

SAFETY DATA SHEET

Version 8.10
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Product Number Sigma-Aldrich - 51799

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Putrescine

Product Number : 51799

Brand : Sigma-Aldrich
Recommended use of the chemical and restrictions on use : **Identified uses**
Laboratory chemicals

Company : 씨그마알드리치코리아(유)
서울특별시 강남구 테헤란로 508,
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금요일 (공휴일 제외)

2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to metals : Category 1

Acute toxicity (Oral) : Category 4

Acute toxicity (Inhalation) : Category 2

Acute toxicity (Dermal)	: Category 3
Skin corrosion/irritation	: Category 1
Serious eye damage/eye irritation	: Category 1

GHS label elements

Hazard pictograms



Signal word : Danger

Hazard statements : H290 May be corrosive to metals.
H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H330 Fatal if inhaled.

Precautionary statements : **Prevention:**
P234 Keep only in original container.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash the contact area thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.

Response:
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physi-

cian.
P363 Wash contaminated clothing before reuse.
P390 Absorb spillage to prevent material damage.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P406 Store in corrosive resistant (decided by the manufacturer or authority) container, as this is a metal corrosive material.

Disposal:

P501 Dispose of contents and container according to wastes control act.

Other hazards which do not result in classification

Stench.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 110-60-1

Components

Chemical name	CAS-No.	Concentration (% w/w)
1,4-Diaminobutane	110-60-1	>= 95 - <= 100

4. FIRST AID MEASURES

General advice : First aiders need to protect themselves. Show this safety data sheet to the doctor in attendance.

In case of eye contact : After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

In case of skin contact : In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

If inhaled : After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

If swallowed : After swallowing: make victim drink water (two glass-

	es at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.
Most important symptoms and effects, both acute and delayed	: The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
Protection of first-aiders	: For personal protection see section 8.
Notes to physician	: No data available

5. FIREFIGHTING MEASURES

Suitable and unsuitable extinguishing media

Suitable extinguishing media	: Water Foam Carbon dioxide (CO ₂) Dry powder
Unsuitable extinguishing media	: For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	: Combustible. Vapours are heavier than air and may spread along floors. Development of hazardous combustion gases or vapours possible in the event of fire.
Hazardous combustion products	: Carbon oxides Nitrogen oxides (NO _x)
Specific extinguishing methods	: Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	: Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	: Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	: Do not let product enter drains.
Methods and materials for containment and cleaning up	: Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	: Work under hood. Do not inhale substance/mixture.
Conditions for safe storage	: No metal containers.
Further information on storage conditions	: Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	: 6.1B, Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials
Recommended storage temperature	: 2 - 8 °C
Further information on storage stability	: Stench. Air and moisture sensitive. Sensitive to carbon dioxide Hygroscopic. Over time, pressure may increase causing containers

to burst
Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Contains no substances with occupational exposure limit values.

Engineering measures : No data available

Personal protective equipment

Among the following personal protective equipment, the PPEs which require safety certification need to be certified by KOSHA.

Respiratory protection : required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Recommended Filter type: : Filter type P3

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Eye protection : Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Tightly fitting safety goggles

Hand protection

Material : butyl-rubber
Break through time : 480 min
Glove thickness : 0.3 mm
Protective index : Full contact
Manufacturer : Butoject® (KCL 897 / Aldrich Z677647, Size M)

Material : Nature latex/chloroprene
Break through time : 30 min
Glove thickness : 0.6 mm
Protective index : Splash contact
Manufacturer : Lapren® (KCL 706 / Aldrich Z677558, Size M)

Manufacturer : data source: KCL GmbH, D-36124 Eichenzell, phone

+49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

- Remarks : Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it.
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.
- Skin and body protection : protective clothing
- Hygiene measures : Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance : solid (20 °C , 1,013 hPa)
- Color : colourless
- Odor : pungent
- Odor Threshold : No data available
pH : No data available
- Melting point/ range : 28 °C
- Boiling point/boiling range : 158 - 159 °C (1,013 hPa)
Method: Regulation (EC) No. 440/2008, Annex, A.2
- Flash point : 45 °C
(1,013 hPa)
Method: ISO 3679, closed cup
- Evaporation rate : No data available

Burning rate	: No data available
Self-ignition	: ca. 420 °C Method: DIN 51794
Upper explosion limit / Upper flammability limit	: Upper explosion limit 11.2 %(V)
Lower explosion limit / Lower flammability limit	: Lower explosion limit 0.7 %(V)
Vapor pressure	: ca. 4.36 hPa (25 °C)
Solubility(ies) Water solubility	: ca. 930 g/l completely soluble (20 °C) pH: 11.9
Relative vapour density	: No data available
Relative density	: 0.877 (25 °C)
Density	: 0.88 g/cm ³ (25 °C)
Partition coefficient: n- octanol/water	: log Pow: -0.84 (25 °C) pH: 10.45 - 11.86 Method: Regulation (EC) No. 440/2008, Annex, A.8 Bioaccumulation is not expected.
Autoignition temperature	: No data available
Decomposition tempera- ture	: No data available
Viscosity Viscosity, dynamic	: 1.91 mPa.s (25 °C)
Viscosity, kinematic	: No data available
Flow time	: No data available
Explosive properties	: Not classified as explosive.
Oxidizing properties	: none
Surface tension	: 33.3 mN/m, 40 °C
Molecular weight	: 88.15 g/mol
Metal corrosion rate	: May be corrosive to metals.

Particle characteristics
Particle size : No data available

10. STABILITY AND REACTIVITY

Chemical stability and possibility of hazardous reactions : Reactivity:
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.
Chemical stability:
The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions:
Violent reactions possible with:
Possibility of hazardous reactions:
Strong oxidizing agents
acid halides
Acid anhydrides
Aldehydes
phenols
Ketones
nitrates
Isocyanates
acids
Possibility of hazardous reactions:
Caution! In contact with nitrites, nitrates, nitrous acid possible liberation of nitrosamines!

Conditions to avoid : no information available

Incompatible materials : No data available

Hazardous decomposition products : In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

No data available

Delayed and immediate effects and also chronic effects from short and long term exposure

Acute toxicity

LD50 Oral - Rat - male and female - 740 mg/kg

Remarks: (ECHA)

LC50 Inhalation - Rat - male and female - 4 h - 1.131 mg/l - vapour

Remarks: (ECHA)

LD50 Dermal - Rabbit - male and female - 614 - 1,228 mg/kg

Skin corrosion/irritation

Skin - Rabbit - Causes burns. - 24 h - Draize Test

Serious eye damage/eye irritation

Remarks: Causes serious eye damage.

Respiratory or skin sensitization

Maximisation Test - Guinea pig - negative - OECD Test Guideline 406

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Germ cell mutagenicity

Genotoxicity in vitro

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Genotoxicity in vitro

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Human lymphocytes

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 473

Result: negative

Genotoxicity in vitro

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Signs and Symptoms of Exposure

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Numerical measures of toxicity

No data available

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 5 - 6 Weeks - No observed adverse effect level - 180 mg/kgRemarks: Subacute toxicity

Repeated dose toxicity - Rat - male and female - Inhalation - 4 WeeksRemarks: Subchronic toxicity

RTECS: EJ6800000

12. ECOLOGICAL INFORMATION**Ecotoxicity****Components:****1,4-Diaminobutane:**

Toxicity to fish	: LC50 (Poecilia reticulata (guppy)): 730 mg/l End point: mortality Exposure time: 96 h Test Type: static test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to fish (Chronic toxicity)	: NOEC (Gasterosteus aculeatus): > 10 mg/l Exposure time: 28 d Remarks: (in analogy to similar products)
Toxicity to microorganisms	: NOEC (activated sludge): 32.5 mg/l Exposure time: 14 d Test Type: static test GLP: yes

Persistence and degradability**Components:****1,4-Diaminobutane:**

Biodegradability	: aerobic Inoculum: activated sludge Concentration: 32.5 mg/l Result: Readily biodegradable. Biodegradation: $\geq 89\%$ Exposure time: 28 d Method: OECD Test Guideline 301B GLP: yes
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Bioaccumulative potential**Components:****1,4-Diaminobutane:**

Partition coefficient: n-octanol/water : log Pow: -0.84 (25 °C)
pH: 10.45 - 11.86
Method: Regulation (EC) No. 440/2008, Annex, A.8
Remarks: Bioaccumulation is not expected.

Mobility in soil

No data available

Other adverse effects

No data available

Endocrine disrupting properties

No data available

13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

Disposal precautions

Dispose of contents and container according to wastes control act.

14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No. : UN 2928
Proper shipping name : Toxic solid, corrosive, organic, n.o.s.
(1,4-Diaminobutane)
Class : 6.1
Subsidiary risk : 8
Packing group : II
Labels : Division 6.1 - Toxic substances, Class 8 - Corrosive substances
Packing instruction (cargo aircraft) : 675
Packing instruction (passenger aircraft) : 668

IMDG-Code

UN number : UN 2928
Proper shipping name : TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.
(1,4-Diaminobutane)
Class : 6.1
Subsidiary risk : 8
Packing group : II
Labels : 6.1 (8)

EmS Code : F-A, S-B
Marine pollutant : no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

Refer to section 15 for specific national regulation.

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

15. REGULATORY INFORMATION

National regulatory information

Regulation under the Occupational Safety and Health Act

Harmful Substances Prohibited from Manufacturing

Not applicable

Harmful Substances Required Permission for Manufacture

Not applicable

Harmful Agents to be kept below Occupational Exposure Limits

Not applicable

Harmful Agents Required to be kept below Permission Levels

Not applicable

Hazardous substances requiring management

Not applicable

Special Management Materials

Not applicable

Controlled Substances Subject to Environment Monitoring

Not applicable

Controlled Substances Subject to Health Examination

Not applicable

Regulation under the Chemicals Control Act

Chemicals of Acute and Chronic Hazard to Human Health and the Environment

Accident Precaution Chemicals

Not applicable

Toxic Release Inventory

Not applicable

Act on Registration and Evaluation of Chemical Substances (K-REACH)

Restricted Chemicals

Not applicable

Prohibited Chemicals

Not applicable

Substances with Unconfirmed Hazards

Not applicable

Dangerous Substances Safety Management Act

Classification : Group 4, Flammable liquids, Type 2 petroleums, Water soluble liquid

Hazard rank : Hazardous rank III

Designated Quantity : 2000 litre

Safety Warning : Keep away from fire

Wastes Control Act

Industrial waste

Follow article 13 of the act to dispose the product waste

Other requirements in domestic and other countries

16. OTHER INFORMATION

Further information

Issuing date : 2019.10.23

Revision number and date

Number of Revision : 8.10

Revision Date : 2026.05.29

Other information : The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.
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only.

Date format : yyyy/mm/dd

Full text of other abbreviations

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MERCOSUR - The Agreement for the Facilitation of the Transport of Dangerous Goods; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

KR / EN