



Material Safety Data Sheet

MSDS/SDS Number: 00000031MSDS
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Revision: A

SECTION 1 IDENTIFICATION OF THE SUBSTANCE OR PREPARATION AND OF THE COMPANY/UNDERTAKING

Product Name: Anti-Citrulline (Modified)
Catalogue Number(s): 07-390; Component of 17-347
Chemical Name: Aqueous Solution of Sodium Azide, 2-amino-2-(hydroxymethyl) propane-1,3-diol hydrochloride, Glycerol, and Sodium Chloride.
Synonyms: None
Intended Product Use: Cellular Research


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SECTION 2 HAZARDS IDENTIFICATION

GHS Hazard Class: Acute Toxicity: Category 5
Serious Eye Damage/Eye Irritation: Category 2B
Skin Corrosion/Irritation: Category 3

Signal Word and Hazard Statement: Warning: May be harmful if swallowed (oral) (H303)
Warning: May be harmful in contact with skin (dermal) (H313)
Warning: May be harmful if inhaled (gas, vapour, dust, mist) (H333)
Warning: Causes eye irritation (H320)
Warning: Causes mild skin irritation (H316)

EU Hazard Symbol Pictogram:  Xi (R36/38)

SECTION 3 COMPOSITION/INFORMATION ON INGREDIENTS

Identification of Dangerous Components: This product contains the substances listed below, which are defined as dangerous substances or hazardous chemicals as defined in European Community Directives 67/548/EEC or 1999/45/EC, and Hazard Communication Standard 29 CFR 1910.1200.

Dangerous Component	EINECS or ELINCS No.	CAS No.	Content (weight percent)	EU Hazard Symbol Letters*†	R Phrases** †
Sodium Azide:	247-852-1	26628-22-8	< 1%	T N	R28 R32 R50/53
2-amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride:	214-684-5	1185-53-1	< 2 %	N/A	N/A
Glycerol:	200-289-5	56-81-5	30 %	N/A	N/A

Identification of Components Not Classified as Dangerous: This product contains the substances listed below, which are not defined as dangerous substances or hazardous chemicals as defined in European Community Directives 67/548/EEC or 1999/45/EC, and Hazard Communication Standard 29 CFR 1910.1200.

Non-Dangerous Component	EINECS or ELINCS No.	CAS No.	Content (weight percent)	EU Hazard Symbol Letters *	R Phrases**
Sodium Chloride:	231-598-3	7647-14-5	Proprietary	N/A	N/A
Water:	231-791-2	7732-18-5	< 67 %	N/A	N/A

* Symbol letters and categories of danger: **T+** = Very toxic, **T** = Toxic, **C** = Corrosive, **Xn** = Harmful, **Xi** = Irritant, **E** = Explosive, **F+** = Extremely flammable, **F** = Very flammable, **N** = Dangerous for the environment, **O** = Oxidising.

** The full text of each R phrase is listed in Section 15.

† Symbols letters and R Phrases are assigned to each dangerous component for the highest concentration range as defined in 67/548/EEC and 1999/45/EC.

SECTION 4 FIRST AID MEASURES

	Treatment Measures:	Symptoms of Exposure:
Contact with Eyes:	If the product contacts the eyes, promptly wash (irrigate) the eyes with large amounts of tepid water for at least 15 minutes, occasionally lifting the lower and upper lids. Seek medical attention immediately.	Possible eye irritation
Ingestion:	Seek medical attention immediately. Never give an unconscious person anything by mouth.	Possible gastrointestinal irritation causing nausea and vomiting.
Inhalation:	If a person inhales large amounts of the product move the exposed person to fresh air at once. If breathing is difficult or stops seek immediate medical attention.	Possible respiratory tract and mucous membrane irritation.
Skin Contact:	If the product contacts the skin, immediately flush the contaminated	Possible skin irritation.

skin with mild soap and water. If this chemical penetrates clothing immediately remove the clothing and flush the skin with water. Seek medical attention immediately.

SECTION 5 FIRE FIGHTING MEASURES

- Suitable Extinguishing Media:** Use extinguishing media appropriate for the surrounding fire. This product is compatible with commercially available extinguishing media.
- Special Exposure Hazards:** Hazardous decomposition products that form when the substance or mixture burns
- Special Protective Equipment for Firefighters:** This product does not require the use of any additional fire fighting equipment beyond what is appropriate to the surrounding fire.

SECTION 6 ACCIDENTAL RELEASE MEASURES

- Personal Precautions:** Wear chemical resistant boots, clothing, eye protection, and gloves to prevent skin contact. (See Section 8)
- Small Spills:** Identify the spilled material(s). Barricade the spill area and notify others in the surrounding areas. Control all sources of ignition if the substance is flammable. Don the appropriate personal protective equipment (See section 8). Control the movement of the spilled product (into drains, soil, across floors etc.) with absorbent spill materials. Collect contaminated spill material and place in container meeting appropriate U.N. packaging requirements. Decontaminate used equipment and affected spill area appropriately.
- Large Spills:** In addition to small spill precautions, determine personnel evacuation distances. Notify appropriate authorities if necessary.
- Environmental Precautions:** Collect and dispose of contaminated materials according to international, federal, state and local regulations. Keep away from surface and ground water, drains, and soil.

SECTION 7 HANDLING AND STORAGE

- Handling:** Seek appropriate training to safely handle this product under normal conditions. Use the recommended personal protective equipment (See Section 8) to prevent chemical exposures. Wash hands with soap and water before eating, drinking, or touching common items (phone, computer, etc.) to prevent cross contamination. Use this product with adequate ventilation. See product technical data sheet for details.
- Storage:** See product technical data sheet for details.
- Specific use:** See product technical data sheet for details.

SECTION 8 EXPOSURE CONTROL AND PERSONAL PROTECTION

Exposure Limit Values:	OSHA PEL	NIOSH REL	ACGIH TLV	Other
Sodium Azide:	Not Listed	0.1 ppm skin as HN ₃ , 0.3 mg/m ³ skin as NaN ₃	0.11 ppm as HN ₃ , 0.29 mg/m ³ as Na	See Below

(Ceiling)

N3 (Ceilings),
A4 Not
classifiable as
a human
carcinogen.

Australia:	Ceiling Concentration 0.11 ppm (0.3 mg/m ³), JUL2008
Belgium:	TWA 0.1 mg/m ³ , STEL 0.3 mg/m ³ , Skin, MAR2002
Denmark:	TWA 0.1 mg/m ³ , OCT 2002
E.C.:	TWA 0.1 mg/m ³ ; STEL 0.3 mg/m ³ (skin), FEB 2006
Finland:	TWA 0.1 ppm (0.3 mg/m ³), STEL 0.3 ppm (0.9 mg/m ³), JAN1999
France:	VME 0.1 mg/m ³ , VLE 0.3 mg/m ³ , Skin, FEB2006
Germany:	MAK 0.2 mg/m ³ (inhalable), 2005
Hungry:	TWA 0.1 mg/m ³ , STEL 0.3 mg/m ³ , SEP2000
Korea:	Ceiling Concentration 0.1 ppm (0.3 mg/m ³), 2006
The Netherlands:	MAC-TGG 0.1 mg/m ³ , Skin, 2003
New Zealand:	Ceiling Concentration 0.11 ppm (0.29 mg/m ³), JAN2002
Sweden:	TWA 0.1 mg/m ³ ; STEL 0.3 mg/m ³ , Skin, JUN2005
Switzerland:	MAK- week 0.2 mg/m ³ ,KZG- week 0.4e mg/m ³ , DEC2006
United Kingdom:	TWA 0.1 mg/m ³ ; STEL 0.3 mg/m ³ (skin), 2005

2-amino-2-
(hydroxymethyl)propane-1,3-
diol hydrochloride (Tris HCl):

Not Listed Not Listed Not Listed None

Glycerol:	15 mg/m ³ (TWA) (Total Dust) 5 mg/m ³ (TWA) (Respirable Fraction)	Not Listed	10 mg/m ³	See Below
Belgium:	TWA 10 mg/m ³ , JAN1993			
Finland:	TWA 20 mg/m ³ , JAN1999			
France:	VME 10 mg/m ³ , FEB2006			
Korea:	TWA 10 mg/m ³ (mist), 2006			
Mexico:	TWA 10 mg/m ³ (inhalable), 2004			
The Netherlands:	MAC-TGG 10 mg/m ³ , 2003			
New Zealand:	TWA 10 mg/m ³ (mist), JAN2002			
Switzerland:	MAK- week 50 mg/m ³ ,KZG- week 100 mg/m ³ , DEC2006			
United Kingdom:	TWA 10 mg/m ³ , 2005			

Normal Handling Conditions**Emergency Response Conditions**

Engineering Controls:	General room ventilation is adequate for the use of this product.	Provide negative pressure ventilation.
Respiratory Protection	Use appropriate respiratory protection.	Use appropriate respiratory protection.
Eye Protection:	Safety glasses with side shields.	Chemical splash goggles or other face protection as appropriate.
Skin Protection:	Laboratory coat, adequate chemical-resistant gloves.	Chemically resistant boots, clothes, and impermeable gloves as appropriate.

Environmental Exposure Controls: Not available. Not available.

Other Equipment: Safety shower, eyewash stations, and hand washing equipment should be available close to the work area as needed.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear Colorless Liquid

Odor: None

Odor Threshold: Not Available

pH: Not Available

Melting Point/Freezing point: Not Available

Initial boiling point and boiling range: Not Available

Flash Point: Not Available

Evaporation Rate, 20 °C: Not Available

Flammability (Solid/Gas): Not Available

Explosive Limits: UEL: Not Available LEL: Not Available

Vapor Pressure: Not Available

Vapor Density, 20 °C: Not Available

Relative Density (Water = 1.0): Not Available

Solubility: Soluble

Partition coefficient (n-octanol/water): Not Available

Auto Ignition Temperature (ASTM D1929): Not Available

Decomposition temperature: Not Available

Oxidizing Properties: None

Viscosity, centipoise: Not Available

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: Product is stable under normal operating conditions and use as described in the product technical data sheet.

Conditions to Avoid: See product technical data sheet for details.

Incompatible Materials to Avoid: Strong acids or bases, strong oxidizers, extreme temperatures, barium carbonate, trifluoroacryloyl fluoride, chromyl chloride, benzoyl chloride, dimethyl sulfate, dibromomalononitrile, ammonium chloride, and trichloroacetonitrile.

Hazardous Decomposition Products: Sodium azide forms explosion-sensitive materials with some metals such as lead, silver, mercury, and copper. Carbon disulfide and aqueous solutions of metal azides interact to produce metal azidodithioformates

most of which are explosive, with varying degrees of power and sensitivity to shock or heat metal azides.

SECTION 11 TOXICOLOGICAL INFORMATION

Toxicology Data: Toxicological information for this product as a whole does not exist, below is data for the individual components.

Sodium Azide: RTECS #VY8050000

Glycerol: RTECS #MA8050000

	Toxicity Test	Exposure Route	Dose	Observed Effect
Acute Toxicity:				
Sodium Azide:	LC ₅₀ (Rat)	Inhalation	37 mg/m ³	Eye: Other eye effects Behavioral: Convulsions or effect on seizure threshold Lung, Thorax, or Respiration: Structural or functional change in trachea or bronchi ¹
	LD ₁₀ (Human)	Oral	29 mg/kg	Brain and Coverings: Increased intracranial pressure Cardiac: Pulse rate decreased with fall in BP Lung, Thorax, or Respiration: Acute pulmonary edema ¹
	LD ₅₀ (Rat)	Skin	50 mg/kg	N/A ¹
	LD ₅₀ (Rabbit)	Skin	20 mg/kg	N/A ¹
Glycerol:	LD ₅₀ (Rat)	Oral	4,090 mg/kg	N/A ²
Skin Corrosion/Irritation:				
Glycerol:	Skin (Rabbit)	Irritation	Skin	500 mg/24 hour Mild ²
Serious Eye Damage/Eye Irritation:				
Glycerol:	Eye (Rabbit)	Irritation	Eye	500 mg/24 hour Mild ²
Respiratory or Skin Sensitization:	Not Available			
Germ Cell Mutagenicity:	Not Available			
Reproductive Toxicity:	Not Available			
STOST-Single Exposure:	Not Available			
STOST-Repeated Exposure:	Not Available			
Aspiration Hazard:	Not Available			
Carcinogenicity:	Carcinogenetic information for this product as a whole does not exist, below is data for the individual components.			
Research Agency:	OSHA:	NTP:	IARC:	

Sodium Azide:	Not Listed	Not Listed	Not Listed
2-amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride (Tris HCl):	Not Listed	Not Listed	Not Listed
Glycerol:	Not Listed	Not Listed	Not Listed

SECTION 12 ECOLOGICAL INFORMATION

Ecotoxicity: Ecotoxicity information for this product as a whole does not exist, below is data for the individual components:

Sodium Azide: LC₅₀ Lepomis Macrochirus 24 Hours 2,100 ug/L³
 LC₅₀ Oncorhynchus Mykiss 96 Hours 2,750 ug/L⁴
 LC₅₀ Pimephales Promelas 96 Hours 5,460 ug/L⁵

2-amino-2-(hydroxymethyl)propane-1,3-diol hydrochloride: Not Available

Glycerol: LC₅₀ Carassius Auratus 24 Hours 5,000,000 ug/L⁶
 LC₅₀ Leuciscus Idus Melanotus 48 Hours 10,000,000 ug/L⁷
 LC₅₀ Oncorhynchus Mykiss 96 Hours 54.0 ml/L⁸

Mobility:

Sodium Azide: Aquatic Fate: Photolysis of sodium azide may result in metal nitrides initially, with the eventual formation of the free metal and nitrogen gas.⁹

Glycerol: Terrestrial Fate: If released to soil, glycerin is expected to undergo rapid biodegradation under aerobic conditions. Biodegradation under anaerobic conditions is also expected to occur. Based on an experimental log octanol/water partition coefficient of -1.76 and its water solubility, 1,220,000 mg/l at 5 deg C, soil adsorption coefficients for glycerin can be estimated at 3 and 2 (SRC), respectively, using regression-derived equations. The magnitude of these values indicate that glycerin will display very high mobility in soil. Based on an estimated Henry's Law constant of 1.75X10+11 atm cu-m/mol and vapor pressure, 1.58X10-4 mm Hg at 25 deg C glycerin is not expected to significantly volatilize from wither moist or dry soil to the atmosphere (SRC).¹⁰

Aquatic Fate: If released to water, glycerin is expected to rapidly degrade under aerobic conditions. Degradation is also likely in seawater and under anaerobic conditions. Based on an experimental log octanol/water partition coefficient of -1.76 and its water solubility, 1,220,000 mg/l at 5 deg C, bioconcentration factors for glycerin can be estimated at 3 and 0.2 (SRC), respectively, using regression-derived equations. The magnitude of these values indicate that bioconcentration in fish and aquatic organisms is not likely to occur to a significant extent. Estimated soil adsorption coefficients of 2 and 3 indicated that adsorption to sediment and suspended organic matter will not be important. Based on an estimated Henry's Law constant of 1.75X10+11 atm cu-m/mol, volatilization of glycerin from water will be slower then for water itself.¹⁰

Atmospheric Fate: If released to the atmosphere, glycerin may undergo a gas-phase oxidation with photochemically produced hydroxyl radicals. An estimated rate constant for this reaction of 1.7X10-11 cu- cm/molec-sec at 25deg C translates to an atmospheric half-life of 33 hrs (SRC) using an average atmospheric hydroxyl radical concn of 5X10+5 molec/cu-cm. The water solubility of glycerin, 1,220,000 mg/l at 5 deg C, indicates that it may also undergo atmospheric removal by wet deposition processes (SRC).¹⁰

Persistence and Degradation:

Sodium Azide: The dissipation of azides in soil is not by microbial action but is strictly a chemical

process accelerated by increasing acidity and elevated temperatures. Sodium Azide dissipates rapidly in soils by oxidation or by reaction of Hydrazoic Acid with soil organic acids to form Azides of these which decompose by the curtis rearrangement.¹¹

Glycerol: When incubated with a filtered effluent from a sanitary waste treatment plant, glycerin displayed a 5 day BOD of 82%. Inoculation of glycerin with activated sewage sludge resulted in 43.5-52.9% 5 day BOD. Glycerin underwent 94-97% removal after 24 hrs when incubated with activated sludge from a waste water treatment plant. A 98.7% COD was observed in 120 hrs after inoculation with a adapted activated sludge seed. Incubation with an activated sludge seed gave a 5 day BOD of 68%. Inscreening studies, 5 day BODs for glycerin of 31%, 52% using activated sludge, 78.3 using domestic sludge, and 24.4% using seawater were observed. Glycerin is listed as a substance easily degraded in a sewage treatment plant.¹⁰

An estimated rate constant for the vapor-phase reactio of glycerin with photochemically produced hydroxyl radicals of 1.7×10^{-11} cu cm/molec-sec at 25 deg C translates to an atmospheric half-life of 33 hr (SRC) using an average atmospheric hydroxyl radical concn of 5×10^{-5} molec/cu cm.¹⁰

Bio Accumulative Potential:

Sodium Azide: Sodium azide is stable in water in the absence of light but appears to be susceptible to photo-decomposition by solar radiation. Photolysis of sodium azide may result in metal nitrides initially, with the eventual formation of the free metal and nitrogen gas.⁹

Glycerol: Based on an experimental log octanol/water partition coefficient of -1.76 and its water solubility, 1,220,000 mg/l at 5 deg C, bioconcentration factors for glycerin can be estimated at 3 and 0.2 (SRC), respectively, using regression-derived equations. The magnitude of these values indicate that bioconcentration of glycerin in fish and aquatic organisms will not be significant (SRC).¹⁰

Results of PBT Assessment: Not Available

Other adverse effects: None known.

SECTION 13 DISPOSAL INFORMATION

Substance: Dispose of unused contents in accordance with international, federal, state, and local regulations.

Contaminated Packaging: Dispose of container in accordance with international, federal, state and local requirements.

SECTION 14 TRANSPORTATION INFORMATION

UN Number: Not Listed

Class: Not Listed

Proper Shipping Name: Not Listed

Packing Group: Not Listed

Marine Pollutant: Not Listed

Other Applicable Information: None

SECTION 15 REGULATORY INFORMATION

Australia:	Hazchem Code:	Not Listed
	Poisons Schedule Number:	S6
California:	Proposition 65 Listed:	Not Listed
Canada:	WHMIS:	D2B
European Union:	REACH:	Chemical Safety Assessment for the substance or substances in the preparation not required.
	Substances of Very High Concern (SVHC) - October 28 th , 2008:	This product does not contain SVHC's in concentrations above 0.1% weight/weight.
	Category of danger:	Xi: Irritant T: Toxic N: Dangerous for the environment
	Risk phrases:	R36/38: Irritating to eyes and skin. R28: Very toxic if swallowed. R32: Contact with acids liberates toxic gas. R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
	Safety phrases:	S7/9: Keep container tightly closed and in a well-ventilated place. S20/21: When using do not eat, drink or smoke. S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S27/28: After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of soap and tepid water. S29/35: Do not empty into drains; dispose of this material and its container in a safe way. S36/37/39: Wear suitable protective clothing, gloves and eye/face protection. S45: In case of accident or if you feel unwell, seek medical advice immediately S60: This material and its container must be disposed of as hazardous waste. S61: Avoid release to the environment. Refer to special instructions/safety data sheets.
	OECD/High Production Volume (HPV) chemicals:	Glycerol: Listed
	RoHS:	This product does not contain RoHS listed substances in concentrations above the established thresholds.
Japan:	Poisonous and Deleterious Substances Control Law:	Sodium Azide: 26628-22-8 Poisonous Substance

SECTION 16 ADDITIONAL INFORMATION

Training Advice: Seek effective chemical handling training to reduce the hazards associated with this product prior to use.

Technical Contact: <http://www.millipore.com/support>

Abbreviations Used	ACGIH	American Conference of Government Industrial Hygienists
	ADR	European agreement on the international carriage of dangerous goods on road
	CAS	Chemical Abstract Service
	EINECS	European Inventory of Existing Commercial Chemical Substances
	ELINCS	European List of Notified Chemical Substances
	EPA	United States Environmental Protection Agency
	IARC	International Agency for Research in Cancer.
	IATA	International Air Transport Association
	ICAO	International Civil Aviation Organization
	IMDG	Regulations regarding the transportation of dangerous goods on ocean-going vessels issued by the International Maritime Organization.
	LC ₅₀	Lethal Concentration 50% is the concentration of a chemical which kills 50% of a sample population
	LD ₅₀	Lethal Dose 50% is the dose of a chemical which kills 50% of a sample population.
	LDLo	Lowest observed lethal dose
	LEL	Lower Explosive Limit
	MSFU	Manufacture, Formulation, Supply and Use (Section 13)
	NIOSH	National Institute of Occupational Safety and Health (US)
	NTP	National Toxicology Program (US)
	OSHA	United States Occupational Safety and Health Administration
	RID	International regulations concerning the international carriage of dangerous goods by rail.
	RTECS	Registry of Toxic Effects of Chemical Substances (US)
	STOST	Specific Target Organ Systemic Toxicity
	UEL	Upper Explosive Limit
	WHMIS	Workplace Hazardous Materials Information System (Canada)

This safety data sheet has been prepared to comply with the requirements of the European Union regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) 1906/2006 and ANSI standard Z400.1-1998.

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¹ Centers for Disease Control and Prevention, 1600 Clifton Rd, Atlanta, GA 30333, USA, National Institute for Occupational Health and Safety (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) File #VY8050000, 2009.

² Centers for Disease Control and Prevention, 1600 Clifton Rd, Atlanta, GA 30333, USA, National Institute for Occupational Health and Safety (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) File #MA8050000, 2009.

³ Mayer, F.L.Jr., and M.R. Ellersieck, Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals, Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC :505 p. (USGS Data File), 1986.

⁴ Klaverkamp, J.F., A. Kenney, S.E. Harrison, and R. Danell, An Evaluation of Phenol and Sodium Azide as Reference Toxicants in Rainbow Trout, In: Proc.2nd Annual Aquatic Toxicity Workshop, 1975, Ontario Ministry of the Environ., Freshwater Inst., Winnipeg, Manitoba, Canada :73-92, 1975.

⁵ Geiger, D.L., L.T. Brooke, and D.J. Call, Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*), Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI 5:332 p., 1990.

⁶ Bridie, A.L., C.J.M. Wolff, and M. Winter, The Acute Toxicity of Some Petrochemicals to Goldfish, Water Res. 13(7):623-626 (OECDG Data File), 1979.

⁷ Juhnke, I., and D. Luedemann, Results of the Investigation of 200 Chemical Compounds for Acute Fish Toxicity with the Golden Orfe Test (Ergebnisse der Untersuchung von 200 Chemischen Verbindungen auf Akute Fischtoxizität mit dem Goldorfe Test), Z.Wasser-Abwasser-Forsch. 11(5):161-164 (GER) (ENG TRANSL) (OECDG Data File), 1978.

⁸ Mayer, F.L.Jr., and M.R. Ellersieck, Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals, Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC :505 p. (USGS Data File), 1986.

⁹ USEPA; Chemical Hazard Information Profile: Sodium Azide p.242 (1977) EPA-560/11-80-011.

¹⁰ <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+@rel+56-81-5>, U.S. National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20894, 2009.

¹¹ Weed Science Society of America. Herbicide Handbook. 5th ed. Champaign, Illinois: Weed Science Society of America, 1983., p. 440.