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Thymosin alpha 1

CAS: 62304-98-7
Formula: C129H215N33O55

Document ID: 522d5a29
Revision Date: 2026-08-07
Version: 1.0

Section 1 — Product and Company Identification

Product Name	Thymosin alpha 1
Synonyms	Thymalfasin; 62304-98-7; Thymosin alpha 1
CAS Number	62304-98-7
Molecular Formula	C129H215N33O55
IUPAC Name	(4S)-4-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S,3R)-2-[[(2S,3R)-2-[[(2S,3S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S,3R)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-[[(2S)-2-acetamido-3-hydroxypropanoyl]amino]-3-carboxypropanoyl]amino]propanoyl]amino]propanoyl]amino]-3-methylbutanoyl]amino]-3-carboxypropanoyl]amino]-3-hydroxybutanoyl]amino]-3-hydroxypropanoyl]amino]-3-hydroxypropanoyl]amino]-4-carboxybutanoyl]amino]-3-methylpentanoyl]amino]-3-hydroxybutanoyl]amino]-3-hydroxybutanoyl]amino]-6-aminohexanoyl]amino]-3-carboxypropanoyl]amino]-4-methylpentanoyl]amino]-6-aminohexanoyl]amino]-4-carboxybutanoyl]amino]-6-aminohexanoyl]amino]-6-aminohexanoyl]amino]-4-carboxybutanoyl]amino]-3-methylbutanoyl]amino]-3-methylbutanoyl]amino]-4-carboxybutanoyl]amino]-4-carboxybutanoyl]amino]propanoyl]amino]-5-[[(1S)-3-amino-1-carboxy-3-oxopropyl]amino]-5-oxopentanoic acid
Identified Uses	Research laboratory chemical for in vitro scientific research and development use only.
Restriction on Use	Not for human or veterinary use. Not for food, drug, cosmetic, household, agricultural, clinical, therapeutic, or diagnostic applications.

Manufacturer / Supplier

Company	Ruo.bio

Address	30 N Gould St, Sheridan, WY 82801, US
Phone	+1-804-636-6879
Website	https://ruo.bio/
Emergency Phone	+1(804)636-6879 - Monday-Friday: 9:00 AM - 5:00 PM Pacific

Section 2 — Hazard Identification

Classification of the substance

Not classified based on currently available data; however, data is limited and hazards cannot be fully characterized. The absence of classification should not be interpreted as a determination of the absence of hazard.

Classification has been conducted in accordance with 29 CFR 1910.1200 (OSHA HazCom 2012) and GHS Rev.8 using all available data and scientifically valid weight-of-evidence approaches (GHS Rev.8 Chapter 1.3.2.4), including read-across from chemical class and structural considerations where substance-specific study data is not available.

Signal Word: None

GHS Pictograms:

None required based on classification.

Hazard Statements

None. This substance is not classified for any GHS hazard class based on available data.

Precautionary Statements

- P261: Avoid breathing dust, fume, gas, mist, vapors, or spray.
- P264: Wash hands and exposed skin thoroughly after handling.
- P280: Wear protective gloves, protective clothing, and eye/face protection.
- P501: Dispose of contents and container in accordance with local, regional, national, and international regulations.

Precautionary statements are provided as best practice for handling substances with limited toxicological data, and are not a declaration of GHS classification.

Hazards Not Otherwise Classified (HNOC)

None known based on available data and weight-of-evidence assessment. The toxicological properties of this substance have not been fully characterized; handle as a potentially bioactive substance of unknown toxicity.

Section 3 — Composition / Information on Ingredients

Single-substance product. Chemical identity:

Ingredient	CAS Number	Mol. Formula	Mol. Weight	Concentration
Thymosin alpha 1	62304-98-7	C129H215N33O55	3108.3 g/mol	>98% (research grade)

Impurities

No hazardous impurities known to be present above the GHS classification thresholds specified in 29 CFR 1910.1200 Appendix A. Residual synthesis reagents, solvents, and counter-ions may be present at levels consistent with research-grade (>98% purity) material. Balance: non-hazardous impurities. Refer to the accompanying Certificate of Analysis (CoA) for the lot-specific impurity profile.

Section 4 — First Aid Measures

Eye Contact
Rinse cautiously with water for several minutes. If irritation persists, seek medical advice.

Skin Contact
Wash with soap and water. Remove contaminated clothing and wash before reuse. If irritation persists, seek medical advice.

Inhalation
Move affected person to fresh air. If symptoms develop, seek medical advice.

Ingestion
Rinse mouth thoroughly with water. If large amounts are swallowed or if symptoms develop, seek medical advice. Do not induce vomiting unless directed by medical personnel.

Note to Physician
Treat symptomatically. No specific antidote known.

Section 5 — Fire Fighting Measures

Flash Point: *Not determined*

Suitable Extinguishing Media
Use extinguishing media appropriate to the surrounding fire conditions. Carbon dioxide (CO2), dry chemical powder, foam, or water spray.

Special Hazards
May produce toxic gases upon combustion. Carbon monoxide and other combustion products may be generated.

Protective Equipment for Firefighters
Wear self-contained breathing apparatus (SCBA) and full protective gear. Do not enter fire area without proper protective equipment.

Section 6 — Accidental Release Measures

Personal Precautions
Avoid dust formation. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment as described in Section 8.

Environmental Precautions
Prevent further leakage or spillage if safe to do so. Do not allow the product to enter drains, sewers, or waterways.

Containment and Cleanup
Sweep up and shovel. Keep in suitable, closed containers for disposal. Avoid raising dust. Clean contaminated surface thoroughly. Dispose of waste in accordance with local regulations (see Section 13).

Section 7 — Handling and Storage

Handling Precautions

Handle Thymosin alpha 1 (CAS 62304-98-7) in accordance with OSHA HazCom 2012 (29 CFR 1910.1200) and good laboratory/industrial hygiene practice for bioactive peptides of unknown toxicological profile. Manipulate only in a well-ventilated area, preferably within a certified chemical fume hood, biosafety cabinet, or local exhaust enclosure that contains airborne particulates generated during weighing, transfer, or reconstitution of the lyophilized solid. Use engineering controls to keep airborne exposure as low as reasonably achievable; no occupational exposure limit (OEL) has been established by OSHA (PEL), ACGIH (TLV), or NIOSH (REL) for this substance, so apply the precautionary principle and the OSHA hierarchy of controls (29 CFR 1910.134). Wear chemically resistant nitrile gloves, a buttoned laboratory coat, and ANSI Z87.1-compliant safety eyewear; add a properly fit-tested NIOSH-approved N95 or higher particulate respirator when dust generation cannot be eliminated. Avoid contact with skin, eyes, and clothing, and avoid inhalation of dust, mist, vapor, or aerosol (GHS precautionary statements P261, P262, P264, P270, P271, P280). Do not eat, drink, smoke, or apply cosmetics in areas where the material is handled. Wash hands and exposed skin thoroughly with soap and water immediately after handling and before leaving the work area. Minimize generation and accumulation of dust; use anti-static tools and ground containers when transferring larger quantities. Keep containers tightly closed when not in use to limit moisture uptake and oxidative degradation of the peptide. Reconstitute and aliquot under aseptic conditions to limit microbial contamination and the need for repeated freeze-thaw cycles. Collect any spilled material with a HEPA-filtered vacuum or damp wipe (do not dry-sweep) and manage waste in accordance with 40 CFR 261-262 (RCRA) and applicable state/local regulations.

Storage Conditions

Store the lyophilized solid in its original tightly closed container, protected from light, moisture, and atmospheric oxygen. As a small hydrophilic peptide, the substance is hygroscopic and is best maintained desiccated; storage under an inert atmosphere (e.g., dry nitrogen or argon) in the headspace is recommended once the original container has been opened. Recommended long-term storage of the dry powder is at -20 degC or colder; for extended storage, -80 degC is preferred. Reconstituted aqueous solutions should be stored frozen in single-use aliquots to avoid repeated freeze-thaw cycles, which can promote aggregation, oxidation, and hydrolytic degradation of peptide bonds. Allow sealed containers to equilibrate to room temperature before opening to prevent condensation onto the cold solid. Keep the storage area cool, dry, well-ventilated, and segregated from foodstuffs, incompatible chemicals, and ignition sources. Restrict access to trained personnel and label the storage location in compliance with 29 CFR 1910.1200(f). Do not use beyond any expiration or retest date assigned by the producer; the manufacturer's certificate of analysis should be consulted for compound-specific stability data, as no authoritative shelf-life value has been established by OSHA, EPA, or ECHA for this substance.

Incompatibilities

Avoid contact with strong oxidizing agents (e.g., peroxides, hypochlorites, permanganates, nitric acid, chromates), which can oxidize susceptible side chains (e.g., threonine and serine hydroxyl functionalities) and the peptide backbone. Avoid strong acids and strong bases, which can catalyze hydrolysis of amide (peptide) bonds and deamidation of asparagine and glutamine residues. Avoid strong reducing agents that may alter the peptide structure. Protect from moisture, elevated temperatures, direct sunlight, and ultraviolet light, all of which can accelerate hydrolytic and oxidative degradation. Incompatible with sources of ignition; combustion of the dry solid may generate hazardous decomposition products including carbon monoxide, carbon dioxide, and oxides of nitrogen (NOx), consistent with general thermal-decomposition behavior of peptides containing N-bearing residues. (Note: the thymosin alpha 1 sequence does not contain sulfur-containing amino acids, so SOx formation is not expected.) No specific reactivity data for Thymosin alpha 1 are listed in PubChem, ECHA, or NIOSH databases; the incompatibilities above are inferred from general peptide chemistry and should be treated as precautionary.

Section 8 — Exposure Controls / Personal Protection

Exposure Limits

No regulatory occupational exposure limits (OEL) have been established by OSHA, ACGIH, NIOSH, or equivalent bodies. No biological exposure indices (BEIs) have been established. Control exposure to the lowest level reasonably achievable (ALARA) using the engineering controls and PPE specified below. Thymosin alpha 1 (CAS 62304-98-7) is a 28-amino-acid synthetic peptide and a pharmacologically active substance; handle as a potentially bioactive substance of unknown occupational toxicity.

Engineering Controls

Use in a well-ventilated area with local exhaust ventilation (LEV) sufficient to keep airborne concentrations as low as reasonably achievable. Weighing, transfer, and manipulation of the dry powder should be performed inside a containment primary engineering control (C-PEC) such as a ventilated enclosure, fume hood, glove box, or Class II Type B2 biological safety cabinet, consistent with the hierarchy of controls described by NIOSH and the principles for handling hazardous drugs in USP <800> and the OSHA technical guidance on controlling occupational exposure to hazardous drugs. Provide closed-system transfer devices (CSTDs) where compounding parenteral solutions. Ensure ready access to an emergency eyewash and safety shower in the work area (ANSI/ISEA Z358.1). Do not eat, drink, smoke, or store food in areas where the substance is handled. Decontaminate work surfaces after use and provide written standard operating procedures for spill response.

Personal Protective Equipment

Respiratory Protection: If engineering controls are insufficient to prevent airborne exposure to dust, mist, or aerosol (e.g., during weighing of dry peptide, reconstitution, or cleanup of a spill outside a C-PEC), use a NIOSH-approved particulate respirator. A NIOSH-certified N95 filtering facepiece (42 CFR Part 84) is generally suitable for nuisance levels of fine powder; for higher potential exposures, dry powder handling outside containment, or aerosol-generating procedures, use a NIOSH-approved elastomeric half-mask or full-facepiece respirator equipped with P100 filters, or a powered air-purifying respirator (PAPR) with HEPA cartridges. Respirator selection, fit testing, and medical clearance must comply with the OSHA Respiratory Protection Standard (29 CFR 1910.134).

Hand Protection: Wear chemical-resistant, powder-free gloves tested against pharmaceutical/chemotherapy agents in accordance with ASTM D6978. Nitrile gloves of at least 4 mil (0.10 mm) thickness are recommended; double-gloving is advised when handling the neat powder, consistent with USP <800> recommendations for handling hazardous drugs. Inspect gloves before each use, change immediately if torn, punctured, or contaminated, and replace at least every 30 minutes during continuous handling or per the manufacturer's permeation data. Wash hands thoroughly with soap and water after removing gloves.

Eye / Face Protection: Wear tightly fitting safety glasses with side shields meeting ANSI/ISEA Z87.1. Where splashes, aerosols, or dust generation are foreseeable (e.g., reconstitution of lyophilized peptide, open transfers, spill cleanup), wear indirect-vented chemical splash goggles, and add a full face shield (worn over goggles) for additional protection. Contact lenses should not be worn in lieu of eye protection. An emergency eyewash station meeting ANSI/ISEA Z358.1 must be readily accessible.

Skin Protection: Wear a long-sleeved, low-permeability laboratory coat or chemotherapy-rated disposable gown with closed front, knit cuffs, and back closure (consistent with USP <800> recommendations for handling hazardous drugs). Use disposable polyethylene-coated or polypropylene sleeve covers when handling the dry powder. Wear full-length trousers and closed-toe, non-absorbent footwear; chemical-resistant shoe covers are recommended for activities with splash potential. Remove and bag contaminated clothing immediately; do not launder contaminated disposable garments - dispose of as contaminated pharmaceutical waste. Wash any exposed skin promptly with soap and water.

Section 9 — Physical and Chemical Properties

Physical State	Solid (research-grade lyophilised powder or crystalline solid)
Appearance	White lyophilized powder
Odor	Odorless

Odor Threshold	Not available.
Boiling Point	*Not determined*
Melting Point	*Not determined*
Flash Point	*Not determined*
Auto-ignition Temperature	No data available.
Decomposition Temperature	No experimental data available.
Vapor Pressure	*Not determined*
Vapor Density	*Not determined*
Specific Gravity	*Not determined*
Partition Coefficient (log Kow)	No experimental data available.
Solubility	Soluble in water; soluble in dilute acetic acid
Stability in Solution	Subject to hydrolytic and oxidative degradation typical of the chemical class; store reconstituted solutions refrigerated or frozen, protect from light, and use within the stability window indicated on the Certificate of Analysis.
pH	*Not determined*
Molecular Weight	3108.3 g/mol
Molecular Formula	C129H215N33O55

Section 10 — Stability and Reactivity

Chemical Stability: Stable under normal conditions of use, storage, and transport.

Conditions to Avoid: Excessive heat, open flames, sparks, incompatible materials.

Incompatible Materials: Avoid contact with strong oxidizing agents (e.g., peroxides, hypochlorites, permanganates, nitric acid, chromates), which can oxidize susceptible side chains (e.g., threonine and serine hydroxyl functionalities) and the peptide backbone. Avoid strong acids and strong bases, which can catalyze hydrolysis of amide (peptide) bonds and deamidation of asparagine and glutamine residues. Avoid strong reducing agents that may alter the peptide structure. Protect from moisture, elevated temperatures, direct sunlight, and ultraviolet light, all of which can accelerate hydrolytic and oxidative degradation. Incompatible with sources of ignition; combustion of the dry solid may generate hazardous decomposition products including carbon monoxide, carbon dioxide, and oxides of nitrogen (NOx), consistent with general thermal-decomposition behavior of peptides containing N-bearing residues. (Note: the thymosin alpha 1 sequence does not contain sulfur-containing amino acids, so SOx formation is not expected.) No specific reactivity data for Thymosin alpha 1 are listed in PubChem, ECHA, or NIOSH databases; the incompatibilities above are inferred from general peptide chemistry and should be treated as precautionary.

Hazardous Decomposition Products: Upon combustion or decomposition may produce: carbon monoxide (CO), carbon dioxide (CO_2), nitrogen oxides (NOx).

Hazardous Polymerization: Will not occur.

Section 11 — Toxicological Information

The toxicological properties of this substance have not been fully characterized. Where no authoritative study data was identified, endpoint classifications are based on a weight-of-evidence approach using read-across from the compound's chemical class and structural features, per GHS Rev.8 Chapter 1.3.2.4. "Not classified" entries below mean "not classified based on currently available data" — hazards cannot be excluded.

Acute Toxicity: Acute toxicity data for thymosin alpha 1 (CAS 62304-98-7) are limited and the toxicological profile of this substance is not fully characterized. No oral, dermal, or inhalation LD50/LC50 values from authoritative regulatory sources (NIOSH, ECHA, NTP, EPA) have been identified. No occupational exposure limits have been established by OSHA, NIOSH, or ACGIH. In the absence of comprehensive test data, the substance is not classified for acute toxicity based on currently available data; hazards cannot be excluded. Handle as a substance of unknown acute toxicity and minimize all routes of exposure.

Skin Corrosion / Irritation: No data from authoritative sources (ECHA, NTP, peer-reviewed literature) demonstrating skin corrosion or irritation potential for thymosin alpha 1 have been identified. The substance is not classified for skin corrosion/irritation based on currently available data; hazards cannot be excluded. Direct skin contact with the solid or solutions should be avoided as a precaution.

Serious Eye Damage / Irritation: No data from authoritative sources establishing serious eye damage or eye irritation potential for thymosin alpha 1 have been identified. The substance is not classified for serious eye damage/eye irritation based on currently available data; hazards cannot be excluded. Eye contact with dusts, mists, or solutions should be prevented as a precaution.

Skin / Respiratory Sensitization: No respiratory or skin sensitization data from authoritative sources (ECHA, NTP, peer-reviewed literature) have been identified for thymosin alpha 1. The substance is not classified for respiratory or skin sensitization based on currently available data; hazards cannot be excluded. As a biologically active substance of high molecular weight, the potential for sensitization upon repeated exposure cannot be ruled out, and contact should be minimized.

Germ Cell Mutagenicity / Genotoxicity: Not classified based on currently available data; hazards cannot be excluded. Weight-of-evidence assessment applied using read-across from chemical class and structural considerations (GHS Rev.8 Chapter 1.3.2.4); no authoritative substance-specific study data identified.

Carcinogenicity: Thymosin alpha 1 is not listed as a carcinogen by IARC, the U.S. National Toxicology Program (NTP) Report on Carcinogens, OSHA (29 CFR 1910.1003), or the ACGIH TLV carcinogen classification. No long-term carcinogenicity bioassays from authoritative sources have been identified. The substance is not classified for carcinogenicity based on currently available data; hazards cannot be excluded.

Reproductive Toxicity: No reproductive or developmental toxicity studies from authoritative regulatory sources (ECHA, NTP, EPA) have been identified for thymosin alpha 1. The substance is not classified for reproductive toxicity based on currently available data; hazards cannot be excluded. Exposure of pregnant or nursing workers should be minimized as a precaution.

Specific Target Organ Toxicity (STOT): No specific target organ toxicity has been identified for thymosin alpha 1 from authoritative sources following either single exposure (STOT-SE) or repeated exposure (STOT-RE). No occupational exposure limits or target-organ effect levels have been established by OSHA, NIOSH, ACGIH, or ECHA. The substance is not classified for STOT-SE or STOT-RE based on currently available data; hazards cannot be excluded, and the toxicological profile is not fully characterized.

Aspiration Hazard: Not classified based on currently available data; hazards cannot be excluded. Weight-of-evidence assessment applied using read-across from chemical class and structural considerations (GHS Rev.8 Chapter 1.3.2.4); no authoritative substance-specific study data identified.

Derived No-Effect Level (DNEL): No data available — no substance-specific DNEL has been derived.

Predicted No-Effect Concentration (PNEC): No data available — no substance-specific PNEC has been derived.

Section 12 — Ecological Information

No authoritative substance-specific ecotoxicity study data was identified. In the absence of experimental data, adverse environmental effects cannot be fully excluded.

Ecotoxicity: No substance-specific experimental aquatic toxicity data (e.g., fish LC50, Daphnia EC50, algal ErC50) have been identified for Thymosin alpha 1 (CAS 62304-98-7) in authoritative sources (ECHA, EPA ECOTOX,

PubChem). Not classified as hazardous to the aquatic environment under GHS/CLP based on a weight-of-evidence assessment in the absence of authoritative experimental data. Thymosin alpha 1 is a 28-residue acetylated polypeptide (MW 3108.3 g/mol) used as a parenteral pharmaceutical; its high molecular weight and polar, ionizable peptide character suggest limited bioavailability to aquatic organisms, but this read-across does not substitute for measured data. Releases to the environment should be avoided.

Persistence and Degradability: No substance-specific experimental biodegradation or hydrolysis half-life data (e.g., OECD 301/310 ready biodegradability studies) have been identified in authoritative databases (ECHA registration dossiers, EPA, PubChem). As a linear oligopeptide composed entirely of natural L-amino-acid residues linked by amide (peptide) bonds, Thymosin alpha 1 is expected to be susceptible to enzymatic and microbial proteolysis in biological wastewater treatment and natural waters; however, in the absence of a confirmed authoritative test result, persistence in the environment cannot be definitively characterized.

Bioaccumulative Potential: No experimentally determined bioconcentration factor (BCF) or log Kow has been identified for Thymosin alpha 1 in authoritative sources (ECHA, PubChem, EPA). Given the very high molecular weight (3108.3 g/mol, well above the ~1000 Da cutoff generally associated with limited membrane permeation), the multiple ionizable groups, and the highly hydrophilic peptide backbone, significant bioaccumulation in aquatic organisms is not expected; however, this is a qualitative weight-of-evidence inference and no authoritative BCF value is available to confirm classification.

Mobility in Soil: No substance-specific experimental data identified.

Other Adverse Effects: No other adverse environmental effects identified. The substance is not included on the Montreal Protocol list of ozone-depleting substances.

Section 13 — Disposal Considerations

Dispose of contents and container in accordance with all local, state, and federal regulations. Do not dispose of this material into sewers or waterways. Contact a licensed waste disposal company for disposal guidance.

US: Dispose in accordance with 40 CFR Parts 261-270 (RCRA). **EU:** Dispose according to Directive 2008/98/EC (Waste Framework Directive).

Section 14 — Transport Information

DOT (US)	Not regulated as dangerous goods under DOT (49 CFR) based on current classification.
IATA	Not regulated as dangerous goods under IATA Dangerous Goods Regulations based on current classification.
IMDG	Not regulated as dangerous goods or as a marine pollutant under the IMDG Code based on current classification.
UN Number	Not applicable.

Transport classifications above are based on the substance's intrinsic hazard classification; the shipper must independently verify the classification, packaging, labelling, and documentation requirements for their specific shipment configuration, quantity, and carrier (including airline policies) prior to dispatch.

Section 15 — Regulatory Information

United States

TSCA (Toxic Substances Control Act): May be eligible for exemption from TSCA inventory listing requirements under the R&D provisions of 40 CFR 720.36, depending on actual conditions of use. This substance is supplied solely for use in scientific research and development in small quantities; it is not intended for, and shall not be used for, any commercial manufacturing, processing, or distribution in commerce. The importer/end user is responsible for confirming that the R&D exemption criteria are met for their specific use. **OSHA HazCom 2012:** This SDS was prepared in accordance with 29 CFR 1910.1200 (HazCom 2012), aligned with the Globally Harmonized System (GHS) Rev. 8. **CERCLA / SARA Title III:** Not listed as a CERCLA Hazardous Substance (40 CFR 302.4); not subject to SARA 313 reporting based on available classification data. Users must independently verify applicability for their facility.

European Union

REACH (EC 1907/2006): Supplied solely for Scientific Research and Development (SR&D) use in quantities below 1 tonne per year per legal entity. Where applicable, this use may be exempt from REACH registration obligations under the scientific research and development provisions of REACH Article 3(23) and the conditions of Article 26(3); importers/users should independently verify the applicable exemption pathway for their specific use. If the substance is used as part of a formally notified Product and Process Oriented Research and Development (PPORD) programme, the separate notification procedure under REACH Article 9 (with a 5-year exemption renewable once) may apply instead. **CLP (EC 1272/2008):** Not classified under CLP based on available data; no harmonized classification entry identified in Annex VI of CLP or the ECHA Classification and Labelling (C&L) Inventory.

Canada

WHMIS 2015 / HPR: Not classified as a hazardous product under the Hazardous Products Act and Hazardous Products Regulations (SOR/2015-17) based on available data and weight-of-evidence assessment. Supplied for laboratory research use only. **DSL/NDSL:** Research-use exemption applies; substance is not intended for commercial import or manufacture in Canada.

Note: The regulatory statements above reflect the intended use of this substance for scientific research and development only and do not constitute a legal determination of regulatory status. If the substance is used outside the R&D exemption scope, users are solely responsible for independently verifying applicable regulatory obligations (TSCA, REACH, WHMIS, state, and local) for their specific use and jurisdiction prior to any such use.

Section 16 — Other Information

Document ID	522d5a29-1e26-4f7a-9724-3e91b4b11050
Revision Date	2026-08-07
Version	1.0
Prepared By	Prepared in accordance with GHS Rev.8 and OSHA HazCom 2012 (29 CFR 1910.1200). Independent review by a qualified chemical safety professional is recommended prior to use.

Revision History

Revision date: 2026-08-07
Version: 1.0
Change description: Initial issue. Document prepared in 16-section GHS Rev.8 / OSHA HazCom 2012 format.

Sources Used

- PubChem (U.S. National Library of Medicine / NCBI) — https://pubchem.ncbi.nlm.nih.gov
- Peer-reviewed chemistry and toxicology literature (class-based read-across and weight-of-evidence assessment per GHS Rev.8 Chapter 1.3.2.4)
- OSHA HazCom 2012 / 29 CFR 1910.1200 Appendix A–C; GHS Rev.8; OECD Test Guidelines

Key to Abbreviations

CAS = Chemical Abstracts Service; GHS = Globally Harmonized System of Classification and Labelling of Chemicals; OSHA = U.S. Occupational Safety and Health Administration; HazCom = Hazard Communication Standard; REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals; CLP = Classification, Labelling and Packaging Regulation; TSCA = Toxic Substances Control Act; WHMIS = Workplace Hazardous Materials Information System; OEL = Occupational Exposure Limit; PEL = Permissible Exposure Limit; TLV = Threshold Limit Value; REL = Recommended Exposure Limit; STOT = Specific Target Organ Toxicity; LD50 = Median Lethal Dose; LC50 = Median Lethal Concentration; PPE = Personal Protective Equipment; SCBA = Self-Contained Breathing Apparatus; R&D = Research and Development.

Disclaimer

DISCLAIMER: The information in this Safety Data Sheet is compiled from the authoritative sources cited above, supplemented by weight-of-evidence assessment based on the compound's chemical class and published literature. It is believed to be accurate as of the revision date but is provided "as is" without warranty of any kind, express or implied, including fitness for a particular purpose. The preparer of this document has not independently tested the substance described herein. Users bear sole responsibility for verifying all information, ensuring safe handling, and compliance with all applicable federal, state, provincial, and local regulations. This SDS is not a substitute for independent chemical safety assessment by a qualified professional. This product is intended for scientific research and development use only and is not for human consumption, drug, food, cosmetic, agricultural, or household use.

This SDS complies with GHS Revision 8 / UN GHS Rev.8 and OSHA HazCom 2012 (29 CFR 1910.1200).