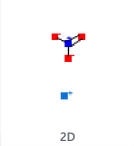
COVID-19 Information
Public health information (CDC) Research information (NIH) SARS-CoV-2 data (NCBI) Prevention and treatment information (HHS) Español

PubChem

COMPOUND SUMMARY

Sodium nitrate

PubChem CID	24268
Structure	 2D Find Similar Structures
Chemical Safety	 Oxidizer Irritant Laboratory Chemical Safety Summary (LCSS) Datasheet
Molecular Formula	$NaNO_3$ or $NNaO_3$
Synonyms	SODIUM NITRATE 7631-99-4 Nitrate of soda Chile saltpeter Cubic niter More...
Molecular Weight	84.995
Component Compounds	CID 5360545 (Sodium)  CID 944 (Nitric acid)
Dates	Modify 2021-05-22 Create 2005-08-08

Sodium nitrate appears as a white crystalline solid. Noncombustible but accelerates the burning of combustible materials. If large quantities are involved in fire or the combustible material is finely divided an explosion may result. May explode under prolonged exposure to heat or fire. Toxic oxides of nitrogen are produced in fires. Used in solid propellants, explosives, fertilizers, and for many other uses.

▸ CAMEO Chemicals

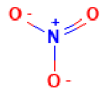
Sodium nitrate is the inorganic nitrate salt of sodium. It has a role as a fertilizer. It is an inorganic sodium salt and an inorganic nitrate salt.

▸ ChEBI

1 Structures

1.1 2D Structure

Chemical Structure Depiction



PubChem

1.2 3D Status

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

PubChem

2 Names and Identifiers

2.1 Computed Descriptors

2.1.1 IUPAC Name

sodium;nitrate

Computed by LexiChem 2.6.6 (PubChem release 2019.06.18)

PubChem

2.1.2 InChI

InChI=1S/NO3.Na/c2-1(3)4;/q-1;+1

Computed by InChI 1.0.5 (PubChem release 2019.06.18)

PubChem

2.1.3 InChI Key

VWDWKYIASSYTQR-UHFFFAOYSA-N

Computed by InChI 1.0.5 (PubChem release 2019.06.18)

PubChem

2.1.4 Canonical SMILES

[N+](=O)([O-])[O-].[Na+]

Computed by OEChem 2.1.5 (PubChem release 2019.06.18)

PubChem

2.2 Molecular Formula

NaNO3

ILO International Chemical Safety Cards (ICSC); Wikipedia

NNaO3

Computed by PubChem 2.1 (PubChem release 2019.06.18)

PubChem

2.3 Other Identifiers

2.3.1 CAS

7631-99-4

CAMEO Chemicals; ChemIDplus; DrugBank; EPA Chemicals under the TSCA; EPA DSSTox; European Chemicals Agency (ECHA); Hazardous Substances Data Bank (HSDB); ILO International Chemical Safety Cards (ICSC); The Na

2.3.2 Deprecated CAS

862599-22-2, 1401517-04-1

ChemIDplus

2.3.3 European Community (EC) Number

231-554-3

European Chemicals Agency (ECHA)

2.3.4 ICSC Number

0185

ILO International Chemical Safety Cards (ICSC)

2.3.5 RTECS Number

WC5600000

The National Institute for Occupational Safety and Health (NIOSH)

2.3.6 UN Number

1498

CAMEO Chemicals; DOT Emergency Response Guidebook; ILO International Chemical Safety Cards (ICSC)

2.3.7 UNII

8M4L3H2ZVZ

FDA/SPL Indexing Data

2.3.8 DSSTox Substance ID

DTXSID6020937

EPA DSSTox

2.3.9 Wikipedia

Sodium nitrate

Wikipedia

2.4 Synonyms

2.4.1 MeSH Entry Terms

sodium nitrate

Medical Subject Headings (MeSH)

2.4.2 Depositor-Supplied Synonyms

SODIUM NITRATE	UNII-8M4L3H2ZVZ	Nitrate, sodium	UN1498	INS-251
7631-99-4	MFCD00011119	Sodium nitrate, 99+%, ACS reagent	EPA Pesticide Chemical Code 076104	Sodium nitrate, ACS reagent grade
Nitrate of soda	8M4L3H2ZVZ	Sodium nitrate, 99+%, for analysis	DSSTox_CID_937	Sodium nitrate, analytical standard
Chile saltpeter	Chili Saltpeter	Saltpeter (Chile) (VAN)	ACMC-1BI1Q	Sodium nitrate, AR, >=99.5%
Cubic niter	CHEMBL1644698	Nitrate de sodium [French]	EC 231-554-3	Tox21_202595
Sodium saltpeter	CHEBI:63005	Sodium nitrate, 99+%, for biochemistry	sodium trioxidonitrate(1-)	AKOS015902552
Nitrate de sodium	Sodium nitrate, extra pure	CCRIS 558	DSSTox_RID_75877	AKOS025243988
Nitric acid, sodium salt	Na (N O3)	HSDB 726	DSSTox_GSID_20937	Sodium nitrate, BioXtra, >=99.0%
Nitric acid monosodium salt	Sodium nitrate(DOT)	NaNO3	Sodium nitrate, ACS reagent	Sodium nitrate, beads, 1-2 mm, 98%
Sodium(I) nitrate (1:1)	Caswell No. 781	Sodium nitrate, 99.999%, (trace metal basis)	INS NO.251	Sodium nitrate, containing in the dry state more than 16,3 per cent by
sodium;nitrate	sodiumnitrate	EINECS 231-554-3	Sodium nitrate, LR, >=98%	NCGC00260143-01
Nitric acid sodium salt (1:1)	Chile salpeter	NSC 77390	DTXSID6020937	Sodium nitrate [UN1498] [Oxidizer]

PubChem

3 Chemical and Physical Properties

3.1 Computed Properties

Property Name	Property Value	Reference
Molecular Weight	84.995	Computed by PubChem 2.1 (PubChem release 2021.05.07)
Hydrogen Bond Donor Count	0	Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18)
Hydrogen Bond Acceptor Count	3	Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18)
Rotatable Bond Count	0	Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18)
Exact Mass	84.97758714	Computed by PubChem 2.1 (PubChem release 2021.05.07)
Monoisotopic Mass	84.97758714	Computed by PubChem 2.1 (PubChem release 2021.05.07)
Topological Polar Surface Area	62.9 Å²	Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18)
Heavy Atom Count	5	Computed by PubChem
Formal Charge	0	Computed by PubChem
Complexity	18.8	Computed by Cactvs 3.4.6.11 (PubChem release 2019.06.18)
Isotope Atom Count	0	Computed by PubChem
Defined Atom Stereocenter Count	0	Computed by PubChem
Undefined Atom Stereocenter Count	0	Computed by PubChem
Defined Bond Stereocenter Count	0	Computed by PubChem
Undefined Bond Stereocenter Count	0	Computed by PubChem
Covalently-Bonded Unit Count	2	Computed by PubChem
Compound Is Canonicalized	Yes	Computed by PubChem (release 2019.01.04)

PubChem

3.2 Experimental Properties

3.2.1 Physical Description

Sodium nitrate appears as a white crystalline solid. Noncombustible but accelerates the burning of combustible materials. If large quantities are involved in fire or the combustible material is finely divided an explosion may result. May explode under prolonged exposure to heat or fire. Toxic oxides of nitrogen are produced in fires. Used in solid propellants, explosives, fertilizers, and for many other uses.

CAMEO Chemicals

DryPowder; DryPowder, PelletsLargeCrystals; Liquid; OtherSolid; PelletsLargeCrystals

EPA Chemicals under the TSCA

COLOURLESS HYGROSCOPIC CRYSTALS.

ILO International Chemical Safety Cards (ICSC)

3.2.2 Color/Form

Colorless, trigonal or rhombohedron crystals

Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 10th ed. Volumes 1-3 New York, NY: John Wiley & Sons Inc., 1999., p. V3: 3264

Hazardous Substances Data Bank (HSDB)

White granules or powder

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

3.2.3 Odor

Odorless

Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 10th ed. Volumes 1-3 New York, NY: John Wiley & Sons Inc., 1999., p. V3: 3264

Hazardous Substances Data Bank (HSDB)

3.2.4 Taste

Saline, slightly bitter taste

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 14th Edition. John Wiley & Sons, Inc. New York, NY 2001., p. 1019

Hazardous Substances Data Bank (HSDB)

3.2.5 Boiling Point

Decomposes 716° 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.

CAMEO Chemicals

380 °C with decomp

Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 10th ed. Volumes 1-3 New York, NY: John Wiley & Sons Inc., 1999., p. V3: 3264

Hazardous Substances Data Bank (HSDB)

3.2.6 Melting Point

584.2 °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.

CAMEO Chemicals

308 °C

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB); ILO International Chemical Safety Cards (ICSC)

3.2.7 Solubility

...is soluble in liquid ammonia and forms Na NO3.4NH3 below -42 °C. The solubility in anhydrous methanol is 2.8 wt% at 25 °C.

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA17: 266 (1991)

Hazardous Substances Data Bank (HSDB)

Slightly soluble in ethanol and methanol

Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 4-87

Hazardous Substances Data Bank (HSDB)

91.2 g/100g water at 25 °C

Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 4-87

Hazardous Substances Data Bank (HSDB)

1 g dissolves in 125 ml alcohol, 52 ml boiling alcohol, 3470 ml absolute alcohol, 300 ml methanol, 1.1 ml water

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

In water, 730,000 mg/L at 0 °C

Shiu WY et al; Rev Environ Contam Toxicol 116:166 (1990)

Hazardous Substances Data Bank (HSDB)

Solubility in water, g/100ml at 25 °C: 92.1

ILO International Chemical Safety Cards (ICSC)

3.2.8 Density

2.26 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.

CAMEO Chemicals

2.26

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

2.3 g/cm^3

ILO International Chemical Safety Cards (ICSC)

3.2.9 Decomposition

... /Sodium nitrate/ decomposes on heating producing nitrogen oxides and oxygen, which increases fire hazard.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

Hazardous Substances Data Bank (HSDB)

When heated to decomposition it emits toxic fumes of /nitrogen oxide and 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. 3265

Hazardous Substances Data Bank (HSDB)

380 °C

ILO International Chemical Safety Cards (ICSC)

3.2.10 Viscosity

2.85 cP at 590 K; 1.53 cP at 730 K

Pokorny L et al; Kirk-Othmer Encyclopedia of Chemical Technology. (2005). NY, NY: John Wiley & Sons; Sodium Nitrate and Nitrite. Online Posting Date: Jan 27, 2006.

Hazardous Substances Data Bank (HSDB)

3.2.11 pH

Aq soln is neutral

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

3.2.12 Refractive Index

Index of refraction = 1.587 (trigonal); 1.336 (rhombohedral)

Pokorny L et al; Kirk-Othmer Encyclopedia of Chemical Technology. (2005). NY, NY: John Wiley & Sons; Sodium Nitrate and Nitrite. Online Posting Date: Jan 27, 2006.

Hazardous Substances Data Bank (HSDB)

3.2.13 Other Experimental Properties

Dissolved in **water** temp of soln is lowered; deliquesces in moist air

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

Liquid Molar volume = 0.044616 cu m/kmol

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

Hazardous Substances Data Bank (HSDB)

Heat of formation = -4.6785X10+8 J/kmol

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

Hazardous Substances Data Bank (HSDB)

Heat of fusion at 580.15 deg K = 1.4602X10+7 J/kmol

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

Hazardous Substances Data Bank (HSDB)

Heat capacity of solid = 1.035 +/-0.005 J/g at 0 °C, 1.23 +/-0.006 J/g at 100 °C; heat capacity of liquid = 1.80 +/-0.02 J/g at 350 °C; heat capacity of aqueous solution = 4.138 +/-3.045 J/g.

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

Hazardous Substances Data Bank (HSDB)

Enthalpy of formation = -466.8 kJ/mol

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA17: 266 (1991)

Hazardous Substances Data Bank (HSDB)

Enthalpy of fusion = +15.7 kJ/mol

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA17: 266 (1991)

Hazardous Substances Data Bank (HSDB)

Specific heat capacity = 93.1 J/mol-K at 298 deg K

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA17: 266 (1991)

Hazardous Substances Data Bank (HSDB)

4 Spectral Information

4.1 1D NMR Spectra

4.1.1 15N NMR Spectra

Copyright	Copyright © 2016-2020 W. Robien, Inst. of Org. Chem., Univ. of Vienna. All Rights Reserved.
Thumbnail	

SpectraBase

4.2 IR Spectra

4.2.1 FTIR Spectra

Showing 2 of 3 View More

Technique	KBr WAFER
Source of Sample	Mallinckrodt Inc., St. Louis, Missouri
Copyright	Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

Technique	KBr WAFER
Source of Sample	Mallinckrodt Inc., St. Louis, Missouri
Copyright	Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

4.2.2 ATR-IR Spectra

Source of Sample	Aldrich
Catalog Number	229938
Copyright	Copyright © 2018-2020 Sigma-Aldrich Co. LLC. - Database Compilation Copyright © 2018-2020 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

4.3 Raman Spectra

Instrument Name	Bio-Rad FTS 175C with Raman accessory
Technique	FT-Raman
Source of Sample	Mallinckrodt Inc., St. Louis, Missouri
Copyright	Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

Instrument Name	Bio-Rad FTS 175C with Raman accessory
Technique	FT-Raman
Source of Sample	Mallinckrodt Inc., St. Louis, Missouri
Copyright	Copyright © 1980, 1981-2020 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

SpectraBase

5 Related Records

5.1 Related Compounds with Annotation

PubChem

5.2 Component Compounds

CID 5360545 (Sodium)


CID 944 (Nitric acid)

PubChem

5.3 Related Compounds

Same Connectivity	3 Records
Mixtures, Components, and Neutralized Forms	2 Records
Similar Compounds	5 Records

PubChem

5.4 Substances

5.4.1 Related Substances

Same	134 Records

PubChem

5.4.2 Substances by Category

PubChem

5.5 Entrez Crosslinks

PubMed	10 Records

Taxonomy	2 Records
Gene	38 Records

PubChem

5.6 Associated Chemicals

Nitrate ion;14797-55-8

Hazardous Substances Data Bank (HSDB)

6 Chemical Vendors

PubChem

7 Drug and Medication Information

7.1 Clinical Trials

7.1.1 ClinicalTrials.gov

ClinicalTrials.gov

7.1.2 EU Clinical Trials Register

EU Clinical Trials Register

7.2 Reported Fatal Dose

3= MODERATELY TOXIC: Probable oral lethal dose (human) 0.5-5 g/kg, Between 1 ounce and 1 pint (or 1 lb) for 79 kg person (150 lb).

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-124

Hazardous Substances Data Bank (HSDB)

8 Food Additives and Ingredients

8.1 Food Additive Classes

JECFA Functional Classes

Food Additives -> COLOUR_RETENTION_AGENT; PRESERVATIVE

Joint FAO/WHO Expert Committee on Food Additives (JECFA)

8.2 FDA Substances Added to Food

Substance	SODIUM NITRATE
Used for (Technical Effect)	PROPELLANT
Document Number (21 CFR)	172.170 172.175 173.310 175.105 176.180 176.320 181.33 181.34

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	CHILE SALTPETRE
Evaluation Year	1995
ADI	0-3.7 mg/kg bw
Comments	Expressed as nitrate ion; ADI does not apply to infants below the age of 3 months
Report	TRS 859-JECFA 44/29,32

Joint FAO/WHO Expert Committee on Food Additives (JECFA)

9 Pharmacology and Biochemistry

9.1 MeSH Pharmacological Classification

Carcinogens

Substances that increase the risk of NEOPLASMS in humans or animals. Both genotoxic chemicals, which affect DNA directly, and nongenotoxic chemicals, which induce neoplasms by other mechanism, are included. (See **all compounds classified as Carcinogens**.)

▸ Medical Subject Headings (MeSH)

9.2 Absorption, Distribution and Excretion

In humans, ingested **nitrate** is rapidly absorbed from the proximal small bowel and distributed throughout the body. **Nitrate** then enters the large bowel from the blood, where it is rapidly converted to highly reactive **nitrite**, in part by fecal microorganisms. The formed **nitrite** is reabsorbed into the blood, where it reacts with the **ferrous** (Fe2+) **iron** of deoxyhemoglobin, forming methemoglobin with **iron** in the **ferric** (Fe3+) valence state. **Ferric iron** is unable to transport **oxygen**. Nitrates are rapidly converted in the liver to denitrated metabolites and inorganic nitrites, which are then excreted in urine. Approximately 60% to 70% of an ingested **nitrate** dose is excreted in urine within the first 24 hours. About 25% is excreted in saliva through an active blood **nitrate** transport system and potentially is reabsorbed. Half-lives of parent **nitrate** compounds are usually <1 hour; half-lives of metabolites range from 1 to 8 hours. /Nitrates/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 9. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

▸ Hazardous Substances Data Bank (HSDB)

... **Nitrate** is concentrated in saliva, where a part of it is reduced to **nitrite** by bacterial **nitrate** reductases. /The authors/ tested if ingestion of inorganic **nitrate** would affect the salivary and systemic levels of **nitrite** and S-nitrosothiols, both considered to be circulating storage pools for NO. Levels of **nitrate**, **nitrite**, and S-nitrosothiols were measured in plasma, saliva, and urine before and after ingestion of sodium nitrate (10 mg/kg). **Nitrate** levels increased greatly in saliva, plasma, and urine after the **nitrate** load. Salivary S-nitrosothiols also increased, but plasma levels remained unchanged. A 4-fold increase in plasma **nitrite** was observed after **nitrate** ingestion. If, however, the test persons avoided swallowing after the **nitrate** load, the increase in plasma **nitrite** was prevented, thereby illustrating its salivary origin. We show that **nitrate** is a substrate for systemic generation of **nitrite**. There are several pathways to further reduce this **nitrite** to NO. These results challenge the dogma that **nitrate** is biologically inert and instead suggest that a complete reverse pathway for generation of NO from **nitrate** exists.

PMID:15223073
Lundberg JO, Govoni M; Free Radic Biol Med 37 (3): 395-400 (2004)

▸ Hazardous Substances Data Bank (HSDB)

Nitrite was quickly eliminated from blood plasma of sheep (T1/2 = 0.49 hr). Three hours after its administration, **nitrite** ion disappeared from blood plasma. Simultaneously the appearance of **nitrate** was observed. After **sodium nitrite** or **nitrate** intravenous administration, the kinetic parameters for **nitrate** were similar (Kel = 0.150/ h and 0.154/ hr, respectively). Urine excretion of **nitrite** amounted to only 0.29%+/- 0.22 of the administered dose. Urine excretion of **nitrate** was 13.80%+/-5.78 of the administered dose of **nitrite** and was slightly lower than that observed after the administration of **nitrate** (16.12%+/- 6.95). The quick elimination of **nitrite** appears to be mainly from its conversion into **nitrate**, because the **nitrate** elimination in urine. as well as the values of its kinetic parameters, were similar after the administration of **nitrite** or **nitrate**. Elimination of **nitrate** from blood plasma of sheep over 80% was different than its excretion in urine in the unchanged.

Lewicki J et al; Small Ruminant Res; 13 (2). 141-6 (1994)

▸ Hazardous Substances Data Bank (HSDB)

... **Sodium** ... **nitrate** /is/ for the most part rapidly absorbed & excreted unchanged ... /following oral ingestion/.

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. III-316

▸ Hazardous Substances Data Bank (HSDB)

For more Absorption, Distribution and Excretion (Complete) data for SODIUM NITRATE (10 total), please visit the **HSDB record page**.

▸ Hazardous Substances Data Bank (HSDB)

9.3 Metabolism/Metabolites

Transformation of **nitrate** to **nitrite** usually occurs within alimentary tract. **Nitrite** is intermediary product in redn of **nitrate** to **ammonia** within rumen of sheep & cow: it appears that above certain concn of **nitrate**, rate of redn of **nitrite** to **ammonia** becomes limiting & ... **nitrite** accumulates. Danger of **nitrate** poisoning is considered slight if **nitrate** is reduced in rumen or if complete redn to **ammonia** occurs rapidly ... /Inorganic nitrate salts/

Clarke, M. L., D. G. Harvey and D. J. Humphreys. Veterinary Toxicology. 2nd ed. London: Bailliere Tindall, 1981., p. 66

▸ Hazardous Substances Data Bank (HSDB)

... Bacterial redn of **nitrate** to **nitrite** in human stomach was reported ... & **n-nitrosodiphenylamine** was identified in stomach contents of 31 human subjects who had received sodium nitrate & **diphenylamine** intragastrically.

Searle, C. E. (ed.). Chemical Carcinogens. ACS Monograph 173. Washington, DC: American Chemical Society, 1976., p. 590

▸ Hazardous Substances Data Bank (HSDB)

Where bacteria are present and the environment can be anaerobic, **nitrate** can be reduced to **nitrite**. The main site for this reaction is mouth and stomach, but **nitrite** formation in the lower intestine and in the bladder (urinary infection) may also be of some toxicological importance. **Nitrite** may be further reduced to **nitrogen** by bacteria under some conditions. In blood, **nitrite** transforms hemoglobin to methemoglobin and is simultaneously oxidized to **nitrate**. Normally methemoglobin gradually reverts to hemoglobin through enzymatic reactions. **Nitrite** has vasodilating properties, probably through transformation into **nitric oxide** (NO) or a NO-containing molecule acting as a signal factor for smooth muscle relaxation. **Nitrite** easily transforms into a nitrosating agent in an acidic environment and can react with a variety of compounds, eg **ascorbic acid**, amines, amides. Nitrosation can also be mediated by bacteria, eg in the stomach. Some reaction products are carcinogenic (eg most nitrosoamines and amides). /**Nitrate** and **nitrite**/

*IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: **http://www.inchem.org/documents/pims/chemical/pimg016.htm***

▸ Hazardous Substances Data Bank (HSDB)

Nitrate salts as such are no more toxic than other neutral salts, but if not promptly absorbed, they may be reduced to nitrites by bacteria in the bowel ... /**Nitrate** salts/

Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. 124

▸ Hazardous Substances Data Bank (HSDB)

... Nitrates generally produce methemoglobinemia when they are changed into nitrites under the influence of a bacterial proliferation of of a reductase held in plants. It happens with spinach and carrot soup. /Nitrates/

European Chemicals Bureau; IUCLID Dataset, Potassium nitrate (7757-79-1) (2000 CD-ROM edition). Available from, as of October 26, 2006: http://esis.jrc.ec.europa.eu/

Hazardous Substances Data Bank (HSDB)

Volunteers received meals with different nitrate contents ... (i) fish with high-nitrate vegetables (ii) fish with low-nitrate vegetables, or (iii) meat or eggs with high-nitrate vegetables. At 0.5 to 2 hr after consumption, dimethylnitrosamine levels up to 7.6, 3.7 and 0.9 ug/kg gastric liquid were found for the three meals, respectively. In some cases, peaks of 16 to 30 ug/kg were found 4 to 5 hr after consumption of the meal with fish and high-nitrate vegetables. A large inter-individual variation in nitrosamine formation was observed. In some cases, diethylnitrosamine was detected at concentrations of up to 13 ug/kg, 0.53 hr after consumption of the meal with fish and high-nitrate vegetables. Dipropyl- and dibutylnitrosamine, N-nitrosopiperidine, N-nitroso-morpholine and N-nitrosopyrrolidine were not detected. In fasting gastric juice, < 0.2 to 0.7 ug dimethylnitrosamine/kg was found. /Nitrate/

WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 27, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm

Hazardous Substances Data Bank (HSDB)

No or very slight increase in blood nitrosamine level was found in human subjects after consumption of nitrate-, nitrite-, and/or amine-rich meals /Nitrate, nitrite, and amine/

WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 27, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm

Hazardous Substances Data Bank (HSDB)

Nitrate, either ingested or secreted into the mouth, is partly reduced by oral bacteria into nitrite; the resulting mixture is swallowed and passes into the gastrointestinal system from which most is absorbed into the general circulation. Nitrite in plasma is converted by a rapid reaction with oxyhemoglobin into nitrate and this cycle then continues. Plasma nitrate and plasma nitrite levels are typically in the micromolar and nanomolar range, respectively. Thus, in the classic model, nitrate/nitrite exists primarily as nitrate, which is the end-product of what has often been considered to be a detoxification and/or elimination mechanism for nitric oxide and nitrite.

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: http://monographs.iarc.fr/ENG/Classification/index.php, p. V. 94: p. 272(2010)

Hazardous Substances Data Bank (HSDB)

9.4 Mechanism of Action

There is an active endogenous nitrogen cycle in humans that involves nitrate and nitrite, which are interconvertible in vivo. Nitrosating agents that arise from nitrite under acidic gastric conditions react readily with nitrosatable compounds, especially secondary amines and amides, to generate N-nitroso compounds. These nitrosating conditions are enhanced following ingestion of additional nitrate, nitrite or nitrosatable compounds. Some of the N-nitroso compounds that could be formed in humans under these conditions are known carcinogens.

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: http://monographs.iarc.fr/ENG/Classification/index.php, p. V. 94: p. 323 (2010)

Hazardous Substances Data Bank (HSDB)

The principal mechanism of nitrite toxicity is the oxidation of the ferrous iron (Fe2+) in deoxyhemoglobin to the ferric (Fe3+) valence state, producing methemoglobin. /Nitrates and nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY.p 9-11. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

... The major concern of possible long-term effects of exposure to nitrate and nitrite is associated with formation of nitroso compounds, many of which are carcinogenic. This formation may take place wherever nitrite and nitrosable compounds are present, but it is favored by acidic conditions or the presence of some bacteria. The gastrointestinal tract and especially the stomach is regarded as the main formation site, but nitrosation reactions can also take place in an infected urinary bladder ... /Nitrate and nitrite poisoning/

IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: http://www.inchem.org/documents/pims/chemical/pimg016.htm

Hazardous Substances Data Bank (HSDB)

Nitrates can be reduced to nitrites which can react with amines or amides and form N-nitroso cmpd (containing the group =N-N=O). N-nitroso cmpd are carcinogenic in a wide range of animal species, most are mutagenic in test systems and some have been teratogenic in animals. It is highly probable that N-nitroso cmpd also may be carcinogenic in man. Therefore exposure to N-nitroso cmpd and their precursors (nitrite, amines and amides) should be kept as low as practically achievable. Relationships have been sought between occurrence of stomach cancer and nitrate content of soil and water in Chile, Colombia and the United Kingdom, but none was established. /Nitrate/

European Chemicals Bureau; IUCLID Dataset, Potassium nitrate (7757-79-1) (2000 CD-ROM edition). Available from, as of October 26, 2006: http://esis.jrc.ec.europa.eu/

Hazardous Substances Data Bank (HSDB)

10 Use and Manufacturing

10.1 Use Classification

EPA Safer Chemical Functional Use Classes -> Oxidants and Oxidant Stabilizers;Preservatives and Antioxidants

- EPA Safer Choice

Safer Chemical Classes -> Yellow triangle - The chemical has met Safer Choice Criteria for its functional ingredient-class, but has some hazard profile issues

- EPA Safer Choice

Food Additives -> COLOUR_RETENTION_AGENT; PRESERVATIVE -> JECFA Functional Classes

- Joint FAO/WHO Expert Committee on Food Additives (JECFA)

10.2 Uses

EPA CPDat Chemical and Product Categories

- EPA Chemical and Products Database (CPDat)

For sodium nitrate (USEPA/OPP Pesticide Code: 76104) 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 Nitrate (7631-99-4). Available from, as of October 11, 2006: **http://npirspublic.ceris.purdue.edu/ppis/***

- Hazardous Substances Data Bank (HSDB)

The first registered pesticide product containing **sodium** or **potassium nitrate** dates from 1948. Currently /as of 1991/, there are a total of six registered products for these two active ingredients. All currently registered products are pyrotechnic fumigants designed to be ignited and placed in burrows thereby delivering lethal doses of toxic gases for the control of various rodents, coyotes and ground wasps, as well as skunks.

*USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic Nitrate/Nitrite (Sodium and Potassium Nitrates), September 1991. Available from, as of October 11, 2006: **http://www.epa.gov/pesticides/reregistration/status.htm***

- Hazardous Substances Data Bank (HSDB)

Manufacture of **nitric acid** and as catalyst in the manufacture of **sulfuric acid**. Manufacture **sodium nitrite**, glass, enamels for pottery; in matches; for improving burning properties of tobacco; pickling meats; as color fixative in meats. Clinical reagent (parasites). Technical grade is used as fertilizer.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

- Hazardous Substances Data Bank (HSDB)

Fertilizer for cotton, tobacco & vegetable crops; oxidizing component of explosives & blasting agents; oxidizer & fluxing agent in the mfr of glass & enamels; component of **charcoal** briquettes, heat-transfer salt; curing agent & preservative in meats; chem for recovery of **tin** from scrap; oxidizing agent (eg, in metal coloring solns); chem int (eg, for **potassium nitrate**)

SRI

- Hazardous Substances Data Bank (HSDB)

Oxidizing agent in manufacture of pharmaceuticals, anaphrodisiac, ... modifying burning properties of tobacco

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 14th Edition. John Wiley & Sons, Inc. New York, NY 2001., p. 1019

- Hazardous Substances Data Bank (HSDB)

More than half of the sodium nitrate produced worldwide (including Chile saltpeter) is used as a fertilizer for crops such as cotton, tobacco, and vegetables ... In Europe and the United States, sodium nitrate is of minor importance compared to other fertilizers. The major industrial use of sodium nitrate is in the explosives industry.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 686 (2003)

- Hazardous Substances Data Bank (HSDB)

... It is ... used in the manufacture of ... **nitrous oxide** ... pyrotechnics ... freezing mixtures and special cements ... as a coloring and preserving additive to food, for coagulation of latexes, in the nuclear industry and for ... and corrosion control in aqueous systems. /**Nitrate**/

*IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: **http://www.inchem.org/documents/pims/chemical/pimg016.htm***

- Hazardous Substances Data Bank (HSDB)

10.2.1 Industry Uses

Adhesives and sealant chemicals	Solvents (for cleaning and degreasing)
Agricultural chemicals (non-pesticidal)	Viscosity adjustors
Explosive Materials	
Explosives Manufacturing	
Explosives Materials	
Finishing agents	
Intermediates	
Odor agents	
Oxidizing/reducing agents	
Plasticizers	
Plating agents and surface treating agents	
Process regulators	
Processing aids, not otherwise listed	

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

EPA Chemicals under the TSCA

10.2.2 Consumer Uses

Adhesives and sealants
Agricultural products (non-pesticidal)
Building/construction materials not covered elsewhere
Cleaning and furnishing care products
Explosive materials
Metal products not covered elsewhere
Water treatment products

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

EPA Chemicals under the TSCA

10.3 Methods of Manufacturing

.../It is/ produced synthetically by reacting **nitric acid** with **sodium carbonate**.

Farm Chemicals Handbook 1983. Willoughby, Ohio: Meister Publishing Co., 1983., p. B-57

Hazardous Substances Data Bank (HSDB)

Neutralization of **nitric acid** with **sodium carbonate** or **sodium hydroxide**, extraction from the ore with a **brine** followed by fractional crystallization (non-U.S. method).

SRI

Hazardous Substances Data Bank (HSDB)

... Production of Chile saltpeter from caliche ... Warm (40 - 45 °C) mother liquor recycled to leaching contains ca. 330 g/L of sodium nitrate. The leaching process is performed in a series of vats, each having a capacity of ca. 1,000 tons of crushed ore. The underflow of each vat is heated before passing to the next one since the dissolution of sodium nitrate is endothermic. Sodium nitrate therefore dissolves preferentially. The product solution obtained after leaching contains 450 g/L of sodium nitrate and is cooled to 5 - 10 °C in heat exchangers and with **ammonia** refrigerating equipment. The mother liquor obtained after centrifugation of crystallized sodium nitrate is heated to 40 - 45 °C with heat from the condensers in the **ammonia** chilling loop and then with cooling **water** from the diesel engines used to generate electric power. Crystalline sodium nitrate obtained after centrifugation contains 3.0 - 3.5 % moisture; it is generally melted at ca. 340 °C and prilled. The granulated product contains only about 1 % **sodium chloride**. ... Large modern plants also produce coarse crystals of Chile saltpeter, which do not require further processing by melting.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 683 (2003)

Hazardous Substances Data Bank (HSDB)

The most important method for producing synthetic sodium nitrate is the reaction of tail gases from **nitric acid** plants with **sodium hydroxide** or **sodium carbonate** solution. This method is, however, intended for tail-gas clean-up (removal of nitrogen oxides) rather than for **nitrate** and **nitrite** production.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 684 (2003)

Hazardous Substances Data Bank (HSDB)

10.4 Impurities

Granulated sodium nitrate from Chile saltpeter contains 98.32 wt% NaNO3, 0.67 wt% NaCl, 0.24 wt% Na2B4O7, 0.03 wt% NaIO3, 0.17 wt% moisture, and 0.57 wt% undetermined. /From table/

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 684 (2003)

Hazardous Substances Data Bank (HSDB)

10.5 Formulations/Preparations

Association of American Plant Food Control Officials defines /sodium nitrate/...as follows: Nitrate of soda (sodium nitrate) is chiefly the **sodium** salt of **nitric acid**. It shall contain not less than 16% nitrate nitrogen & 26% **sodium**.

Farm Chemicals Handbook 1983. Willoughby, Ohio: Meister Publishing Co., 1983., p. B-57

Hazardous Substances Data Bank (HSDB)

Purified grade contains at least 99% sodium nitrate.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

Grade: Granular, sticks, powder; crude; 99.5%; double refined; recrystallized; CP; technical; reagent; diuretic; FCC.

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 14th Edition. John Wiley & Sons, Inc. New York, NY 2001., p. 1019

Hazardous Substances Data Bank (HSDB)

Chile saltpeter is marketed as both a "granular" product (mainly used as a fertilizer) and a coarse crystalline product. Technical-grade synthetic sodium nitrate is a fine, crystalline white powder with a bulk density of about 1.36 kg/L. It is sold as an untreated product and also as a free-flowing product containing up to 0.1% alkyl aryl sulfonate as an anticaking agent.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 686 (2003)

Hazardous Substances Data Bank (HSDB)

/As of 1991/ sodium nitrate /was/ used with other components as an active ingredient to control mammals such as woodchucks, ground squirrels, and coyotes in open fields, non-crop areas, rangelands, lawns and golf courses. The three end-use products, two containing 65% a.i. sodium nitrate and one with 46.2% sodium nitrate, are all used as fumigant gas cartridges designed to be placed in burrows. The sodium nitrate supports the combustion of charcoal in the formulation of each product.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic Nitrate/Nitrite (Sodium and Potassium Nitrates), September 1991. Available from, as of October 11, 2006: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

10.6 U.S. Production

Aggregated Product Volume (EPA CDR 2016)

100,000,000 - 250,000,000 lb

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

EPA Chemicals under the TSCA

(1977) At least 5.0X10+10 G

SRI

Hazardous Substances Data Bank (HSDB)

(1982) 4.75X10+10 G (EST)

SRI

Hazardous Substances Data Bank (HSDB)

Production volumes for non-confidential chemicals reported under the Inventory Update Rule.

Year	Production Range (pounds)
1986	No Reports
1990	>10 thousand-500 thousand
1994	>10 thousand-500 thousand
1998	>10 thousand-500 thousand
2002	No Reports

US EPA; Non-confidential Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Nitric acid sodium salt (7631-99-4). Available from, as of November 8, 2006: http://www.epa.gov/oppt/iur/tools/data/2002-vol.html

Hazardous Substances Data Bank (HSDB)

10.7 U.S. Imports

(1979) 1.27X10+11 G

SRI

Hazardous Substances Data Bank (HSDB)

(1982) 1.18X10+11 G

SRI

Hazardous Substances Data Bank (HSDB)

(1985) 6.44X10+7 g

BUREAU OF THE CENSUS. U.S. IMPORTS FOR CONSUMPTION AND GENERAL IMPORTS 1985 p.1-609

Hazardous Substances Data Bank (HSDB)

The U.S. imports 100,000 t/a

SRI. 1994 Directory of Chemical Producers -United States of America. Menlo Park, CA: SRI International, 1994., p. VA17 271

Hazardous Substances Data Bank (HSDB)

10.8 U.S. Exports

(1978) 1.38X10+10 G

SRI

Hazardous Substances Data Bank (HSDB)

(1982) 5.58X10+10 G

SRI

Hazardous Substances Data Bank (HSDB)

(1985) 4.81X10+6 g

BUREAU OF THE CENSUS. U.S. EXPORTS, SCHEDULE E, 1985 p.2-93

Hazardous Substances Data Bank (HSDB)

10.9 General Manufacturing Information

Industry Processing Sectors

Adhesive manufacturing	Pesticide, fertilizer, and other agricultural chemical manufacturing
All other basic inorganic chemical manufacturing	Petroleum refineries
All other basic organic chemical manufacturing	Primary metal manufacturing
All other chemical product and preparation manufacturing	Services
Carbon black manufacturing	Wholesale and retail trade
Construction	
Explosives manufacturing	
Fabricated metal product manufacturing	
Mining (except oil and gas) and support activities	
Miscellaneous manufacturing	
Nonmetallic mineral product manufacturing (includes clay, glass, cement, concrete, lime, gypsum, and other nonmetallic mineral product manufacturing.	
Oil and gas drilling, extraction, and support activities	
Paint and coating manufacturing	

EPA Chemicals under the TSCA

EPA TSCA Commercial Activity Status

Nitric acid sodium salt (1:1): ACTIVE

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

EPA Chemicals under the TSCA

The winning of sodium nitrate from caliche is very complicated. The raw material contains only 7 to 40 wt % sodium nitrate (corresponding to 2 to 7 % N) and requires multistage processing to achieve an acceptable yield.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V22 683 (2003)

Hazardous Substances Data Bank (HSDB)

...irregular inhibition of seven clostridium botulinum cultures /was obtained/ with sodium nitrate in concn from 2.213 to 4.427%, but...inhibition of clostridium botulinum, clostridium putrificum or clostridium sporogenes with **sodium nitrite** in concn from 0.0588 to 0.392% /was not obtained/. ...in pork infusion agar more than 70% reduction in spore counts /of clostridium botulinum/ was obtained from 0.1% sodium nitrate... /it has been reported/ that "**nitrate** played no role in retarding putrid spoilage, but actually stimulated aerobic spoilage." ... nitrates were.../once/ believed to have significant preservative effects, but...this seems to be in doubt in view of more recent studies...

Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Cleveland: The Chemical Rubber Co., 1972., p. 153

Hazardous Substances Data Bank (HSDB)

In England these salts can be used as preservatives in cheese... use in cheese is permissible also in Netherlands, Norway, South Africa, & Sweden. Nitrates...are permitted in fish products in Norway & Sweden & in poultry meat in Canada. /Nitrates/

Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Cleveland: The Chemical Rubber Co., 1972., p. 154

Hazardous Substances Data Bank (HSDB)

Since nitrates...are components of curing salts, customary procedures in use of these salts prevail & no special recommendations can be made with reference to their applications as antimicrobials. /Nitrates/

Furia, T.E. (ed.). CRC Handbook of Food Additives. 2nd ed. Cleveland: The Chemical Rubber Co., 1972., p. 155

Hazardous Substances Data Bank (HSDB)

Contents in cured meats, fish, & other food products restricted.

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 14th Edition. John Wiley & Sons, Inc. New York, NY 2001., p. 1019

Hazardous Substances Data Bank (HSDB)

11 Identification

11.1 Analytic Laboratory Methods

Xylenol method used to determine nitrates & nitrites (as nitrate n) in meat & meat products by comparing color of extract with standard nitrate curve prepared at 450 nm.

Association of Official Analytical Chemists. Official Methods of Analysis. 10th ed. and supplements. Washington, DC: Association of Official Analytical Chemists, 1965. New editions through 13th ed. plus supplements, 1982., p. 13/380 24.038

Hazardous Substances Data Bank (HSDB)

Modified Jones Reductor used to determine nitrate & nitrite in cheeses containing greater than or equal to 1 ppm NO3. /Nitrates & nitrites/

Association of Official Analytical Chemists. Official Methods of Analysis. 10th ed. and supplements. Washington, DC: Association of Official Analytical Chemists, 1965. New editions through 13th ed. plus supplements, 1982., p. 13/266 16.249

Hazardous Substances Data Bank (HSDB)

AOAC Method No. 973.50. Nitrogen (Nitrate) in Water-Brucine Colorimetric Method; Spectrophotometer Detection Limit not reported /Nitrate/

Association of Official Analytical Chemists. Official Methods of Analysis. 15th ed. and Supplements. Washington, DC: Association of Analytical Chemists, 1990, p. V1 320

Hazardous Substances Data Bank (HSDB)

APHA Method No. 4110. Determination of Anions by Ion Chromatography; Ion Chromatography Detection Limit = 0.1 mg/L /Nitrate/

APHA; Standard Methods for the Examination of Water and Wastewater, 17th Ed. Prepared and published jointly by: American Public Health Association. 1989

Hazardous Substances Data Bank (HSDB)

For more Analytic Laboratory Methods (Complete) data for SODIUM NITRATE (14 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

12 Safety and Hazards

12.1 Hazards Identification

12.1.1 GHS Classification

Showing 1 of 4 View More

Pictogram(s)	 Oxidizer Irritant
Signal	Warning
GHS Hazard Statements	H272 (58.07%): May intensify fire; oxidizer [Danger Oxidizing liquids; Oxidizing solids] H302 (17.3%): Harmful if swallowed [Warning Acute toxicity, oral] H319 (89.43%): Causes serious eye irritation [Warning Serious eye damage/eye irritation]
Precautionary Statement Codes	P210, P220, P221, P264, P270, P280, P301+P312, P305+P351+P338, P330, P337+P313, P370+P378, and P501 (The corresponding statement to each P-code can be found at the GHS Classification page.)
ECHA C&L Notifications Summary	*Aggregated GHS information provided by 1697 companies from 32 notifications to the ECHA C&L Inventory. Each notification may be associated with multiple companies.* *Reported as not meeting GHS hazard criteria by 61 of 1697 companies. For more detailed information, please visit ECHA C&L website.* *Of the 31 notification(s) provided by 1636 of 1697 companies with hazard statement code(s).* *Information may vary between notifications depending on impurities, additives, and other factors. The percentage value in parenthesis indicates the notified classification ratio from companies that provide hazard codes. Only hazard codes with percentage values above 10% are shown.*

▸ European Chemicals Agency (ECHA)

12.1.2 Hazard Classes and Categories

Showing 2 of 4 View More

Ox. Sol. 2 (58.07%)

Acute Tox. 4 (17.3%)

Eye Irrit. 2 (89.43%)

▸ European Chemicals Agency (ECHA)

Ox. Sol. 2 (100%)

Eye Irrit. 2 (100%)

▸ European Chemicals Agency (ECHA)

12.1.3 EPA Safer Chemical

Chemical: Sodium nitrate

Yellow triangle - The chemical has met Safer Choice Criteria for its functional ingredient-class, but has some hazard profile issues. Specifically, a chemical with this code is not associated with a low level of hazard concern for all human health and environmental endpoints. (See Safer Choice Criteria). While it is a best-in-class chemical and among the safest available for a particular function, the function fulfilled by the chemical should be considered an area for safer chemistry innovation.

▸ EPA Safer Choice

12.1.4 Health Hazards

INGESTION: Dizziness, abdominal cramps, vomiting, bloody diarrhea, weakness, convulsions, and collapse. Small repeated doses may cause headache and mental impairment. (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.

▸ CAMEO Chemicals

12.1.5 Fire Hazards

Special Hazards of Combustion Products: Yields toxic gaseous oxides of nitrogen when involved in fire. Behavior in Fire: Explodes when heated to over 1000°C. (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.

▸ CAMEO Chemicals

Not combustible but enhances combustion of other substances. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with reducing agents.

▸ ILO International Chemical Safety Cards (ICSC)

12.1.6 Fire Potential

Not combustible but enhances combustion of other substances ... /Sodium nitrate/ is a strong oxidant and reacts with combustible and reducing materials, causing fire and explosion hazard.

IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from http://www.inchem.org/documents/icsc/icsc/eics0185.htm as of October 23.

▸ Hazardous Substances Data Bank (HSDB)

Flames up when heated to 540 °C. ...

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

Hazardous Substances Data Bank (HSDB)

12.1.7 Skin, Eye, and Respiratory Irritations

The substance is irritating to the eyes, the skin and the respiratory tract.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

Hazardous Substances Data Bank (HSDB)

12.2 Safety and Hazard Properties

12.2.1 Critical Temperature & Pressure

Critical temperature = 1321 deg K

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

Hazardous Substances Data Bank (HSDB)

12.2.2 Explosive Limits and Potential

... /Sodium nitrate/ is a strong oxidant and reacts with combustible and reducing materials, causing fire and explosion hazard.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

Hazardous Substances Data Bank (HSDB)

Explodes when heated to over 1000 °C.

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

Hazardous Substances Data Bank (HSDB)

12.3 First Aid Measures

12.3.1 First Aid

See a physician. EYES: Rinse with **water**. SKIN: Wash with **water** for 15 minutes. INGESTION: Drink **water**, milk, or activated **charcoal**; then induce vomiting or gastric lavage followed by catharsis. (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.

CAMEO Chemicals

12.3.2 Inhalation First Aid

Fresh air, rest. Refer for medical attention.

ILO International Chemical Safety Cards (ICSC)

12.3.3 Skin First Aid

First rinse with plenty of **water** for at least 15 minutes, then remove contaminated clothes and rinse again.

ILO International Chemical Safety Cards (ICSC)

12.3.4 Eye First Aid

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

ILO International Chemical Safety Cards (ICSC)

12.3.5 Ingestion First Aid

Rinse mouth. Refer for medical attention .

ILO International Chemical Safety Cards (ICSC)

12.4 Fire Fighting

Excerpt from ERG Guide 140 [Oxidizers]: SMALL FIRE: Use **water**. Do not use dry chemicals or foams. CO2 or **Halon®** may provide limited control. LARGE FIRE: Flood fire area with **water** from a distance. Do not move cargo or vehicle if cargo has been exposed to heat. Move containers from fire area if you can do it without risk. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of **water** until well after fire is out. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (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).*

CAMEO Chemicals

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

▸ ILO International Chemical Safety Cards (ICSC)

12.4.1 Fire Fighting Procedures

Use abundant amount of water in early stages of fire. When large quantities are involved in fire, nitrate may fuse or melt, in such conditions, application of water may result in extensive scattering of molten material.

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

▸ Hazardous Substances Data Bank (HSDB)

If material on fire or involved in fire: Flood with water. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 828

▸ Hazardous Substances Data Bank (HSDB)

12.4.2 Firefighting Hazards

Increases the flammability of any combustible substance.

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

▸ Hazardous Substances Data Bank (HSDB)

12.5 Accidental Release Measures

12.5.1 Isolation and Evacuation

Excerpt from ERG Guide 140 [Oxidizers]: 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. LARGE SPILL: Consider initial downwind evacuation for at least 100 meters (330 feet). 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).*

▸ CAMEO Chemicals

12.5.2 Spillage Disposal

Sweep spilled substance into plastic or glass containers. Wash away remainder with plenty of water.

▸ ILO International Chemical Safety Cards (ICSC)

12.5.3 Cleanup Methods

Sweep spilled substance into plastic or glass containers. Wash away remainder with plenty of water.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

▸ Hazardous Substances Data Bank (HSDB)

SRP: /Laboratory quantities/ For solid: Sweep into a beaker. Dilute with sufficient water. Ad soda ash. Mix and neutralize with 6M-HCl. Drain into the sewer with abundant water. For solution: Cover with soda ash. After mixing, transfer into a beaker containing water. Neutralize with 6M-HCl. Drain into the sewer with abundant water.

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

▸ Hazardous Substances Data Bank (HSDB)

12.5.4 Disposal Methods

SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure 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, aquatic, and plant life; and conformance with environmental and public health regulations.

▸ Hazardous Substances Data Bank (HSDB)

12.5.5 Preventive Measures

SRP: The scientific literature for the use of contact lenses in industry is conflicting. The benefit 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.

▸ Hazardous Substances Data Bank (HSDB)

If material not on fire and not involved in fire: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 828

▸ Hazardous Substances Data Bank (HSDB)

Personnel protection: ... Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. ... Approach fire with caution.

Association of American Railroads; Bureau of Explosives. Emergency Handling of Hazardous Materials in Surface Transportation. Association of American Railroads, Pueblo, CO. 2005, p. 828

Hazardous Substances Data Bank (HSDB)

NO contact with combustibles and reducing agents ... PREVENT DISPERSION OF DUST ... Local exhaust or breathing protection ... Do not eat, drink, or smoke during work. Wash hands before eating ... Rinse contaminated clothes (fire hazard) with plenty of water. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from http://www.inchem.org/documents/icsc/icsc/eics0185.htm as of October 23.

Hazardous Substances Data Bank (HSDB)

Approximately 14 million households in the United States use private wells to supply their drinking water (Bureau of the Census 1993). In agricultural areas, nitrogen-based fertilizers are a major source of contamination for shallow groundwater aquifers that provide drinking water. A recent United States Geological Survey study showed that >8,200 wells nationwide were contaminated with nitrate levels above the U.S. Environmental Protection Agency (EPA) drinking water standard of 10 parts per million (ppm). ... Because of the risks for potential adverse health effects, persons who use drinking water that contains nitrate levels >10 milligrams per liter (mg/L) should have alternative sources of water or appropriate treatment of existing supplies. Information regarding testing of well water can be obtained from city or county health departments. Other sources of nitrate contamination are organic animal wastes and contamination from septic sewer systems, especially in wells <100 feet deep. During spring melt or drought conditions, both domestic wells and public water systems using surface water can show increased nitrate levels. /Nitrate/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. 32p. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

12.6 Handling and Storage

12.6.1 Nonfire Spill Response

Excerpt from ERG Guide 140 [Oxidizers]: Keep combustibles (wood, paper, oil, etc.) away from spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Do not get water inside containers. SMALL DRY SPILL: With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area. SMALL LIQUID SPILL: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. LARGE SPILL: Dike far ahead of liquid spill for later disposal. Following product recovery, flush area with water. (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).

CAMEO Chemicals

12.6.2 Safe Storage

Separated from combustible substances and reducing agents. Dry.

ILO International Chemical Safety Cards (ICSC)

12.6.3 Storage Conditions

Prevent against physical damage; store in dry and cool place away from inflammable organics or easily oxidizable substances; wooden floor is not acceptable; wear rubber gloves, safety glasses, protecting work clothing.

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

Hazardous Substances Data Bank (HSDB)

12.7 Exposure Control and Personal Protection

12.7.1 Inhalation Risk

Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

ILO International Chemical Safety Cards (ICSC)

12.7.2 Effects of Short Term Exposure

The substance is irritating to the eyes, skin and respiratory tract. Ingestion could cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

ILO International Chemical Safety Cards (ICSC)

12.7.3 Allowable Tolerances

Sodium nitrate is exempted from the requirement of a tolerance when used as a solid diluent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

40 CFR 180.920; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of August 30, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

12.7.4 Personal Protective Equipment (PPE)

Rubber gloves, goggles, laboratory coat. (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.

CAMEO Chemicals

Rubber gloves, goggles, laboratory coat.

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

Hazardous Substances Data Bank (HSDB)

12.7.5 Fire Prevention

NO contact with combustible substances or reducing agents.

ILO International Chemical Safety Cards (ICSC)

12.7.6 Exposure Prevention

PREVENT DISPERSION OF DUST!

ILO International Chemical Safety Cards (ICSC)

12.7.7 Inhalation Prevention

Use local exhaust or breathing protection.

ILO International Chemical Safety Cards (ICSC)

12.7.8 Skin Prevention

Protective gloves.

ILO International Chemical Safety Cards (ICSC)

12.7.9 Eye Prevention

Wear safety goggles.

ILO International Chemical Safety Cards (ICSC)

12.7.10 Ingestion Prevention

Do not eat, drink, or smoke during work. Wash hands before eating.

ILO International Chemical Safety Cards (ICSC)

12.8 Stability and Reactivity

12.8.1 Air and Water Reactions

Soluble in water.

CAMEO Chemicals

12.8.2 Reactive Group

Nitrate and Nitrite Compounds, Inorganic

CAMEO Chemicals

12.8.3 Reactivity Alerts

Explosive

Strong Oxidizing Agent

CAMEO Chemicals

12.8.4 Reactivity Profile

A mixture of SODIUM NITRATE and sodium hypophosphite constitute a powerful explosive [Mellor 8, Supp. 1:154 1964]. Sodium nitrate and aluminum powder mixtures have been reported to be explosive,[Fire, 1935, 28, 30]. The nitrate appears to be incompatible with barium thiocyanate, antimony, arsenic trioxide/iron(II) sulfate, boron phosphide, calcium-sodium alloy, magnesium, metal amidosulfates, metal cyanides, powdered charcoal, peroxyformic acid, phenol/trifluoroacetic acid, sodium, sodium nitrite/sodium sulfide, sodium phosphinate, sodium thiosulfate, tris(cyclopentadienyl)cerium, and even wood [Bretherick 5th ed., 1995].

CAMEO Chemicals

12.8.5 Hazardous Reactivities and Incompatibilities

Interaction of nitrates when heated with amidosulfates (sulfamates) may become explosively violent owing to liberation of dinitrogen oxide and steam. /Nitrates/

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1339

Hazardous Substances Data Bank (HSDB)

A study of the kinetics in attack of **magnesium** by molten sodium nitrate indicates that decomposition of the **nitrate** releases **oxygen** atoms which oxidize the metal so exothermally that ignition ensues.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1339

Hazardous Substances Data Bank (HSDB)

Fibrous organic material (jute storage bags) is oxidized in contact with sodium nitrate above 160 °C and will ignite below 220 °C. Wood and similar cellulosic materials are rendered highly combustible by **nitrate** impregnation.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

Mixtures of /**sodium**/ **nitrate** with powdered **aluminum** or its oxide (the latter seems unlikely) were reported to be explosive. ... A violent explosion in a **copper** smelting works was caused mainly by reaction of **aluminum** with sodium nitrate.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1337

Hazardous Substances Data Bank (HSDB)

Mixtures /of **barium thiocyanate** and sodium nitrate/ may explode.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

Interaction of sodium nitrate and **sodium** alone, or dissolved in liquid **ammonia**, eventually gives a yellow explosive compound.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1340

Hazardous Substances Data Bank (HSDB)

Oxidizable substances, organic materials.

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

Hazardous Substances Data Bank (HSDB)

Mixture with powdered **antimony** explodes.

Armour, M.A. Hazardous Laboratory Chemicals Disposal Guide. Boca Raton, FL: CRC Press Inc., 1991., p. 400

Hazardous Substances Data Bank (HSDB)

Mixture with **charcoal** ignites on heating.

Armour, M.A. Hazardous Laboratory Chemicals Disposal Guide. Boca Raton, FL: CRC Press Inc., 1991., p. 400

Hazardous Substances Data Bank (HSDB)

Mixture /with **sodium thiosulfate** or sodium phosphinate/ explodes on heating.

Armour, M.A. Hazardous Laboratory Chemicals Disposal Guide. Boca Raton, FL: CRC Press Inc., 1991., p. 400

Hazardous Substances Data Bank (HSDB)

Use of mixtures of metal nitrates with **acetic anhydride** as a nitrating agent may be hazardous, depending on the proportions of reactants and on the cation ... sodium nitrate usually causes violent reactions ...

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 450

Hazardous Substances Data Bank (HSDB)

Mixtures of the **nitrate** with powdered **aluminium** or its oxide (the latter seems unlikely) were reported to be explosive, and the performance characteristics of flares containing compressed mixtures of the metal and **nitrate** have been evaluated. A violent explosion in a **copper** smelting works was caused mainly by reaction of **aluminium** with sodium nitrate.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1336

Hazardous Substances Data Bank (HSDB)

During investigation of pyrotechnic flare formulations, it was found that mixtures of the metal powder /eg **aluminium**/ and oxidant /eg sodium nitrate/ underwent a low-temp exothermic reaction at 70 to 135 °C in presence of moisture.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

A veterinary preparation containing the oxidant and reducant materials /**arsenic trioxide**, **iron(II) sulfate**, and sodium nitrate/ (possibly with some additional combustibles) ignited spontaneously.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

The induction periods for the reaction of sodium nitrate-bitumen mixtures (43:57 wt) heated at 195, 234 or 260 °C are 44, 2 and 0.5 hr, respectively. Further study of sodium nitrate/bitumenized waste systems held at these temp showed an initial weak exotherm around 260 °C and a larger exotherm (0.96 to 1.21 kJ/g) accompanied by 50% wt loss around 430 °C.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

Deflagration occurs /when **boron phosphide**/ in contact with molten alkali metal nitrates /eg sodium nitrate/.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

Combustion of the /**calcium-silicon**/ alloy in admixture with sodium nitrate is mentioned in an explosive context ...

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1338

Hazardous Substances Data Bank (HSDB)

Solid crude sodium nitrate packed in jute bags sometimes ignited the latter in storage. Normally ignition did not occur below 240 °C, but in cases where magnesium chloride (up to 16%) was present, ignition occurred at 130 °C. This was attributed to formation of magnesium nitrate hexahydrate, which hydrolyses above its mp (90 °C) liberating nitric acid. the latter was thought to have caused ignition of the jute bags under unusual conditions of temp and friction.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1339

Hazardous Substances Data Bank (HSDB)

A rotary drum had been used previously to dry metal components which had been heat-treated in /sodium/ nitrate-/sodium/ nitrite molten salt baths, washed, then tumble dried with ground maize husks to absorb adhering water. When the drum was taken out of service, it was not cleaned out. After some 10 mo it was recommissioned, but while being heated up to operating temp, an explosion occurred which ejected flame jets for several meters. This was attributed to presence of considerable contamination of the maize husks by metal nitrate-nitrite residues, and ignition on heating of such material was confirmed experimentally.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1339

Hazardous Substances Data Bank (HSDB)

Contact of powdered charcoal with the molten /sodium/ nitrate, or of the solid /sodium/ nitrate with glowing charcoal, causes vigorous combustion of the carbon ... Charcoal powder-nitrate mixtures burn briskly at 200 °C.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1339

Hazardous Substances Data Bank (HSDB)

/Sodium nitrate/ may lead to explosive decomposition of the /peroxyformic acid (methaneperoxoic acid)/.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 153

Hazardous Substances Data Bank (HSDB)

When the /sodium nitrate/ salt-/trifluoroacetic/ acid nitration mixture was applied to phenol, a potential hazardous rapid exothermic reaction occurred producing tar.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1340

Hazardous Substances Data Bank (HSDB)

Accidental mixing of /sodium nitrate, sodium nitrite and sodium sulfide/ caused a violent explosion.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1337

Hazardous Substances Data Bank (HSDB)

Reaction of ammonium hexanitrocerate and cyclopentadienylsodium under inert conditions gives tri(cyclopentadienyl)cerium and sodium nitrate, removed by filtration before evaporation of solvent. When the filtration step was omitted, and the evaporated solid mixture was heated to 75 °C, a violent explosion occurred. This may have involved complexes of the type Ce(NO3)Cp2.NaNO3, but a direct redox reaction between the reactive CeCp3 and the oxidant is also possible.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1340

Hazardous Substances Data Bank (HSDB)

When organic matter is destroyed for residue analysis by heating with equimolar potassium nitrate-sodium nitrate mixture to 390 °C, a 20-fold excess of nitrate must be used. If over 10% of organic matter is present, pyrotechnic reaction occur which could be explosive. Subsequent to an explosion while a citric acid-sodium nitrate mixture was being heated at below 500 °C, experiments on the effect of heating various organic materials with metal nitrates showed the tendency for explosion to increase from magnesium through calcium to sodium nitrate. This is in the order of mp of the nitrates, and explosion may occur when the nitrates melt and make intimate contact with the organic matter. Pretreatment with nitric acid may reduce the explosion risk.

Bretherick, L. Handbook of Reactive Chemical Hazards. 4th ed. Boston, MA: Butterworth-Heinemann Ltd., 1990, p. 1672

Hazardous Substances Data Bank (HSDB)

A mixture of ... /barium rhodanide and sodium nitrate/ may cause an explosion.

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 491-28

Hazardous Substances Data Bank (HSDB)

Addition of cyanides to a molten /sodium/ nitrate bath (or vice versa) will result in an explosion.

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 491-124

Hazardous Substances Data Bank (HSDB)

A mixture of sodium nitrate and sodium hypophosphite constitutes a powerful explosive.

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 491-182

Hazardous Substances Data Bank (HSDB)

The familiar black powder explosion begins with the reaction, sulfur-plus-sodium-nitrate, which produces the energy to initiate the carbon-plus-sodium nitrate explosion.

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 491-190

Hazardous Substances Data Bank (HSDB)

12.9 Transport Information

12.9.1 DOT Emergency Guidelines

/GUIDE 140: OXIDIZERS/ Fire or Explosion: These substances will accelerate burning when involved in a fire. Some may decompose explosively when heated or involved in a fire. May explode from heat or contamination. Some will react explosively with hydrocarbons (fuels). May ignite combustibles (wood, paper, oil, clothing, etc.). Containers may explode when heated. Runoff may create fire or explosion hazard.

U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012

Hazardous Substances Data Bank (HSDB)

/GUIDE 140: OXIDIZERS/ Health: Inhalation, ingestion or contact (skin, eyes) with vapors or substance may cause severe injury, burns or death. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause pollution.

U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012

Hazardous Substances Data Bank (HSDB)

/GUIDE 140: OXIDIZERS/ Public Safety: CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover. 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 closed spaces before entering.

U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012

Hazardous Substances Data Bank (HSDB)

/GUIDE 140: OXIDIZERS/ 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 will only provide limited protection.

U.S. Department of Transportation. 2012 Emergency Response Guidebook. Washington, D.C. 2012

Hazardous Substances Data Bank (HSDB)

For more DOT Emergency Guidelines (Complete) data for SODIUM NITRATE (8 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

12.9.2 DOT ID and Guide

1498 140

DOT Emergency Response Guidebook

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

UN 1498; Sodium nitrate

Hazardous Substances Data Bank (HSDB)

IMO 5.1; Sodium nitrate

Hazardous Substances Data Bank (HSDB)

12.9.4 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 February 15, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (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

Hazardous Substances Data Bank (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. 71

Hazardous Substances Data Bank (HSDB)

12.9.5 DOT Label

Oxidizer

CAMEO Chemicals

12.9.6 UN Classification

UN Hazard Class: 5.1; UN Pack Group: III

ILO International Chemical Safety Cards (ICSC)

12.10 Regulatory Information

12.10.1 Federal Drinking Water Standards

EPA 10,000 ug/L /Nitrate ion/

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

Hazardous Substances Data Bank (HSDB)

12.10.2 Federal Drinking Water Guidelines

EPA 10000 ug/L /Nitrate ion/

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

Hazardous Substances Data Bank (HSDB)

12.10.3 State Drinking Water Guidelines

(ME) MAINE 10,000 ug/L /Nitrate ion/

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

Hazardous Substances Data Bank (HSDB)

(MN) MINNESOTA 10,000 ug/L /Nitrate ion/

USEPA/Office of Water; Federal-State Toxicology and Risk Analysis Committee (FSTRAC). Summary of State and Federal Drinking Water Standards and Guidelines (11/93) To Present

Hazardous Substances Data Bank (HSDB)

12.10.4 FIFRA Requirements

Section 4(g)(2)(A) of FIFRA calls for the Agency to determine, after submission of relevant data concerning an active ingredient, whether products containing the active ingredient are eligible for reregistration. The Agency has previously identified and required or waived the submission of the generic (i.e., active ingredient specific) data required to support reregistration of products containing sodium or potassium nitrate as an active ingredient. The Agency has completed its review of these generic data and information from published literature, and has determined that the data are sufficient to support reregistration of products containing sodium or potassium nitrate.

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic Nitrate/Nitrite (Sodium and Potassium Nitrates) September 1991. Available from, as of October 11, 2006: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (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 future use. Under this pesticide reregistration program, EPA examines health and safety data for pesticide active ingredients initially registered before November 1, 1984, and determines whether they are eligible for reregistration. In addition, all pesticides must meet the new safety standard of the Food Quality Protection Act of 1996. Pesticides for which EPA had not issued Registration Standards prior to the effective date of FIFRA, as amended in 1988, were divided into three lists based upon their potential for human exposure and other factors, with List B containing pesticides of greater concern and List D pesticides of less concern. Sodium nitrate is found on List D. Case No: 4052; Pesticide type: Rodenticide, Antimicrobial; Case Status: RED Approved 09/91; 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 nitrate; 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. 318

Hazardous Substances Data Bank (HSDB)

Residues of sodium nitrate are exempted from the requirement of a tolerance when used as a solid diluent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

40 CFR 180.920; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of August 30, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

12.10.5 FDA Requirements

Sodium nitrate is a food additive permitted for direct addition to food for human consumption, as long as 1) the quantity of the substance added to food does not exceed the amount reasonably required to accomplish its intended physical, nutritive, or other technical effect in food, and 2) any substance intended for use in or on food is of appropriate food grade and is prepared and handled as a food ingredient.

21 CFR 172.170; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of August 30, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

Sodium nitrate is an indirect food additive for use as a component of adhesives.

21 CFR 175.105; U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of August 30, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses. A number of active ingredients have been present in OTC drug products for various uses, as described below. However, based on evidence currently available, there are inadequate data to establish general recognition of the safety and effectiveness of these ingredients for the specified uses: sodium nitrate is included in orally administered menstrual drug products.

21 CFR 310.545(a)(24); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of August 30, 2006: http://www.ecfr.gov

Hazardous Substances Data Bank (HSDB)

12.11 Other Safety Information

12.11.1 Toxic Combustion Products

Gives off irritating or toxic fumes (or gases) in a fire ... /Sodium nitrate/ decomposes on heating producing nitrogen oxides and oxygen, which increases fire hazard.

IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from http://www.inchem.org/documents/icsc/icsc/eics0185.htm as of October 23.

Hazardous Substances Data Bank (HSDB)

12.11.2 Other Hazardous Reactions

Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

- Hazardous Substances Data Bank (HSDB)

12.11.3 History and Incidents

The first reported case of fatal acquired methemoglobinemia in an infant due to ingestion of **nitrate**-contaminated well **water** occurred in 1945. Since then, about 2,000 similar cases of acquired methemoglobinemia in young infants have been reported worldwide; about 10% of such cases result in fatality.

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 8. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

- Hazardous Substances Data Bank (HSDB)

12.11.4 Special Reports

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, Vol 94: Ingested **Nitrate** and **Nitrite** and Cyanobacterial Peptide Toxins (2010)[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: http://monographs.iarc.fr/ENG/Classification/index.php, p. V94 (2010)]

- Hazardous Substances Data Bank (HSDB)

Walker R; Food Addit Contam 7 (6): 717-68 (1990). Data on occurrence of **nitrate**, **nitrite** and N-nitroso compounds in food and drinking **water**, and on total dietary intakes are reviewed. Metabolic, toxicological and epidemiological studies are surveyed and the implications with respect to safety evaluation are addressed.

- Hazardous Substances Data Bank (HSDB)

European Chemicals Bureau; IUCLID Dataset, Sodium nitrate, containing in the dry state more than 16.3 per cent by weight of **nitrogen** (7631-99-4) (2000 CD-ROM edition). Information on usage pattern, toxicology, and environmental effects submitted by industry to the European Union.[Available from, as of October 26, 2006: http://esis.jrc.ec.europa.eu/]

- Hazardous Substances Data Bank (HSDB)

PARKE DV, LEWIS D FV; SAFETY ASPECTS OF FOOD PRESERVATIVES INTERNATIONAL SYMPOSIUM ON CURRENT ISSUES WITH FWD PRESERVATIVES: CHEMICO-TECHNICAL, NUTRITIONAL AND SAFETY IN USE ASPECTS, ROME, ITALY, JULY 3-5, 1991. FOOD ADDIT CONTAM 9 (5): 561-77 (1992). RRM HUMAN FOOD PRODUCTS FOOD ADDITIVES ANTIOXIDANTS FOOD SAFETY METHODS.

- Hazardous Substances Data Bank (HSDB)

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic **Nitrate**/**Nitrite** (**Sodium** and Potassium Nitrates), September 1991. The RED summarizes the risk assessment conclusions and outlines any risk reduction measures necessary for the pesticide to continue to be registered in the U.S.[Available from, as of October 11, 2006: http://www.epa.gov/pesticides/reregistration/status.htm]

- Hazardous Substances Data Bank (HSDB)

13 Toxicity

13.1 Toxicological Information

13.1.1 NIOSH Toxicity Data

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

13.1.2 Evidence for Carcinogenicity

There is inadequate evidence in humans for the carcinogenicity of **nitrate** in food. There is inadequate evidence in humans for the carcinogenicity of **nitrate** in drinking-**water**. There is inadequate evidence in experimental animals for the carcinogenicity of **nitrate**. Overall evaluation: Ingested **nitrate** or **nitrite** under conditions that result in endogenous nitrosation is probably carcinogenic to humans (Group 2A).

*IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: **http://monographs.iarc.fr/ENG/Classification/index.php**, p. V. 94: p. 323 (2010)*

▸ Hazardous Substances Data Bank (HSDB)

13.1.3 Exposure Routes

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

▸ ILO International Chemical Safety Cards (ICSC)

13.1.4 Inhalation Symptoms

Cough. Sore throat.

▸ ILO International Chemical Safety Cards (ICSC)

13.1.5 Skin Symptoms

Redness.

▸ ILO International Chemical Safety Cards (ICSC)

13.1.6 Eye Symptoms

Redness. Pain.

▸ ILO International Chemical Safety Cards (ICSC)

13.1.7 Ingestion Symptoms

Abdominal pain. Blue lips, fingernails and skin. Convulsions. Diarrhoea. Dizziness. Headache. Laboured breathing. Confusion. Nausea. Unconsciousness.

▸ ILO International Chemical Safety Cards (ICSC)

13.1.8 Acute Effects

ChemIDplus

13.1.9 Interactions

Nitric oxide (NO) is rapidly oxidized to nitrite (NO-2) and then to nitrate (NO-3) in biological tissues. Although urinary excretion rates of NO-3 are often used as an index of NO production in the body, very little is known regarding the kidney's ability to excrete circulating NO-3. /The authors/ have evaluated the renal responses to systemic administration of sodium nitrate (NaNO3) in eight anesthetized dogs treated with the NO synthase inhibitor, nitro-L-arginine (NLA; 50 ug/kg/min), intrarenally to minimize renal production of NO. Urinary and plasma concentrations of NO-3/NO-2 (NOX) were determined by the Greiss reaction after enzymatic reduction of NO-3 to NO-2. NLA treatment alone resulted in reductions in urinary NOX excretion rates (UNOXV, 1.13+/-0.2 to 0.53+/-0.1 nmol/min/g) and an increase in fractional reabsorption of NOX (FRNOX, 93.8+/-0.6 to 97+/-0.6%) without changes in arterial plasma concentrations (ANOX, 18.7+/-1.4 to 21.2+/-3.7 uM). Administration of NaNO3 (10, 20, 30, and 40 ug/kg/min) resulted in dose-dependent increases in ANOX (34.5+/-8.0, 46.4+/-7.3, 60.7+/-6.3, and 78.1+/-6.3 uM), UNOXV (1.8+/-0.7, 4.2+/-1.8, 7.0+/-2.0, and 11.4+/-3.3 nmol/min/g), and decreases in FRNOX (93.8+/-2.3, 90.3+/-3.5, 88.6+/-3.2, and 84.6+/-3.5%). Absolute net tubular reabsorption of NO-3 showed a linear relationship with filtered loads, with no evidence of a transport maximum. These data show that, in the absence of additions from intrarenal sources, urinary excretion rates of nitrate increases progressively in response to increases in its circulating levels without exhibiting a transport maximum but with progressive decreases in fractional reabsorption.

PMID:9689006
Godfrey M, Majid DS; Am J Physiol 275 (1 Pt 2): F68-73 (1998)

Hazardous Substances Data Bank (HSDB)

The individual and combined effects of trichlorphon, lead-nitrate, cadmium-nitrate, sodium-nitrate, and lindane were determined in Wistar-rats. The median lethal dose (LD50) and average time of death were determined individually for each of the substances in acute gavage experiments. A mixture was made up of 0.44 LD50 of each of the five substances. The mixture LD50 was 4,833mg/kg. For subacute experiments, rats were administered the compounds or the mixture daily for 30 days at one twentieth to one thousandth the LD50, or were administered one tenth or one hundredth the LD50 of each substance separately and in combination for 5 or 20 days. Urinary delta-aminolevulinic-acid (ALA) concentrations significantly increased at daily doses of 5%, 1%, and 0.1% of the LD50 of lead and mixture at days ten, 20 and 30, with mixture ALA levels higher than lead alone. Significant increases were also seen in ALA after sublethal daily dosing with cadmium and lindane, with similar results obtained for urinary coproporphyrin. A decrease in liver sulfhydryl groups, similar to the effects of lead and cadmium, was observed upon administration of the mixture as was an increase in methemoglobin to 20% to 30% compared with nitrate induction to 16% to 26%, and control levels of 9%. The electron paramagnetic resonance (EPR) of a number of complexes were studied after 5 and 20 days of daily dosing with the substances singly or mixed. EPR signals of cytochrome-P450 were multiplied by lindane and mixture treatment, and were attenuated and multiplied by cadmium. The nitrosilic complexes EPR signals were multiplied by the effect of nitrates and lead, while the effect of the mixture was antagonistic to nitrates. Multiplication of the EPR signals of free radicals and iron and sulfur containing proteins was observed after 20 days dosing with 1% LD50 of lindane, cadmium, and the mixture. The authors conclude that the individual intake limits of trichlorphon, lindane and nitrates are valid for the mixture, while a dose summation formula should be used for lead and cadmium.

Shtabsky BM et al; Fresenius Environ Bull 4 (6): 364-8 (1995)

Hazardous Substances Data Bank (HSDB)

No increase in lung adenomas was produced in mice administered 0.69 to 18.75 mg of piperazine/kg in drinking water for 20 to 25 weeks and sacrificed 10 to 13 weeks later. An increase in lung adenomas was produced in this bioassay by administration of piperazine together with sodium nitrate, suggesting the formation of the active nitroso derivative ... Co-administration of 250 ppm piperazine and 500 ppm sodium nitrate in drinking water did not produce tumors in rats ... Piperazine dihydrochloride was not mutagenic in the mouse host-mediated assay. However, when tested in combination with sodium nitrate (to produce the N-nitroso derivative), a mutagenic response was seen ... Urinary metabolites isolated from mice given oral doses of both piperazine and sodium nitrate were also mutagenic.

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 4:1146

Hazardous Substances Data Bank (HSDB)

Formation of (the carcinogen) nitrosodimethylamine (NDMA) from dimethylamine (DMA) & sodium nitrate in stomach of monkeys was investigated. After admin of DMA & sodium nitrate, the peak concn of NO2- & NDMA in stomach contents of the 3 starved monkeys were 2.7, 89, & 16.2 ppm, & 41.1, 144.4 & 5.4 ppb, respectively, while peaks of the 2 compounds in the unstarved monkeys (5 per group) were 75.6, 69.9, 5.7, 1.0 & 201.5 ppm of no2- & 833.6, 63.9, 6.1, not detected & 4.7 ppb of NDMA. NDMA was not detected (detection limit 0.2 ng) in blood of any monkey investigated.

HAYASHI N ET AL; J FOOD HYG SOC JPN 21 (4): 273 (1980)

Hazardous Substances Data Bank (HSDB)

For more Interactions (Complete) data for SODIUM NITRATE (7 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

13.1.10 Antidote and Emergency Treatment

Maintain an open airway and assist ventilation if necessary. Administer supplemental oxygen. Treat hypotension with supine positioning, intravenous crystalloid fluids, and a low dose -pressor if needed. Monitor vital signs and ECG for 4 to 6 hours. Symptomatic methemoglobinemia may be treated with methylene blue. ... Administer activated charcoal. Gastric emptying is not necessary for small ingestions if activated charcoal can be given promptly . Hemodialysis and hemoperfusion are not effective. Severe methemoglobinemia in infants not responsive to methylene blue therapy may require exchange transfusion. /Nitrates and Nitrates/

Olson, K.R. (Ed.); Poisoning & Drug Overdose. 4th ed. Lange Medical Books/McGraw-Hill. New York, N.Y. 2004., p. 279

Hazardous Substances Data Bank (HSDB)

Decontamination: Remove victim from exposure and administer supplemental oxygen if available. Remove contaminated clothing and wash with copious soap and water. Irrigate exposed eyes with water or saline. /Nitrates and Nitrates/

Olson, K.R. (Ed.); Poisoning & Drug Overdose. 4th ed. Lange Medical Books/McGraw-Hill. New York, N.Y. 2004., p. 280

Hazardous Substances Data Bank (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 10 to 15 L/min. Monitor for shock and treat if necessary ... Anticipate seizures and treat as 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 d of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal ... /Nitrates, nitrites, 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. 286-7

Hazardous Substances Data Bank (HSDB)

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or is in severe respiratory distress. Monitor cardiac rhythm and treat arrhythmias if 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. If unresponsive to these measures, vasopressors may be helpful. Watch for signs of fluid overload ... Treat seizures with **diazepam** or **lorazepam** ... Administer 1% solution **methylene blue** if patient is symptomatic with severe hypoxia, cyanosis, and cardiac compromise not responding to **oxygen**. ... . Use **proparacaine hydrochloride** to assist eye irrigation ... /Nitrates, nitrites, 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. 287

Hazardous Substances Data Bank (HSDB)

Monitor vital signs, blood pressure, respiration and onset of cyanosis. Administer **oxygen** if there are clinical signs of methemoglobinemia. **Methylene blue** is the specific antidote indicated in case of methemoglobinemia. /**Nitrate** and **nitrite** poisoning/

*IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: **http://www.inchem.org/documents/pims/chemical/pimg016.htm***

Hazardous Substances Data Bank (HSDB)

... The treatment of methemoglobinemia caused by nitrates and nitrites is not specific: suppression of the oxidizing agents, oxygenation, prescription of reducing agents. /Nitrates and nitrites/

*European Chemicals Bureau; IUCLID Dataset, Potassium nitrate (7757-79-1) (2000 CD-ROM edition). Available from, as of October 26, 2006: **http://esis.jrc.ec.europa.eu/***

Hazardous Substances Data Bank (HSDB)

Sample collection: Arterial blood sampling reveals a characteristic chocolate-brown color. Methemoglobin concentrations can be quantified by spectrophotometry and should be measured immediately. Biochemical analysis: Total hemoglobin, blood count. Serum electrolytes, especially **potassium**. Acid-base balance. Arterial blood gases. Urine analysis. Toxicological analysis: The most relevant investigation is methemoglobin concentration which correlates well with symptoms and should be monitored according to the clinical condition. /**Nitrate** and **nitrite** poisoning/

*IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 25, 2006: **http://www.inchem.org/documents/pims/chemical/pimg016.htm***

Hazardous Substances Data Bank (HSDB)

... Relevant laboratory analyses are: arterial blood gases, acid base balance, nitrates could be measured in urine. The levels are usually below 150 mg NO3-/day). /**Nitrate** and **nitrite** poisoning/

*IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: **http://www.inchem.org/documents/pims/chemical/pimg016.htm***

Hazardous Substances Data Bank (HSDB)

13.1.11 Medical Surveillance

Clinical Evaluation: History. Evaluation of a patient with suspected **nitrate**/**nitrite** exposure includes a complete medical history and physical examination. Clues to potential exposure are often obtained by reviewing the following items with the patient or family: location of home (urban, suburban, or rural); drinking **water** source and supply (if well **water**: depth, location, type of well construction, and frequency of microbiologic and **nitrate** testing); surrounding activities (agricultural or industrial) and proximity to drinking-**water** source; type of sewer system (municipal or septic) and proximity to drinking **water** source; recent flooding; occupations, avocations, and hobbies of family members; nutritional status (for infants: type of formula, feeding regimen, and source of dilution **water**); family history, including recent use of medications by infant and mother; and history of recent gastroenteritis with vomiting or diarrhea. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 12. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Physical examination should include special attention to the color of the skin and mucous membranes. If there is a history of gastroenteritis (especially in infants), evaluate the patient for the possible presence of dehydration (poor skin turgor, sunken fontanelle, dry mucous membranes). All cyanotic patients should be assessed for possible cardiac and lung disease (cardiac murmurs, gallops, arrhythmias; rales, rhonchi, wheezes, dullness or hyperresonance in the chest). A central chocolate-brown or slate-gray cyanosis that does not respond to administration of 100% **oxygen** is indicative of methemoglobinemia. Cyanosis due to cardiorespiratory compromise most often improves with administration of 100% **oxygen**. In young infants, look for labored breathing, respiratory exhaustion, hypotension, below-average weight gain, and failure to meet developmental markers. Gastroenteritis can increase the rates of production and absorption of nitrites in young infants and aggravate methemoglobinemia. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 12. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Signs and Symptoms Signs and symptoms of methemoglobinemia can be directly correlated with the percentage of total hemoglobin in the oxidized form... The lips and mucous membranes of patients with **nitrate**/**nitrite** toxicity usually have more of a brownish than a bluish cast. Dyspnea, especially on exertion, is common. Varying degrees of central nervous system depression might be present. The cardiac and pulmonary examinations are usually normal, but systolic flow murmurs might be detected. Cardiac arrhythmias and hypotension can occur in patients with severe poisoning, although death from methemoglobinemia alone is uncommon, except in infants. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 13. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Laboratory Evaluation Most commonly, a drop of the patient's blood is placed on a piece of filter paper next to a drop of blood from person who does not have methemoglobinemia; when dry, the blood with methemoglobin will turn a deep chocolate-brown or slate-gray color. A tube of methemoglobin containing blood will not turn red when shaken in air or when **oxygen** is bubbled through it, whereas blood that is dark because of normal deoxyhemoglobin will turn red. Screening Tests: Examination of blood color. Determination of the calculated versus measured arterial saturation gap. Hemoglobin and hematocrit. Serum-free hemoglobin (for hemolysis detection). Serum haptoglobin (for hemolysis detection). Heinz bodies on peripheral blood smear. Urinalysis. Specialized Tests: Determination of methemoglobin level. Tests for causes of congenital methemoglobinemia. Hemoglobin electrophoresis. Activity of **NADH**-dependent methemoglobin reductase. Tests for Causes of Failure of **Methylene Blue** Therapy (see Treatment and Management section): Activity of **glucose-6-phosphate** dehydrogenase (G-6-PD). Activity of **NADPH**-dependent methemoglobin reductase. Sulfhemoglobin blood level (not readily available for clinical use). /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 13-14. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Direct Biologic Indicators. Although 80% to 90% of the body's excretion of **nitrate** is through urine and saliva, biologic **nitrate** or **nitrite** levels are generally not useful for diagnostic purposes. However, urinary and salivary **nitrate** concentrations can be important indicators of exposure requiring remedial action. The correlation between blood **nitrite** and methemoglobin is not usually linear at lower **nitrite** concentrations because a certain minimum amount of **nitrite** must enter the bloodstream before a measurable increase in methemoglobin concentration can be detected. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 14. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Indirect Biologic Indicators. The methemoglobin level in blood is the most useful screening, as well as diagnostic, test for **nitrate** toxicity. Methemoglobin can be measured in whole blood using a visible spectrophotometer (or co-oximeter) at 635 nanometers. To express the methemoglobin level as a percentage, total hemoglobin content of the blood sample also must be determined. Oximeters used to measure methemoglobin levels can falsely report sulfhemoglobin as methemoglobin. Although sulfhemoglobinemia is seldom severe enough to be life-threatening, its presence can explain some **methylene blue** treatment (see Treatment and Management section) failures. For the evaluation of suspected congenital methemoglobinemia, hemoglobin electrophoresis is helpful. In patients with methemoglobinemia, the partial pressure of **oxygen** (PO2) is usually normal despite the presence of an abnormal hemoglobin that cannot bind or transport **oxygen**. The percent O2 saturation calculated by some blood-gas instruments from the PO2, or calculated manually with a nomogram, will be normal. However, the percent O2 saturation actually measured with a co-oximeter will be decreased, resulting in a calculated versus measured arterial "percent O2 saturation gap." This finding is not specific for methemoglobinemia, however, because carboxyhemoglobinemia and sulfhemoglobinemia produce the same findings. Percent O2 saturation determined with a pulse oximeter might be unreliable in patients with methemoglobinemia, especially after administration of **methylene blue** (see Treatment and Management section). Arterial blood gases should be used to monitor oxygenation in such patients. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 14-15. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

▸ Hazardous Substances Data Bank (HSDB)

Treatment and Management In cases of mild **nitrate** toxicity (blood methemoglobin levels <20%), asymptomatic patients do not require treatment other than avoiding ingestion or inhalation of substances that cause methemoglobinemia. In symptomatic patients with moderate or severe toxicity and hypoxia or dyspnea, 100% oxygen should be administered immediately to saturate fully all remaining normal hemoglobin. Specific therapy for methemoglobinemia consists of intravenous administration of methylene blue at a dose of 1 to 2 milligrams/kilograms (mg/kg) body weight (0.1 to 0.2 milliliters [mL]/kg body weight of a 1% solution in saline) over a 5- to 10-minute period. Within 15 minutes of methylene blue administration, cyanosis will usually begin obviously to improve. If no response to the initial injection occurs within 15 minutes in seriously ill patients, or within 30 to 60 minutes in moderately ill patients, a second methylene blue dose of 0.1 mL/kg body weight can be given. Caution is advised because methylene blue can slightly worsen methemoglobinemia when given in excessive amounts. In general, the total dose administered during the first 2 to 3 hours should not be >0.5 to 0.7 mL/kg of body weight. **Methylene blue** should not be administered to a patient with known G-6-PD deficiency because severe hemolytic anemia can develop. For severe, life-threatening methemoglobinemia, especially when the patient responds poorly to **methylene blue** therapy or when the patient has G-6-PD deficiency, treatment options include exchange transfusion and hyperbaric **oxygen** therapy. During treatment in the hyperbaric chamber, sufficient **oxygen** can be dissolved directly in the blood to support life; reversible binding to hemoglobin is not required. Blood transfusion might be required if massive hemolysis develops. In persons with severe hemolysis, maintaining a brisk urine flow and alkalinizing the urine by administration of **sodium bicarbonate** might help protect against renal injury from erythrocyte breakdown products. Patients with severe poisoning who are experiencing seizures or cardiac arrhythmias might require anticonvulsant or antiarrhythmic therapy. If a local anesthetic is suspected of being the etiologic agent for the methemoglobinemia, however, **lidocaine** probably should be avoided. /Nitrates and Nitrites/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 15-16. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

▸ Hazardous Substances Data Bank (HSDB)

13.1.12 Human Toxicity Excerpts

/HUMAN EXPOSURE STUDIES/ Ten volunteers on 10 separate days within 10 weeks received 16 or 64 mg NaNO3 in 250 mL of **water** (about equal or 4 times the recommended WHO guideline value of 50 mg NO3-/L). Nitroso compounds (amines and amides) were determined in saliva before and 1 hr after ingestion of **nitrate**. **Nitrate** ingestion did not affect the level of nitroso compounds in the saliva.

*WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 27, 2006: **http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm***

▸ Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ Both normal and asthmatic adults who breathed submicronic aerosol of sodium nitrate (up to 1 mg/cu m) for 10 min showed no significant changes in lung vol, distribution of ventilation, ear oximetry, dynamic mechanics of breathing and oscillation mechanics of the chest-lung system.

PMID:510258
SACKNER MA ET AL; ENVIRON RES 18 (2): 421 (1979)

▸ Hazardous Substances Data Bank (HSDB)

/HUMAN EXPOSURE STUDIES/ The use of **N-methylnicotinamide** (NMN) as a biomarker for **nitrate**/**nitrite** exposure was investigated in a human study with volunteers. 8 volunteers received a single does of sodium nitrate, corresponding with 10 mg NaNO3/kg/day (2 times the acceptable daily intake for **nitrate**). A rapid incr of urinary NMN (up tp 6-fold) was observed.

*European Chemicals Bureau; IUCLID Dataset, Sodium nitrate, containing in the dry state more than 16.3 per cent by weight of nitrogen (7631-99-4) (2000 CD-ROM edition). Available from, as of October 26, 2006: **http://esis.jrc.ec.europa.eu/***

▸ Hazardous Substances Data Bank (HSDB)

/SIGNS AND SYMPTOMS/ ACUTE ... SYMPTOMS: Inhalation--Cough. Sore throat; Skin--Redness; Eyes--Redness. Pain; Ingestion--Abdominal pain. Blue lips or fingernails. Blue skin. Convulsions. Diarrhoea. Dizziness. Headache. Labored breathing. Confusion. Nausea. Unconsciousness.

*IPCS, CEC; International Chemical Safety Card on Sodium nitrate. (October 2001). Available from **http://www.inchem.org/documents/icsc/icsc/eics0185.htm** as of October 23.*

▸ Hazardous Substances Data Bank (HSDB)

For more Human Toxicity Excerpts (Complete) data for SODIUM NITRATE (29 total), please visit the **HSDB record page**.

▸ Hazardous Substances Data Bank (HSDB)

13.1.13 Non-Human Toxicity Excerpts

/LABORATORY ANIMALS: Acute Exposure/ ... A 10% aq soln of sodium nitrate applied continuously for 5 min was practically innocuous to the surface of ... /rabbit/ eyes. The conjunctivae became midly hyperemic, but the corneas remained clear, and the eyes rapidly returned completely to normal ... No disturbance of the cornea occurred in a more prolonged test with sodium nitrate dripped continuously for three hours on rabbit eyes as a 0.1 molar solution at pH 7.0 or 7.5 made up to 0.46 osmolar with **sodium chloride** or **sucrose**.[Grant, W.M. Toxicology of the Eye. 3rd ed. Springfield, IL: Charles C. Thomas Publisher, 1986., p. 840]

▸ Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ Organs and blood of bulls poisoned by intragastric admin of 0.9 g sodium nitrate/kg contained 14.0 to 43.0 and 63.7 mg % nitrates, respectively, and 0.16 ot 0.89 and 1.53 mg % nitrites. Myoglobin level was decreased in heart and other muscles. Basophilic neurons were found. Dystrophic changes and extravasation occurred in organs.[YATSYSHIN AI ET AL; VETERINARIYA (MOSCOW) 3: 70 (1979)]

▸ Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Acute Exposure/ Primary Eye Irritation /Rabbit/: Corneal Opacity reversible within 7 days; Primary Dermal Irritation /Rabbit/: Mild or slight irritation at 72 hrs.[USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic **Nitrate**/**Nitrite** (**Sodium** and Potassium Nitrates), September 1991. Available from, as of October 11, 2006: http://www.epa.gov/pesticides/reregistration/status.htm]

Hazardous Substances Data Bank (HSDB)

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Vitamin A and E levels in the blood serum, and also in liver were determined in 80 weaned piglets or feeder pigs. The effects of sodium nitrate were studied, and 5 experiments were designed to assess the effects of sodium nitrite or potassium nitrite, all administered in the drinking water or added to dry complete feed mixtures for 20 to 42 days. In no case (including that of potassium nitrite intake at 1.8 g/kg body mass for 28 days) was this supplementation found to exert adverse effects on the metabolism of vitamins A and E. Some indication of a downward trend in vitamin A and E levels in the serum and liver was found in 4 experiments. There were no adverse effects on either health status or gains in body mass. Toxic effects were produced by administration of 31 mg nitrite/kg body mass in the drinking water. Consideration was also given to the development and course of methemoglobinemia.[Dvorak M; Acta Vet Brno 53 (3-4): 159-68 (1984)]

Hazardous Substances Data Bank (HSDB)

For more Non-Human Toxicity Excerpts (Complete) data for SODIUM NITRATE (36 total), please visit the HSDB record page.

Hazardous Substances Data Bank (HSDB)

13.1.14 Non-Human Toxicity Values

Showing 5 of 8 View More

LD50 Rat oral 1267 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. 3265

Hazardous Substances Data Bank (HSDB)

LD50 Mouse iv 175 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. 3265

Hazardous Substances Data Bank (HSDB)

LD50 Mouse oral 2480 mg/kg

WHO; WHO Food Additives Series 35 (845): Nitrate. Available from, as of October 30, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je14.htm

Hazardous Substances Data Bank (HSDB)

LD50 Rabbit oral 1600 mg/kg

WHO; WHO Food Additives Series 35 (845): Nitrate. Available from, as of October 30, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je14.htm

Hazardous Substances Data Bank (HSDB)

LD50 Rabbit oral 2680 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. 3265

Hazardous Substances Data Bank (HSDB)

13.1.15 Ecotoxicity Values

Showing 5 of 25 View More

LC50; Species: Daphnia magna (Water flea); Conditions: freshwater; static; Concentration: 4206000 ug/L for 96 hr /total/

Dowden BF, Bennett HJ; J Water Pollut Control Fed 37 (9): 1308-1316 (1965) Available from, as of August 28, 2006

Hazardous Substances Data Bank (HSDB)

LC50; Species: Daphnia magna (Water flea); Conditions: freshwater; static; Concentration: 2125000 ug/L for 72 hr /total/

Dowden BF, Bennett HJ; J Water Pollut Control Fed 37 (9): 1308-1316 (1965) Available from, as of August 28, 2006

Hazardous Substances Data Bank (HSDB)

LC50; Species: Daphnia magna (Water flea); Conditions: freshwater; static; Concentration: 3581000 ug/L for 48 hr /total/

Dowden BF, Bennett HJ; J Water Pollut Control Fed 37 (9): 1308-1316 (1965) Available from, as of August 28, 2006

Hazardous Substances Data Bank (HSDB)

LC50; Species: Daphnia magna (Water flea, 4th instar or adult); Conditions: freshwater; static; Concentration: 5980000 ug/L for 24 hr /total/

Dowden BF, Bennett HJ; J Water Pollut Control Fed 37 (9): 1308-1316 (1965) Available from, as of August 28, 2006

Hazardous Substances Data Bank (HSDB)

LC50; Species: Lepomis macrochirus (Bluegill, size 6.09 cm, wt. 2.80 g); Conditions: freshwater; static; Concentration: 10000000 ug/L for 96 hr /total/

Cairns J Jr, Scheier A; Proc.13th Ind.Waste Conf., Purdue Univ.Eng.Bull 96:243-252 (1959) Available from, as of August 28, 2006

Hazardous Substances Data Bank (HSDB)

13.1.16 Ecotoxicity Excerpts

/BIRDS and MAMMALS/ The intended purpose of /pesticide/ products containing these active ingredients is to kill certain vertebrates and wasp pest species inhabiting burrows. Pest species are not exposed to sodium and potassium nitrates, but rather to the products of their pyrolysis. Application is subsurface and precludes exposure to avian populations and aquatic organisms. The Agency realizes, however, that any organism in a properly treated burrow will likely be killed and is concerned about potential impact to populations of non-target and endangered species. The open literature indicates that several types of non-target organisms, including burrowing owls, may inhabit the burrows of target pests. ... Due to the potential risk to non-target organisms, the Agency is currently developing more extensive labeling regarding timing of application and observation of signs indicating the presence or absence of target and nontarget organisms. These instructions will be explicit concerning actions users must take before applying the product. The use of these products may also result in a potential impact on endangered species which utilize burrows...

USEPA/Office of Pesticide Programs; Reregistration Eligibility Decision Document - Inorganic Nitrate/Nitrite (Sodium and Potassium Nitrates), September 1991. Available from, as of October 11, 2006: http://www.epa.gov/pesticides/reregistration/status.htm

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ The effects of **ammonium nitrate**, **ammonium chloride**, **ammonium sulfate**, and sodium nitrate on survival and growth of Pacific treefrog (Pseudacris regilla) and African clawed frog (Xenopus laevis) embryos were determined in static-renewal tests. The 10-day LC50s for the three **ammonium** compounds for P. regilla ranged from 25.0-32. 4 mg/L NH4 -N. The 10-day sodium nitrate LC50 for P. regilla was 578. 0 mg/L NO3-N. LC50s for X. laevis exposed for 4 or 5 days to the three **ammonium** compounds ranged from 27.5-60.2 mg/L NH4-N. The sodium nitrate LC50 for X. laevis ranged from 438.4-871.6 mg/L NO3-N. The lowest LOAEL based on length or weight was 6.1 mg/L NH4-N for the two species. The lowest LOAELs for NO3-N were 111.1 mg/L for P. regilla and 56.7 mg/L for X. laevis. Calculated unionized NH3 comprised 0.5-1.8% of measured NH4-N concentrations. Potential harm to amphibian populations could occur if NH4-N and NO3-N in agricultural runoff or drainage impacts sensitive life stages for a sufficiently long period.

PMID:9888966
Schuytema GS, Nebeker AV; Arch Environ Contam Toxicol 36 (2): 200-6 (1999)

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ Safe concentrations (SCs) of **nitrate** (NO3-N) for early and last instar larvae of two species of Nearctic net-spinning caddisflies, Cheumatopsyche pettiti and Hydropsyche occidentalis, are estimated from short-term toxicity bioassays using an innovative methodology, the multifactor probit analysis (MPA) software. Toxicity bioassays were conducted in soft **water** (average hardness value of 42.7 ppm CaCO3). Larvae were exposed to five different concentrations of sodium nitrate (NaNO3) for 120 hours. SCs were estimated on the basis of mortality data. SCs (or 8760 hour LC0.01 values expressed in ppm NO3-N) and their 95% confidence limits were 1.4 (0.4-3.0) for the early instar of H. occidentalis, 2.4 (0.7-5.4) for the early instar of C. pettiti, 2.2 (0.8-4.7) for the last instar of H. occidentalis, and 3.5 (1.0-8.1) for the last instar of C. pettiti. These results suggest that larvae of C. pettiti and H. occidentalis may be much more sensitive to **nitrate** pollution than fishes

Camargo JA, Ward JV; Chemosphere; 31 (5) 3211-6 (1005)

Hazardous Substances Data Bank (HSDB)

/AQUATIC SPECIES/ Freshwater Life The recommended interim freshwater guideline for the **nitrate** ion is 13 mg NO3 x L-1. This value was derived by multiplying the 10-d LOEC of 133 mg NO3 x L-1 for P. regilla (Schuytema and Nebeker 1999c) by a safety factor of 0.1 (CCME 1991). Marine Life The recommended interim marine guideline for the **nitrate** ion is 16 mg NO3 x L-1. This value was derived by multiplying the LC50 for N. grubei by a safety factor of 0.05 (CCME 1991). A more conservative safety factor was used for the marine guideline because: the polychaete in the critical study was not tested at its most sensitive life stage; the critical endpoint, although chronic, was based on a median lethal effect rather than a low sublethal effect; and adverse effects have been observed in non-indigenous tropical species exposed to much lower **nitrate** concentrations. **Water** Quality Guideline Application These guidelines are only intended to protect against direct toxic effects of **nitrate**; indirect toxic effects resulting from eutrophication may still occur at **nitrate** concentrations below these guideline values, depending on the total amount of bioavailable **nitrogen** and other site-specific factors (e.g., **phosphorous**, light availability). /**Nitrate**/

Environment Canada; Canadian Environmental Quality Guidelines Vol:1, 7 p (2003)

Hazardous Substances Data Bank (HSDB)

For more Ecotoxicity Excerpts (Complete) data for SODIUM NITRATE (7 total), please visit the **HSDB record page**.

Hazardous Substances Data Bank (HSDB)

13.1.17 Populations at Special Risk

/Protect/ from exposure those individuals with diseases of kidneys and lungs./Nitrates/

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

Hazardous Substances Data Bank (HSDB)

Infants and children are especially susceptible to **nitrate** exposure through topical **silver nitrate** used in burn therapy.... Infants younger than 4 months of age who are fed formula diluted with **water** from rural domestic wells are especially prone to developing acute acquired methemoglobinemia from **nitrate** exposure. The pH of the gut is normally higher in infants than in older children and adults. Higher gut pH enhances the conversion of ingested **nitrate** to more potent **nitrite**; gastroenteritis with vomiting and diarrhea can exacerbate **nitrite** formation. ... Additionally, premature or newborn infants might be more susceptible because they can have two to five times the level of fetal hemoglobin. In infants, reduced **nicotinamide-adenine dinucleotide** (**NADH**)- dependent methemoglobin reductase (reduced form of nicotinimide **adenine** dinucleotide), the enzyme responsible for reduction of methemoglobin back to normal hemoglobin, has only about half the activity present in adults. These factors combine to place young infants who are fed formula diluted with **nitrate**-contaminated well **water** at the greatest risk for toxicity. /Nitrates/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 6-8. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

In pregnant women, the level of methemoglobin increases from the normal (0.5% to 2.5% of total hemoglobin) to a maximum of 10.5% at the 30th week of pregnancy and subsequently declines to normal after delivery. Thus, pregnant women might be more sensitive to the induction of clinical methemoglobinemia by nitrites or nitrates at or near the 30th week of pregnancy. /Nitrates/

ATSDR; Case Studies in Environmental Medicine. NITRATE/NITRITE TOXICITY. p 9. Course: SS3054. Revision Date: January 2001 Original Date: October 1991 Expiration Date: January 2007.

Hazardous Substances Data Bank (HSDB)

Acute **nitrate** toxicity is almost always seen in infants rather than adults when it results from ingestion of well waters and vegetables high in nitrates ... /It was/ deduced that infants were prone to upset stomachs and achlorhydria. As result, stomach pH increased in alkalinity allowing **nitrate**-reducing organisms to enter and to reduce nitrates to nitrites. A gastric pH above 4 supports **nitrate**-reducing organisms ... Immature enzyme systems may also be of importance ... Fetal hemoglobin (hemoglobin F) is oxidized by **nitrite** to methemoglobin at rate twice as rapid as adult hemoglobin (hemoglobin A). Furthermore, enzymatic capacity of erythrocytes of newborn infants to reduce methemoglobin to hemoglobin appears less than that of adults. Difference is probably due to developmental deficiency in activity of DPNH-methemoglobin reductase (**diphosphopyridine nucleotide**). As opposed to adults, several clinical, physiologic and metabolic factors predispose infants to development of methemoglobinemia and acute **nitrate** poisoning. /**Nitrate** and **nitrite**/

National Research Council. Drinking Water & Health Volume 1. Washington, DC: National Academy Press, 1977., p. 420

Hazardous Substances Data Bank (HSDB)

Those with ulcerative lesions of the bowel, and infants, seem to be at special risk following ingestion of nitrates. /Nitrates/

International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 878

Hazardous Substances Data Bank (HSDB)

... Individuals with diseases of kidneys and lungs. /Nitrates/

ITII. Toxic and Hazardous Industrial Chemicals Safety Manual. Tokyo, Japan: The International Technical Information Institute, 1988., p. 484

Hazardous Substances Data Bank (HSDB)

Neonates are at special risk for high nitrate and nitrite levels as their enzyme system for regeneration of hemoglobin is not fully developed ... Most clinical case data refers to neonates developing methemoglobinemia after drinking water or water-based formulations with high nitrate or nitrite content. The great majority of cases (well-water methemoglobinemia) occurred when nitrate levels in drinking water exceeded 100 mg NO3-/L ... It is generally acknowledged that water nitrate content of 50 mg/L is safe even for neonates. Assuming normal liquid intake of 150 mL/kg/day by neonates, nitrate intake of 7.5 mg NO3-/kg/day is safe ... Cases of methemoglobinemia have also been reported due to feeding babies vegetable preparations where nitrate has been converted to nitrite through bacterial action. /Nitrate and nitrite poisoning/

IPCS; Poisons Information Monograph G016: Nitrates and nitrites. (September 1996). Available from, as of October 24, 2006: http://www.inchem.org/documents/pims/chemical/pimg016.htm

Hazardous Substances Data Bank (HSDB)

Nitrite intoxication is encountered most frequently among neonates who consume water contaminated with nitrates. Nitrate as such does not produce methemoglobinemia ... /Sodium nitrate is/ rapidly absorbed and excreted unchanged, causing few reactions other than diuresis and ... catharsis. Under some circumstances ... appreciable amounts of nitrate are converted to nitrite ... A case of severe (57%) methemoglobinemia in 2 week-old infant /is reported/ ... A common history in ... /this and other/ cases was residence in rural area where home water supply was a well ... These waters /have been found/ to be heavily contaminated with nitrates and coliform bacteria ... Reaction is peculiar to neonate ... Sensitive neonates had gastric pH values above 4. Thus ingested bacteria may escape destruction in stomach and proliferate in upper GI tract. Many strains of bacteria are known that avidly reduce nitrate to nitrite. /Nitrate and nitrite/

Gosselin, R.E., H.C. Hodge, R.P. Smith, and M.N. Gleason. Clinical Toxicology of Commercial Products. 4th ed. Baltimore: Williams and Wilkins, 1976., p. III-251

Hazardous Substances Data Bank (HSDB)

... Individuals with stomach lesions or disorders ... /and/ persons on cimetidine and other antacid medication present special risk groups in which a correlation between nitrate or nitrite intake and incidence of gastric cancer cannot be excluded. /Nitrate and nitrite/

European Chemicals Bureau; IUCLID Dataset, Sodium nitrite (7632-00-0) (2000 CD-ROM edition). Available from, as of October 27, 2006: http://esis.jrc.ec.europa.eu/

Hazardous Substances Data Bank (HSDB)

Aside from infants under 3 months of age, several other categories of individuals with altered physiological status or with hereditary or acquired disease may also be predisposed to the development of nitrite- or nitrate-induced methaemoglobinaemia. These include pregnant women ... individuals with glucose-6-phosphate dehydrogenase deficiency ... adults with reduced gastric acidity (including those being treated for peptic ulcer or individuals with chronic gastritis or pernicious anaemia), a rare group with a hereditary lack of NADH or methaemoglobin reductase activity in their red blood cells ... and probably the elderly ... Individuals with hereditary structural abnormalities in hemoglobin, referred to as hemoglobin Ms, are probably also at increased risk from dietary nitrate or nitrite. /Nitrate and nitrite/

WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 30, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm

Hazardous Substances Data Bank (HSDB)

Atrophic gastritis is a relevant factor in determining the gastric nitrite level, because nitrate administered to subjects with this type of gastritis results in a ten times higher nitrite concentration than that found in subjects with a normal mucosa. A given nitrate dose may be harmless to normal subjects, but harmful to a patient with atrophic gastritis, especially in the presence of precursors of N-nitrosamines or nitrosamides in the diet. /Nitrate and nitrite/

WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 31, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm

Hazardous Substances Data Bank (HSDB)

... Iron deficient patients with gastric lesions and patients with pernicious anemia (PA) are predisposed to stomach cancer and also have a high reduction rate of nitrate to nitrite. The reduction rates in PA patients were nearly 50-fold higher than of matched controls, as was the number of bacteria. /Nitrate and nitrite/

WHO; WHO Food Additives Series 35 (844): Nitrite. Available from, as of October 31, 2006: http://www.inchem.org/documents/jecfa/jecmono/v35je13.htm

Hazardous Substances Data Bank (HSDB)

13.2 Ecological Information

13.2.1 Natural Pollution Sources

Occurs as a mineral in Chile.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. 13th Edition, Whitehouse Station, NJ: Merck and Co., Inc., 2001., p. 1544

Hazardous Substances Data Bank (HSDB)

Chile saltpeter (caliche) is impure natural sodium nitrate.

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 14th Edition. John Wiley & Sons, Inc. New York, NY 2001., p. 1019

Hazardous Substances Data Bank (HSDB)

Found in deposits associated with sodium and potassium chloride, potassium nitrate, sodium sulfate, magnesium chloride and other salts.

Pokorny L et al; Kirk-Othmer Encyclopedia of Chemical Technology. (2005). NY, NY: John Wiley & Sons; Sodium Nitrate and Nitrite. Online Posting Date: Jan 27, 2006.

Hazardous Substances Data Bank (HSDB)

14 Associated Disorders and Diseases

- Comparative Toxicogenomics Database (CTD)

15 Literature

15.1 NLM Curated PubMed Citations

PubChem

15.2 Springer Nature References

Springer Nature

15.3 Thieme References

Thieme Chemistry

15.4 Wiley References

Wiley

15.5 Depositor Provided PubMed Citations

PubChem

15.6 Chemical Co-Occurrences in Literature

PubChem

15.7 Chemical-Gene Co-Occurrences in Literature

PubChem

15.8 Chemical-Disease Co-Occurrences in Literature

PubChem

16 Patents

16.1 Depositor-Supplied Patent Identifiers

PubChem

Link to all deposited patent identifiers

PubChem

16.2 WIPO PATENTSCOPE

Patents are available for this chemical structure:

https://patentscope.wipo.int/search/en/result.jsf?inchikey=VWDWKYIASSYTQR-UHFFFAOYSA-N

PATENTSCOPE (WIPO)

17 Biomolecular Interactions and Pathways

17.1 Chemical-Gene Interactions

17.1.1 CTD Chemical-Gene Interactions

Comparative Toxicogenomics Database (CTD)

18 Biological Test Results

18.1 BioAssay Results

PubChem

19 Classification

19.1 Ontologies

19.1.1 MeSH Tree

Medical Subject Headings (MeSH)

19.1.2 ChEBI Ontology

ChEBI

19.1.3 EPA Safer Choice

EPA Safer Choice

19.1.4 ChemIDplus

ChemIDplus

19.1.5 CAMEO Chemicals

CAMEO Chemicals

19.1.6 ChEMBL Target Tree

ChEMBL

19.1.7 UN GHS Classification

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

19.1.8 EPA CPDat Classification

EPA Chemical and Products Database (CPDat)

19.1.9 NORMAN Suspect List Exchange Classification

NORMAN Suspect List Exchange

19.1.10 EPA DSSTox Classification

EPA DSSTox

20 Information Sources

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   Sodium nitrate
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   Sodium nitrate
   https://www.drugbank.ca/drugs/DB15952

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   Nitric acid sodium salt (1:1)
   https://www.epa.gov/chemicals-under-tsca

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   Sodium nitrate
   https://comptox.epa.gov/dashboard/DTXSID6020937

   CompTox Chemicals Dashboard Chemical Lists
   https://comptox.epa.gov/dashboard/chemical_lists/

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   Sodium nitrate
   https://echa.europa.eu/substance-information/-/substanceinfo/100.028.686

   Sodium nitrate
   https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/61079

   Sodium Nitrate
   https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/213018

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   SODIUM NITRATE
   https://pubchem.ncbi.nlm.nih.gov/source/hsdb/726

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   SODIUM NITRATE
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   Sodium(I) nitrate (1:1)
   https://www.cdc.gov/niosh-rtecs/WC557300.html

10. **DOT Emergency Response Guidebook**

    sodium nitrate
    https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg

11. **ChEBI**

    Sodium nitrate
    http://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI:63005

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

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sodium nitrate
https://comptox.epa.gov/dashboard/DTXSID6020937#exposure

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

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

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

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CHILE SALTPETRE
https://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=550

17. EU Clinical Trials Register
https://www.clinicaltrialsregister.eu/

18. NITE-CMC

Sodium nitrate - FY2010
https://www.nite.go.jp/chem/english/ghs/10-mhlw-2022e.html

Sodium nitrate - FY2006
https://www.nite.go.jp/chem/english/ghs/06-imcg-1384e.html

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SODIUM NITRATE
https://www.cfsanappsexternal.fda.gov/scripts/fdcc/index.cfm?set=FoodSubstances&id=SODIUMNITRATE

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8M4L3H2ZVZ
https://www.fda.gov/ForIndustry/DataStandards/SubstanceRegistrationSystem-UniqueIngredientIdentifierUNII/

21. Wikipedia

sodium nitrate
https://en.wikipedia.org/wiki/Sodium_nitrate

22. SpectraBase

SODIUM NITRATE
https://spectrabase.com/spectrum/KENfrBY8gE

SODIUM NITRATE
https://spectrabase.com/spectrum/6BAcX6KRAZl

SODIUM-NITRATE
https://spectrabase.com/spectrum/GNXmqAUrFgU

NITRIC ACID, SODIUM SALT
https://spectrabase.com/spectrum/KzY5JeR2c7A

SODIUM NITRATE
https://spectrabase.com/spectrum/3R2aswkfY8L

SODA NITER - SODIUM NITRATE (TARAPACA, CHILE)
https://spectrabase.com/spectrum/E3unGMsqAOn

Sodium nitrate
https://spectrabase.com/spectrum/3HiJTUdVvPd

23. Springer Nature

24. Thieme Chemistry

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25. Wiley

https://pubchem.ncbi.nlm.nih.gov/substance/?source=wiley&sourceid=14196

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

27. Medical Subject Headings (MeSH)
sodium nitrate
https://www.ncbi.nlm.nih.gov/mesh/67031618
MeSH Tree
http://www.nlm.nih.gov/mesh/meshhome.html
Carcinogens
https://www.ncbi.nlm.nih.gov/mesh/68002273

28. 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

29. ChEMBL
Target Tree
https://www.ebi.ac.uk/chembl/target/browser

30. NORMAN Suspect List Exchange
NORMAN Suspect List Exchange Classification
https://www.norman-network.com/nds/SLE/

31. PATENTSCOPE (WIPO)
SID 403029884
https://pubchem.ncbi.nlm.nih.gov/substance/403029884