACTA DERMATO-VENEREOL 52 (1): 11-23 (1972)

▸ from HSDB

/OTHER TOXICITY INFORMATION/ Cases of squamous cell carcinoma of the esophagus have occurred with latent periods of 12 to 42 years after ingestion; These cancers may have been sequelae of tissue destruction and possibly scar formation rather than from a direct carcinogenic action of sodium hydroxide itself.

Mackison, F. W., R. S. Stricoff, and L. J. Partridge, Jr. (eds.). NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards. DHHS(NIOSH) Publication No. 81-123 (3 VOLS). Washington, DC: U.S. Government Printing Office, Jan. 1981., p. 2

▸ from HSDB

/OTHER TOXICITY INFORMATION/ There is a latent period between contact of NaOH with the skin and the sensation of irritation.

NIOSH; Criteria Document: Sodium Hydroxide p.62 (1975) DHEW Pub. NIOSH 76-105

▸ from HSDB

/OTHER TOXICITY INFORMATION/ "Button" batteries, which contain concentrated solutions of sodium or potassium hydroxide, represent a serious risk for leakage, corrosion, and perforation when lodged in the esophagus.

Klaassen, C.D., M.O. Amdur, Doull J. (eds.). Casarett and Doull's Toxicology. The Basic Science of Poisons. 5th ed. New York, NY: McGraw-Hill, 1995., p. 976

▸ from HSDB

/OTHER TOXICITY INFORMATION/ Malfunctioning automobile air-bag inflation systems may release sodium hydroxide powder, a byproduct in the chemical conversion of sodium azide to nitrogen gas that inflates the auto air bags. Chemical surface burns will require symptomatic treatment.

Ellenhorn, M.J., S. Schonwald, G. Ordog, J. Wasserberger. Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed. Baltimore, MD: Williams and Wilkins, 1997., p. 1094

▸ from HSDB

/OTHER TOXICITY INFORMATION/ Seventy-five percent of all caustic injury to the esophagus in chidren under 5 years results from sodium hydroxide. Eighty-three percent of these victims are under 3 yr, and 62% are males. Gastric acid is not sufficiently strong or present in sufficient quantity to neutralize even small quantities of strong alkali.

Gossel, T.A., J.D. Bricker. Principles of Clinical Toxicology. 3rd ed. New York, NY: Raven Press, Ltd., 1994., p. 222

▸ from HSDB

14.1.17 Non-Human Toxicity Excerpts

/LABORATORY ANIMALS: Acute Exposure/ ... Enucleated bovine and porcine (n = 59 each) eyes were used for exposure to sodium, ammonium, and calcium hydroxide, respectively, /in three different concentrations 11 M, 6 M, or 0.25 M and were splashed onto the eye using a syringe. Approximately 5 mL each alkali solution was splashed onto the fully exposed cornea, ensuring that the entire cornea was covered. Each assigned to a predesignated time interval (30 sec, 60 sec, 12 min, 30 min, 8 hr, and 24 hr) for exposure and were immediately washed in water./ Eyes were subjected to fluorescein staining, 5-bromo-2'-deoxy-uridine (BrdU) labeling. Excised cornea was subjected to protein extraction, spectrophotometric determination of protein amount, dynamic light scattering and SDS-PAGE profiling, mass spectrometric protein identification, and iTRAQ-labeled quantification. Select identified proteins were subjected to Western blot and immunohistochemical analyses. Alkali exposure resulted in lower protein extractability from corneal tissue. Elevated aggregate formation was found with strong alkali exposure (sodium hydroxide>ammonium, calcium hydroxide), even with a short duration of exposure compared with controls. The protein yield after exposure varied as a function of post exposure time. Protein profiles changed because of alkali exposure. Concentration and strength of the alkali affected the profile change significantly. Mass spectrometry identified 15 proteins from different bands with relative quantification. Plexin D1 was identified for the first time in the cornea at a protein level that was further confirmed by Western blot and immunohistochemical analyses. Exposure to alkaline chemicals results in predictable and reproducible changes in corneal protein profile. Stronger alkali, longer durations, or both, of exposure resulted in lower yields and significant protein profile changes compared with controls.

Parikh T et al; Invest Ophthalmol Vis Sci. 52 (3): 1819-31 (2011)

PMID:20861482

Full text: ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3101685/***

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ Keratin material in the skin underwent rapid decomposition in sodium hydroxide above pH 9.2. Aliquots of washed human hair and fingernails were mixed with various amounts of sodium solution and the extent of keratin breakdown was measured by estimating the cystine produced. The cystine portion of the keratin complex of human hair or nails was readily cleaved by sodium hydroxide in the S-S bond. After 20 hr of contact with 0.1N or 0.25N sodium hydroxide, 61.4% and 97.6%, respectively, of the nail keratin were decomposed. Thus, a high degree of destruction of tissue even by a dilute sodium hydroxide solution can occur from prolonged contact.

NIOSH; Criteria Document: Sodium Hydroxide p.30 (1975) DHEW Pub. NIOSH 76-105

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ The objective of this study was/ to investigate immediate changes in water-soluble metabolites of ocular tissue in alkali-burned eyes by using high-resolution 1H-NMR spectroscopy. Adult New Zealand rabbit eyes were burned with 1 M NaOH for 1 min. Normal eyes were used as control. Samples from aqueous humor and perchloric acid extracts of the cornea and lens were analyzed on a NMR spectrometer operating at 500 MHz for protons. Metabolites were quantified by comparing peak area with an added internal standard, TSP (3'-trimethylsilylpropinate-2,2,3,3-d4). Alkali burn of corneal surface causes immediate changes in concentration of many water-soluble metabolites in the anterior segment. Even as far away as the lens a significant increase in lactate was found. Cornea showed a significant increase in glucose and a significant decrease in hypo-taurine concentration. Most changes were observed in aqueous humor, with significant increases in succinate, creatine, scyllo- and myo-inositol and a significant decrease in citrate concentration. Furthermore, a small decrease in ascorbate concentration in aqueous humor was observed.

Risa O et al; Graefes Arch Clin Exp Ophthalmol. 240 (1): 49-55 (2002)

PMID:11954781

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... To study morphological and functional alterations of the esophagus in rabbits submitted to esophageal infusion of caustic soda (NaOH). The 88 rabbits studied were divided into 4 groups: G1 (n=22) were submitted to esophageal infusion with distilled water. G2, G3, and G4 were submitted to esophageal infusion of 2%, 4% and 6% NaOH respectively. Morphological alterations were studied in 12 animals from each group and manometric alterations in the remaining 10. An analysis was made of lower esophageal sphincter (LES) pressure, number and amplitude of contractions in the distal third of the esophagus. These studies were performed before (moment M1) and at 30 min, 6 hr, and 24 hr after (moments M2, M3, and M4, respectively) esophageal infusion. Morphological evaluation: G1 - no alterations; G2 - edema, hyperemia, and ecdysis; G3 - enlarged calibre of esophagus, ulcers, ecdysis of mucosa; G4 - lesions similar to G3, but more intense, areas of extensive hemorrhage at M3 and M4. Functional evaluation: LES was higher at M2; the number of distal third lower esophageal contractions in G3, and G4 was lower; and the contraction amplitude was lower in G4. ... Esophageal infusion with NaOH caused lesions in the esophageal wall, with gravity proportional to solution concentration. Infusion caused LES spasm at M2, and reduced both contraction number and amplitude in the distal third of the esophagus.

Henry MA et al; Acta Cir Bras. 23 (1): 16-21 (2008)

PMID:18278388

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... An experimental study on rats was designed to evaluate systemic effects of household bleaches that contain 4% sodium hypochlorite and less than 0.05% sodium hydroxide on lungs, livers, kidneys and intestines after 2, 4, 6, 12, 24 and 48 hr of administration via intragastric route. Prominent congestion and some interstitial mononuclear cellular infiltration were observed in the lungs, the livers and the kidneys of the rats after administration of household bleaches. Additionally, the lungs showed expansion of the alveolar spaces. While erosive changes were present in the stomachs, the intestines were normal. These histopathological changes were especially prominent at early periods of systemic administration. In the second part of the study, to assess whether these findings would hold for intravenous administration of household bleaches, another group of rats were given intravenous administration of household bleach and after 4 hr of intravenous administration of household bleach, the same histopathological changes above were observed in the lungs, kidneys and livers. ...

Andiran F et al; Drug Chem Toxicol. 22 (3): 545-53 (1999)

PMID:10445163

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ To investigate the optimal concentration of sodium hydroxide (NaOH) on esophageal stricture formation in rats to establish an animal model of benign esophageal stricture (BES). Corrosive esophageal burn was produced by internal application of different concentrations of NaOH to the distal esophagus in rats. As many as 66 male rats were randomly divided into eight groups: Group A (control, n = 6), Group B (sham-operated group, n = 6), Group C (5% NaOH, n = 8), Group D (10% NaOH, n = 8), Group E (20% NaOH, n = 8), Group F (30% NaOH, n = 10), Group G (40% NaOH, n = 14), and Group H (50% NaOH, n = 6). Surviving rats were killed at 28 days. The survival rate, body weight gain, symptoms, and histopathological changes were assessed. The mortality rate was high in Groups G and H (73 and 67%). The prevalence of symptoms of BES was 43% in Groups D and E, 50% in Group F, 75% in Group G, and 100% in Group H. Statistically significant stricture formation of the esophagus was observed in Groups F and G. The degree of tissue damage was significantly higher in Groups E, F, and G. ...

Okata Y et al; Pediatr Surg Int. 27 (1): 73-80 (2011)

PMID:20865264

▶ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... Ten microliters of ... 2 or 8% sodium hydroxide (NaOH) were directly applied to the cornea of the right eye of each test rabbit. Untreated left eyes served as the controls. Eyes and eyelids were macroscopically examined for signs of irritation beginning 3 hours after dosing and periodically until recovery or day 35. Eyes and eyelids from animals in each group were collected for microscopic examination after 3 hours and on days 1, 3, and 35. The macroscopic and microscopic changes were consistent with ... mild (2% NaOH ...), and severe (8% NaOH) irritancy. ... As with surfactants, as the extent of initial injury increased, the intensity and duration of the subsequent responses increased. ... The initial extent of injury associated with ocular irritation may be used to predict the subsequent responses and final outcome. ...

Maurer JK, Parker RD; Toxicol Pathol. 28 (5): 679-87 (2000)

PMID:11026603

▶ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... Esophageal burns were induced in male rats by the administration of 10% sodium hydroxide. Lipid peroxidation (LPO) products were then measured at the following times: 0, 1, 6, 24, 48 and 72 hr after treatment. Tissue hydroxyproline (HP) concentrations in the injured area were assessed at 14 days after the administration of sodium hydroxide. The groups received either systemic melatonin or normal saline. There were two, non-ischemic, sham control groups treated with or without melatonin. LPO products, malondialdehyde (MDA) and 4-hydroxyalkenal (4-HDA), increased immediately after the administration of sodium hydroxide; this indicates the participation of free radicals in the development of damage. Melatonin diminished the oxidative response and the amount of HP in the late phase of the lesion. Melatonin reduced oxidative damage in the early phase of the esophageal burns induced by sodium hydroxide.

Larios-Arceo F et al; J Pineal Res. 45 (2): 219-23 (2008)

PMID:18373556

▶ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... This study examined the roles of vascular dysfunction and inflammation to the esophageal injury response to different caustic substances in mice. The esophageal responses to sodium hydroxide (10%, 5%, and 2.5%) ... were evaluated by intravital videomicroscopy and histopathology. Intravital microscopy was used to monitor changes in the diameter of arterioles and venules, the adhesion and movement of leukocytes in venules, and the time of cessation of arteriolar blood flow in mouse esophagus. The esophageal mucosa was exposed to caustic substances for 0 to 60 minutes before evaluation. The higher concentrations of sodium hydroxide ... elicited rapid stasis in both arterioles and venules, which was accompanied by arteriolar constriction and thrombosis. An accumulation of adherent leukocytes in venules was not observed with any agent. Histopathological evaluation revealed marked cellular and interstitial edema in the mucosa with alkali. ... Ischemia and thrombosis are dominant processes, whereas inflammation is less important in the pathogenesis of acute corrosive injury to the esophageal mucosa.

Osman M et al; J Pediatr Surg. 43 (9): 1672-8 (2008)

PMID:18779005

Full text: ***https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2583796/***

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ An in vivo test was conducted with Yorkshire weanling pigs using applications of 2N (8 %), 4N (16 %) and 6N (24%) NaOH on the lower abdominal region. Gross blisters developed within 15 minutes of application and 8 and 16 % NaOH produced severe necrosis in all epidermal layers. A concentration of 24 % produced numerous and severe blisters with necrosis extending deeper into the subcutaneous tissue. Also an in vitro test was performed with isolated perfused skin flaps of Yorkshire weanling pigs using NaOH concentrations of 4N (16 %) and 6N (24%). At both concentrations NaOH showed severe necrosis of all epidermal cell layers and dermis. At times this lesion extended deep into the subcutaneous layers.

Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.13 (March 2002). Available from, as of October 4, 2011: ***http://www.inchem.org/pages/sids.html***

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ Ocular blood flow was determined using radioactive S 85 microspheres after an alkali NaOH burn to the eye /of adult albino rabbits/. With 20 uL NaOH, blood flow was significantly increased in the iris, ciliary processes, and choroid from 2 through 4 hr. This correlated well with the sustained increase in intraocular pressure (IOP) seen after a 20 uL burn. A 50 uL burn increased blood flow 1 hr, but it returned toward normal levels beyond 2 hr. ... There appeared to be a meaningful correlation between IOP changes and altered blood flow following ocular alkali burns. The blood flow changes paralleled those occurring after the topical application of prostaglandins and supported the concept that ocular blood flow dynamics are mediated by prostaglandins.

Green K et al; Arch Ophthalmol (Chicago) 103 (4): 569-71 (1985)

PMID:3985842

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ Species differences have been observed in degrees of damage and of recovery after contamination of the eye with sodium hydroxide. In comparisons made /in separate studies/ they eyes of monkeys react a little less, and recover a little better, than the eyes of rabbits. It is believed that human eyes are more like monkey eyes.

Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 834

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... ADMIN CAUSTIC SODA IN A BARIUM MEAL TO DOGS AND FOLLOWED THE GASTROINTESTINAL PROGRESS OF THIS FLUID MASS BY FLUOROSCOPY. IT FOLLOWED THE MAGENSTRASSE TO THE ANTRUM, WHERE IT INDUCED PYLOROSPASM, TRAPPING THE CORROSIVE AT THAT SITE. AUTOPSY CONFIRMED THAT THIS WAS THE LOCUS OF THE GREATEST NECROTIC DAMAGE. SUBSEQUENT INVESTIGATIONS HAVE CONFIRMED THAT LYE ADMIN TO ERECT DOG PRODUCES HEMORRHAGIC GASTRITIS ...

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. III-246

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ WITHIN THE FIRST MIN AFTER TOPICAL APPLICATION OF SODIUM HYDROXIDE TO GUINEA PIGS, BLOCKADE OF RESP ENZYMES IN DERMAL CELLS AND SWELLING OF DERMAL COLLAGENIC FIBERS OCCURRED.

PANCHENKO KI; VESTN DERMATOL VENEROL (2): 28-32 (1977)

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ RATS ADMIN 0.2 mL OF 0.1 N SODIUM HYDROXIDE DEMONSTRATED IMMEDIATE NECROSIS OF DERMAL TISSUE. MARKED REDUCTIONS IN GLYCOGEN AND TOTAL LIPID WERE OBSERVED.

SANYAL S ET AL; INDIAN J MED RES 63 (11): 1609-19 (1975)

PMID:1222967

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ The hair of adult mice was clipped and a circular area 2 cm in diameter was painted by applicator with 50 % NaOH. Afterwards the area was irrigated with water at various intervals. The mortality of mice was 20, 40, 80 and 71 % when they were irrigated 30 min, 1 hr, 2 hr or not at all after the application. The animals were observed daily for up to 7 days after the treatment. All animals developed rapidly progressive burns. No mortality or burns were observed when the mice were irrigated immediately after the application.

Organization for Economic Cooperation and Development; Screening Information Data Set for Sodium Hydroxide, (1310-73-2) p.12 (March 2002). Available from, as of October 4, 2011: ***http://www.inchem.org/pages/sids.html***

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ 0.05 mL of 0.123N (0.5%), 0.5N (2.0%), and 2.0N (8.0%) sodium hydroxide were applied into the eyes of 3 anesthetized albino rabbits. The intraocular pressure increased 5, 18, and 37 mm Hg, respectively, within 2.5 min.

Chiang TS et al; Invest Ophthamol 10: 270-273 (1971) as cited in NIOSH; Criteria Document: Sodium Hydroxide p.43 (1975) DHEW Pub. NIOSH 76-105

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ Damage to the gastric fundic mucosa was produced in rats by intragastric administration of 1 mL 0.2 M NaOH, ... a control group received 1 mL saline solution. The animals were killed 1 hr later, and the number and severity of ulcers (lesions) noted. The gastric fundic mucosa were excised and frozen, and assayed enzymatically for adenosine triphosphate (ATP), adenosine diphosphate (ADP), adenosine monophosphate (AMP) and lactate, while the tissue level of cyclic adenosine monophosphate (cAMP) was estimated by radioimmunoassay. It was found that: (1) The number and severity of gastric lesions (ulcers) increased significantly in all groups treated by the necrotizing agent; (2) The extent of ATP breakdown into ADP increased significantly, while the ATP transformation into cAMP by adenylate cyclase, and of cAMP into AMP by phosphodiesterase, decreased. ... It was concluded that: (1) The mucosal damage develops as a consequence of a very active metabolic adaption of the rat gastric fundic mucosa, notably the significantly increased ATP transformation into ADP, which is not the consequence of hypoxaemia; (2) The feed-back mechanism system between the membrane-bound ATP-dependent energy systems is broken as the mucosal damage develops, the main changes being significantly decreased ATP transformation into cAMP, and significant alterations by neural, hormonal, and pharmacological influences in the membrane-bound ATP-dependent energy systems.

Mor'on F et al; Int J Tissue React 5(4): 357-362 (1983)

PMID:6323336

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ ... a 10s exposure of rabbit esophagus to 7N (22.5%) sodium hydroxide produces necrosis in all layers of the tissue.

Gossel, T.A., J.D. Bricker. Principles of Clinical Toxicology. 3rd ed. New York, NY: Raven Press, Ltd., 1994., p. 224

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ A 5% aqueous solution of sodium hydroxide produced severe necrosis when applied to the skin of rabbits for 4 hr. Rats were exposed to an aerosol of 40% aqueous sodium hydroxide whose particles were less than 1 um in diameter. ... After 3 weeks two 2 of the 10 rats died. ... Examination showed mostly normal lung tissue with foci of enlarged alveolar septa, emphysema, bronchial ulceration, and enlarged lymph adenoidal tissues.

Clayton, G.D., F.E. Clayton (eds.) Patty's Industrial Hygiene and Toxicology. Volumes 2A, 2B, 2C, 2D, 2E, 2F: Toxicology. 4th ed. New York, NY: John Wiley & Sons Inc., 1993-1994., p. 772

▸ from HSDB

/LABORATORY ANIMALS: Acute Exposure/ Oral intubation of /sodium hydroxide in/ a 4% solution in rabbits caused mucosal and submucosal necrosis within 10 seconds, a 12% solution eroded into the muscle, and a 28% solution caused perforation. Similar results are seen in cats. A 5% aqueous solution of sodium hydroxide applied to the skin of rabbits for 4 hr produced severe necrosis; however, a 1% solution (pH 13.4) failed to cause gastric, esophageal, or other damage. Instillation of a 1% solution into the conjunctival sac failed to cause ocular or conjunctival injury in rabbits, provided the eye was promptly irrigated with copious amounts of water.

American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 1416

▸ from HSDB

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ 27 white rats died within a month, mostly from bronchopneumonia, after twice weekly exposures to an aerosol of unknown airborne concn generated from an aqueous 40% NaOH solution. When exposed to an aerosol generated from aqueous 20% NaOH solution, the septa were emphymatously (sic) dilated and cracked, the bronchi were dilated and their epithelial cover was thin and frequently desquamated, and a light roundcell infiltration of the submucus membrane tissue occurred. Other rats were exposed to aerosols generated from 10% and 5% solutions of NaOH. In the group exposed to aerosols from 10% NaOH, little change occurred. In the group exposed to aerosols from 5% NaOH, rats had dilation of the bronchi and a slight degeneration of the mucus membrane and thickened strata of the lymphadenoid tissue surrounding the bronchi.

NIOSH; Criteria Document: Sodium Hydroxide p.46 (1975) DHEW Pub. NIOSH 76-105

▸ from HSDB

/OTHER TOXICITY INFORMATION/ ... /Changes in Aldehyde dehydrogenase 3A1 (ALDH3A1) expression after corneal alkaline burns to the mouse cornea were detected using/ ... RTQ-PCR to monitor the transcriptional change of ALDH3A1. ... Used zymography to test enzyme activity changes of ALDH3A1 in the alkali burn cornea; And SDS-PAGE and mass spectrometry technology were used to verify protein content changes and to identify ALDH3A1 protein. ... Alkali burn of the corneal surface caused a rapid decrease of ALDH3A1 in the corneal at both the RNA and protein levels, which leads to the loss of the protective component of the corneal surface and makes it vulnerable to further damage. The ALDH3A1 level in the cornea gradually recovered during the healing process. Use of an anti-oxidation reagent as a treatment ingredient for alkali burn of the corneal surface could compensate for the decrease of anti-oxidation protection potential caused by ALDH3A1 loss. /alkaline burn/

Feng Y et al; Mol Vis. 10: 845-50 (2004)

PMID:15547490

▸ from HSDB

/OTHER TOXICITY INFORMATION/ A micropolarographic system was used as a quantitative means of monitoring the healing course of corneal epithelium following a 10 second exposure to 0.20 N sodium hydroxide solution. ... The healing course following those exposures consisted of two well defined phases: an initial period of hypoflux lasting some 48 hr before rising back up to the pre-lesion baseline, followed then by a period of hyperflux lasting about 7 days before decreasing once again down to the pre-lesion baseline.

Mauger TF, Hill RM; Acta Ophthalmol (Copenh) 63 (3): 264-7 (1985)

PMID:4036553

▸ from HSDB

/OTHER TOXICITY INFORMATION/ INGESTION OF ANY CAUSTIC AGENT ... /CAUSES/ CORROSION OF MUCOUS MEMBRANES OF UPPER PART OF DIGESTIVE TRACT. VOMITING, COLIC, & PURGATION MAY FOLLOW, WITH PROSTRATION & DEATH FROM ACUTE SHOCK. ... CORROSION OF MOUTH. /CAUSTIC AGENTS/

Clarke, M. L., D. G. Harvey and D. J. Humphreys. Veterinary Toxicology. 2nd ed. London: Bailliere Tindall, 1981., p. 25

▸ from HSDB

/OTHER TOXICITY INFORMATION/ The efficacy of various disinfectants was tested against cultures from rabbit feces containing coccidian parasites (Eimeria intestinalis, E. magna, E. media, E. perforans, and E. stidae). At concn of 0.5-5%, ... NaOH ... suppressed oocyte development, but /was/ not lethal. ... The most effective treatment (96-98% efficient) was achieved using a mixture of 2% CCl_4, 2% NaOH, 5% **ammonia water**, and 5% NaCl.

Abramova VF, Karare MV; Profil Parazit Bolezn Zhivotn 30-3 (1985)

▸ from HSDB

/OTHER TOXICITY INFORMATION/ Rats that inhaled unmeasured concentrations of sodium hydroxide aerosols for 30 min/day suffered pulmonary damage after 2.5 mos.

American Conference of Governmental Industrial Hygienists, Inc. Documentation of the Threshold Limit Values and Biological Exposure Indices. 6th ed. Volumes I, II, III. Cincinnati, OH: ACGIH, 1991., p. 1416

▸ from HSDB

14.1.18 Non-Human Toxicity Values

LD50 Rabbit dermal 1,350 mg/kg

National Research Council; Prudent Practices in the Laboratory. Handling and Management of Chemical Hazards. the National Academies Press, Washington, D.C. 2011, p. CD

▸ from HSDB

LD50 Rat oral 140-340 mg/kg

National Research Council; Prudent Practices in the Laboratory. Handling and Management of Chemical Hazards. the National Academies Press, Washington, D.C. 2011, p. CD

▸ from HSDB

LD50 Mouse ip 40 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 3254

▸ from HSDB

14.1.19 Ecotoxicity Values

EC50; Species: Ceriodaphnia dubia (Water Flea) age <24 hr neonate; Conditions: freshwater, static, 23 deg C; Concentration: 40380 ug/L for 48 hr (95% confidence interval: 34590-47130 ug/L); Effect: intoxication, immobilization /100% purity/

*Warne MSJ, Schifko AD; Ecotoxicol Environ Saf 44 (2): 196-206 (1999) as cited in the ECOTOX database. Available from, as of November 15, 2011: **http://cfpub.epa.gov/ecotox/***

▸ from HSDB

LC50; Species: Carassius auratus (Goldfish); Conditions: freshwater, static; Concentration: 160000 ug/L for 24 hr

*Jensen RA; A Simplified Bioassay Using Finfish for Estimating Potential Spill Damage, In: Proc Control of Hazardous Material Spills: 104-108 (1978) as cited in the ECOTOX database. Available from, as of November 15, 2011: **http://cfpub.epa.gov/ecotox/***

▸ from HSDB

LC100; Species: Cyprinus carpio; Concentration: 180 ppm for 24 hr at 25 deg C /Conditions of bioassay not specified in source examined/

Nishiuchi Y; Suisan Zoshoku 23: 132 (1975)

▸ from HSDB

LC50; Species: Poecilia reticulata (Guppy) age 3-4 week young organisms; Conditions: saltwater, renewal, 24 deg C, pH >9.8-<10.0, salinity 2.8%, dissolved oxygen > or =70% saturated; Concentration: 209000 ug/L for 24 hr (95% confidence interval: 153000-286000 ug/L) /98.6% purity/

*Adema DMM; Aquatic Toxicity of Compounds that may be Carried by Ships (Marpol 1973 Annex II). A Progress Report for 1985, Tech Rep No R85/217: 40 (1985) as cited in the ECOTOX database. Available from, as of November 15, 2011: **http://cfpub.epa.gov/ecotox/quick_query.htm***

▸ from HSDB

LC50; Species: Poecilia reticulata (Guppy) age 3-4 week young organisms; Conditions: saltwater, renewal, 24 deg C, pH >9.8-<10.0, salinity 2.8%, dissolved oxygen > or =70% saturated; Concentration: 196000 ug/L for 48 hr (95% confidence interval: 144000-267000 ug/L) /98.6% purity/

*Adema DMM; Aquatic Toxicity of Compounds that may be Carried by Ships (Marpol 1973 Annex II). A Progress Report for 1985, Tech Rep No R85/217: 40 (1985) as cited in the ECOTOX database. Available from, as of November 15, 2011: **http://cfpub.epa.gov/ecotox/quick_query.htm***

▸ from HSDB

LC50; Species: Poecilia reticulata (Guppy) age 3-4 week young organisms; Conditions: saltwater, renewal, 24 deg C, pH >9.8-<10.0, salinity 2.8%, dissolved oxygen > or =70% saturated; Concentration: 196000 ug/L for 96 hr (95% confidence interval: 144000-267000 ug/L) /98.6% purity/

Adema DMM; Aquatic Toxicity of Compounds that may be Carried by Ships (Marpol 1973 Annex II). A Progress Report for 1985, Tech Rep No R85/217: 40 (1985) as cited in the ECOTOX database. Available from, as of November 15, 2011: ***http://cfpub.epa.gov/ecotox/quick_query.htm***

▸ from HSDB

14.1.20 Ecotoxicity Excerpts

/AQUATIC SPECIES/ Concentration 20-100 mg/L in water kills some species of aquatic wildlife due to increase in pH.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.1 (1981)

▸ from HSDB

/AQUATIC SPECIES/ Chronic exposure of guppies to sodium hydroxide (> or =25 mg/L) decreased their survival rate and weight gain, and caused either late or premature sexual maturity resulting in decreased fertility.

Rustamova SA; Gidrobiol ZH 13 (3): 96-9 (1977)

▸ from HSDB

14.2 Ecological Information

14.2.1 ICSC Environmental Data

This substance may be hazardous to the environment. Special attention should be given to aquatic organisms.

▸ from ILO International Chemical Safety Cards (ICSC)

14.2.2 Environmental Fate

AQUATIC FATE: In the case of a solid, anhydrous sodium hydroxide spill on soil, ground water pollution will occur if precipitation occurs prior to clean up. Precipitation will dissolve some of the solid (with much heat given off) and create an aqueous solution of sodium hydroxide, which then would be able to infiltrate the soil. However, prediction of the concentration and properties of the solution produced would be difficult.

Environment Canada; Tech Info for Problem Spills: Sodium Hydroxide (Draft) p.24 (1981)

▸ from HSDB

14.2.3 Environmental Biodegradation

BOD: none

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

▸ from HSDB

14.2.4 Environmental Water Concentrations

GROUNDWATER: Sodium hydroxide was identified as a chemical of concern in wells associated with the Pavilion Area Groundwater Plume in Pavilion Wyoming in Fremont County. Land use in the area is agricultural with some properties used for natural gas production. Sampling was conducted from March 2 through 6, 2009 and May 14, and 15, 2009(1).

(1) US EPA; Expanded Site Investigation - Field Sampling Plan, Pavillion Area Groundwater Investigation. Pavilion, Fremont County, Wyoming. USEPA Contract No. EP-W-05-050. TDD No., 0901-01. January 6, 2010. START 3. Superfund Technical Assessment and Response Team 3-Region 8.Available from, as of Oct 11, 2011: ***http://www.epa.gov/region8/superfund/wy/pavillion/Pavillion_GWInvestigationFSP.pdf***

▸ from HSDB

14.2.5 Effluent Concentrations

Estimated emissions of sodium hydroxide as one of the typical pollutants released from the synthetic organic chemical manufacturing industry (production/processing) may range from (unit process, product): alkylation, ethylbenzene, 1.9 to 21.5; condensation, polyethylene terephthalate, 0.065 to 23.1; dehydrogenation, isoprene, 0.5 to 19; dehydrohalogenation, vinylidene chloride, 45.5 to 605.5; polymerization, polyethylene terephthalate, 0.1 to 23.1 (all in g/kg produced)(1). The compound was spilled at an estimated 3,500 gallons into the Newark Bay on October 1991 from the Gist Brocades facility(2). Sodium hydroxide was involved in 2.6% of 6,928 chemical accidents in the US over a 5 year period up to 1985 at a reportable quantity of 2200 kg(3).

(1) Carpenter CE et al; Toxic Subst J 10: 323-71 (1990) (2) Gunster DG et al; Ecotoxicol Environ Saf 25: 202-13 (1993) (3) Meharg AA; Rev Environ Contam Toxicol 138: 21-48 (1994)

▸ from HSDB

14.2.6 Probable Routes of Human Exposure

According to the 2006 TSCA Inventory Update Reporting data, the number of persons reasonably likely to be exposed in the industrial manufacturing, processing, and use of sodium hydroxide is 1000 or greater; the data may be greatly underestimated(1).

(1) US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of Sept 9, 2011: ***http://cfpub.epa.gov/iursearch/index.cfm***

▸ from HSDB

NIOSH (NOES Survey 1981-1983) has statistically estimated that 2,819,743 workers (995,960 of these were female) were potentially exposed to sodium hydroxide in the US(1). NIOSH (NOES Survey 1981-1983) has statistically estimated that 370,582 workers (137,156 of these were female) were potentially exposed to liquid sodium hydroxide in the US(1). The NOES Survey does not include farm workers. Occupational exposure to sodium hydroxide may occur through dermal contact with this compound at workplaces where sodium hydroxide is produced or used(SRC).

(1) NIOSH; NOES. National Occupational Exposure Survey conducted from 1981-1983. Estimated numbers of employees potentially exposed to specific agents by 2-digit standard industrial classification (SIC). Available from, as of Oct 11, 2011: ***http://www.cdc.gov/noes/***

▸ from HSDB

Inhalation of dust or mist, ingestion, and skin or eye contact.

Sittig M; Handbook of Toxic and Hazardous Chemicals p.606 (1981)

▸ from HSDB

15 Literature

15.1 Depositor Provided PubMed Citations

▸ from PubChem

15.2 NLM Curated PubMed Citations

▸ from PubChem

15.3 General References

1. Bauman PA, Lawrence LA, Biesert L, Dichtelmuller H, Fabbrizzi F, Gajardo R, Groner A, Jorquera JI, Kempf C, Kreil TR, von Hoegen I, Pifat DY, Petteway SR Jr, Cai K: Critical factors influencing prion inactivation by sodium hydroxide. Vox Sang. 2006 Jul;91(1):34-40. doi: 10.1111/j.1423-0410.2006.00790.x. [PMID: 16756599]
2. Sodium Hydroxide, PubChem
3. FDA document, Sodium Hydroxide
4. Sodium Hydroxide Solution
5. EPA, Sodium Hydroxide
6. Chemical Safety Facts, Sodium Hydroxide
7. SODIUM HYDROXIDE
8. Sodium Hydroxide
9. Chlorine and sodium hydroxide

▸ from DrugBank

15.4 Springer Nature References

▸ from Springer Nature

15.5 Thieme References

▸ from Thieme Chemistry

15.6 Chemical Co-Occurrences in Literature

▸ from PubChem

15.7 Chemical-Disease Co-Occurrences in Literature

▸ from PubChem

15.8 Chemical-Gene Co-Occurrences in Literature

▸ from PubChem

16 Patents

16.1 Depositor-Supplied Patent Identifiers

▸ from PubChem

17 Biomolecular Interactions and Pathways

17.1 Protein Bound 3-D Structures

View 1 protein in NCBI Structure

▸ from PubChem

18 Biological Test Results

18.1 BioAssay Results

▸ from PubChem

19 Classification

19.1 Ontologies

19.1.1 MeSH Tree

▸ from MeSH

19.1.2 ChEBI Ontology

▸ from ChEBI

19.1.3 KEGG: Drug

▸ from KEGG

19.1.4 KEGG: JP15

▸ from KEGG

19.1.5 KEGG: Additive

▸ from KEGG

19.1.6 WIPO IPC

▸ from WIPO

19.1.7 EPA Safer Choice

▸ from EPA Safer Choice

19.1.8 ChemIDplus

▸ from ChemIDplus

19.1.9 CAMEO Chemicals

▸ from CAMEO Chemicals

19.1.10 Household Products Database Tree

▸ from NLM Household Products Database

19.1.11 UN GHS Classification

▸ from UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

19.1.12 EPA CPDat Classification

▸ from EPA Chemical and Products Database (CPDat)

20 Information Sources

FILTER BY SOURCE ALL SOURCES

1. **CAMEO Chemicals**

   SODIUM HYDROXIDE SOLUTION
   https://cameochemicals.noaa.gov/chemical/1499

   SODIUM HYDROXIDE, SOLID
   https://cameochemicals.noaa.gov/chemical/9073

   CAMEO Chemical Reactivity Classification
   https://cameochemicals.noaa.gov/browse/react

2. **DOT Emergency Response Guidebook**

   caustic soda, solid
   https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg

3. **ILO International Chemical Safety Cards (ICSC)**

SODIUM HYDROXIDE
http://www.ilo.org/dyn/icsc/showcard.display?p_version=2&p_card_id=0360

4. **NJDOH RTK Hazardous Substance List**

   sodium hydroxide
   http://nj.gov/health/eoh/rtkweb/documents/fs/1706.pdf

5. **DrugBank**

   Sodium hydroxide
   http://www.drugbank.ca/drugs/DB11151

6. **HSDB**

   SODIUM HYDROXIDE
   https://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+@rel+1310-73-2

7. **Occupational Safety and Health Administration (OSHA)**

   SODIUM HYDROXIDE
   http://www.osha.gov/chemicaldata/chemResult.html?RecNo=211

8. **The National Institute for Occupational Safety and Health (NIOSH)**

   Sodium hydroxide
   https://www.cdc.gov/niosh/npg/npgd0565.html

   Sodium hydroxide
   https://www.cdc.gov/niosh-rtecs/WB4AC4A0.html

9. **EU Food Improvement Agents**

   SODIUM HYDROXIDE
   http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32012R0231

10. **CDC-ATSDR Toxic Substances Portal**

    Sodium Hydroxide
    https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=45

11. **ChEBI**

    Sodium hydroxide
    http://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI:32145

    ChEBI Ontology
    http://www.ebi.ac.uk/chebi/userManualForward.do#ChEBI%20Ontology

12. **ChemIDplus**

    Sodium hydroxide [NF]
    https://chem.nlm.nih.gov/chemidplus/sid/0001310732

    ChemIDplus Chemical Information Classification
    https://chem.sis.nlm.nih.gov/chemidplus/

13. **DTP/NCI**

    SODIUM HYDROXIDE
    https://dtp.cancer.gov/dtpstandard/servlet/dwindex?searchtype=NSC&outputformat=html&searchlist=135799

14. **EPA Chemicals under the TSCA**

    > **LICENSE**
    > https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources

    Sodium hydroxide (Na(OH))
    https://www.epa.gov/chemicals-under-tsca

15. **EPA DSSTox**

    Sodium hydroxide
    https://comptox.epa.gov/dashboard/DTXSID0029634

16. **European Chemicals Agency (ECHA)**

    > LICENSE
    >
    > https://echa.europa.eu/web/guest/legal-notice

    Sodium hydroxide
    https://echa.europa.eu/substance-information/-/substanceinfo/100.013.805

    Caustic Soda 50%
    https://echa.europa.eu/information-on-chemicals

    Sodium hydroxide
    https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/134413

    Ascarite
    https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/219535

17. **EPA Chemical and Products Database (CPDat)**

    > LICENSE
    > https://www.epa.gov/privacy/privacy-act-laws-policies-and-resources

    sodium hydroxide
    https://comptox.epa.gov/dashboard/DTXSID0029634#exposure

    EPA CPDat Classification
    https://www.epa.gov/chemical-research/chemical-and-products-database-cpdat

18. **EPA Safer Choice**

    Sodium hydroxide
    https://www.epa.gov/saferchoice/safer-ingredients

    EPA Safer Chemical Ingredients Classification
    https://www.epa.gov/saferchoice

19. **EU Pesticides Database**

    Sodium hydroxide
    http://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/public/?event=activesubstance.detail&language=EN&selectedID=1868

20. **FAO/WHO Food Additive Evaluations (JECFA)**

    CAUSTIC SODA
    http://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=1388

21. **NLM Household Products Database**

    Sodium hydroxide
    https://hpd.nlm.nih.gov/cgi-bin/household/brands?tbl=chem&id=19

    Household Products Classification
    https://hpd.nlm.nih.gov/

22. **Wikipedia**

    sodium hydroxide
    https://en.wikipedia.org/wiki/Sodium_hydroxide

23. **EU REGULATION (EC) No 1272/2008**

sodium hydroxide;caustic soda
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.115.01.0001.01.ENG

24. **Hazardous Chemical Information System (HCIS), Safe Work Australia**

sodium hydroxide
http://hcis.safeworkaustralia.gov.au/HazardousChemical/Details?chemicalID=4177

25. **NITE-CMC**

Sodium hydroxide
http://www.safe.nite.go.jp/english/ghs/09-mhlw-2010e.html

26. **FDA Center for Food Safety and Applied Nutrition (CFSAN)**

SODIUM HYDROXIDE
https://www.accessdata.fda.gov/scripts/fdcc/?set=FoodSubstances&id=SODIUMHYDROXIDE

27. **FDA/SPL Indexing Data**

55X04QC32I
https://www.fda.gov/ForIndustry/DataStandards/SubstanceRegistrationSystem-UniqueIngredientIdentifierUNII/

28. **NIOSH Manual of Analytical Methods**

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> https://www.cdc.gov/Other/disclaimer.html

1310-73-2
https://www.cdc.gov/niosh/docs/2003-154/pdfs/7401.pdf

29. **Pistoia Alliance Chemical Safety Library**

METHANOL; 5-METHYLISOXAZOLE; SODIUM HYDROXIDE
http://www.pistoiaalliance.org/projects/chemical-safety-library/

30. **SpectraBase**

https://spectrabase.com/spectrum/2qe0C1Yik8K

31. **Springer Nature**

32. **Thieme Chemistry**

33. **MeSH**

Sodium Hydroxide
https://www.ncbi.nlm.nih.gov/mesh/68012972

MeSH Tree
http://www.nlm.nih.gov/mesh/meshhome.html

Caustics
https://www.ncbi.nlm.nih.gov/mesh/68002424

34. **PubChem**

https://pubchem.ncbi.nlm.nih.gov

35. **KEGG**

Therapeutic category of drugs in Japan
http://www.genome.jp/kegg-bin/get_htext?br08301.keg

Drugs listed in the Japanese Pharmacopoeia
http://www.genome.jp/kegg-bin/get_htext?br08311.keg

Pharmaceutical additives in Japan
http://www.genome.jp/kegg-bin/get_htext?br08316.keg

36. **WIPO**
International Patent Classification
http://www.wipo.int/classifications/ipc/

37. **UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)**
GHS Classification Tree
http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html