

SAFETY DATA SHEET

Republic of Korea

In accordance with the Standard for Classification and Labeling of Chemical Substance and Safety Data Sheet, Article 10 Paragraph 1

Section 1. Chemical product and company identification

A. Product name ActiCHO™ P with Poloxamer-188, without Insulin, without L-Glutamine

Catalogue Number SH31025

Article Number SH31025

B. Recommended use of the chemical

For Further Manufacturing or Research Use. Not for Diagnostic or Therapeutic Use.

Restrictions on use

Uses advised against

C. Manufacturer Supplier HyClone Laboratories
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Logan, Utah 84321
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Section 2. Hazards identification

A. Hazard classification SKIN IRRITATION - Category 2
SERIOUS EYE DAMAGE - Category 1
GERM CELL MUTAGENICITY - Category 1B
AQUATIC HAZARD (LONG-TERM) - Category 3

This product is classified in accordance with the Industrial Safety and Health Act and the Chemical Control Act.

Percentage of the mixture consisting of ingredient(s) of unknown hazards to the aquatic environment: 49.9%

B. GHS label elements, including precautionary statements

Symbol



Signal word

Danger

Hazard statements	Causes skin irritation. Causes serious eye damage. May cause genetic defects. Harmful to aquatic life with long lasting effects.
Precautionary statements	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing and eye or face protection. Avoid release to the environment. Wash thoroughly after handling.
Response	IF exposed or concerned: Get medical advice or attention. IF ON SKIN: Wash with plenty of water. If skin irritation occurs: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. 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. Specific treatment (see the label).
Storage	Store locked up.
Disposal	Dispose of contents and container in accordance with all local, regional, national and international regulations.
C. Other hazards which do not result in classification	May form explosible dust-air mixture if dispersed.

Section 3. Composition/information on ingredients

Substance/mixture	Mixture		
Other means of identification	Not available.		
Ingredient name	Common name	Identifiers	%
SUCCINIC ACID		CAS: 110-15-6 EC: 203-740-4	≤10
POTASSIUM CHLORIDE		CAS: 7447-40-7 EC: 231-211-8	≤5
SODIUM PHOSPHATE MONOBASIC		CAS: 7558-80-7 EC: 231-449-2	≤5
L-(-)-LEUCINE		CAS: 61-90-5 EC: 200-522-0	≤5
L-serine		CAS: 56-45-1 EC: 200-274-3	≤5
L-(+)-LYSINE MONOHYDROCHLORIDE		CAS: 657-27-2 EC: 211-519-9	≤5
L-valine		CAS: 72-18-4 EC: 200-773-6	≤5
L-(-)-THREONINE		CAS: 72-19-5 EC: 200-774-1	≤5
L-(+)-ARGININE MONOHYDROCHLORIDE		CAS: 1119-34-2 EC: 214-275-1	≤5
ASPARTIC ACID		CAS: 56-84-8 EC: 200-291-6	≤5
L-(-)-METHIONINE		CAS: 63-68-3 EC: 200-562-9	≤5
L-(-)-TRYPTOPHANE		CAS: 73-22-3 EC: 200-795-6	≤5
MAGNESIUM SULFATE		CAS: 7487-88-9 EC: 231-298-2	≤5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

A. Eye contact	Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.
B. Skin contact	Get medical attention immediately. Call a poison center or physician. Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

C. Inhalation	Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
D. Ingestion	Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
E. Notes to physician	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	No specific treatment.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

A. <u>Extinguishing media</u>	
Suitable	Use dry chemical powder.
Not suitable	Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture.
B. Specific hazards arising from the chemical	May form explosible dust-air mixture if dispersed. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous thermal decomposition products	Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides sulfur oxides phosphorus oxides halogenated compounds metal oxide/oxides
C. Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Section 6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
B. Environmental precautions	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.
C. <u>Methods and materials for containment and cleaning up</u>	
Small spill	Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.
Large spill	Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

A. Precautions for safe handling

Protective measures

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

B. Conditions for safe storage, including any incompatibilities

Store between the following temperatures: 2 to 8°C (35.6 to 46.4°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

A. Control parameters

Occupational exposure limits

Not applicable.

Biological exposure indices

No exposure indices known.

B. Appropriate engineering controls

Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

C. Personal protective equipment

Respiratory protection

Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Eye protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Hand protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Skin protection

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9. Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

A. Appearance

Physical state

Solid. [Powder.]

Color

Light brown. to Orange.

B. Odor

Not available.

C. Odor threshold

Not available.

D. pH

3 to 4 [Conc. (% w/w): 2.2%]

E. Melting/freezing point

Not available.

F. Boiling point or initial boiling point and boiling range	Not available.
G. Flash point	Not applicable.
Fire point	Not available.
Burning time	Not available.
Burning rate	Not available.
H. Evaporation rate	Not available.
I. Flammability (solid, gas)	Not available.
J. Lower and upper explosive (flammable) limits	Not applicable.
K. Vapor pressure	Not available.
L. Solubility in water	Not available.
M. Vapor density	Not applicable.
N. Relative density	Not available.
O. Partition coefficient: n-octanol/water	Not applicable.
P. Auto-ignition temperature	Not applicable.
Q. Decomposition temperature	Not available.
SADT	Not available.
R. Viscosity	Dynamic (room temperature): Not available. Kinematic (room temperature): Not available. Kinematic (40°C (104°F)): Not available.
Flow time (ISO 2431)	Not available.
S. Molecular weight	Not applicable.

Particle characteristics

Median particle size	Not available.
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Section 10. Stability and reactivity

A. Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
B. Conditions to avoid	Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
C. Incompatible materials	Reactive or incompatible with the following materials: oxidizing materials
D. Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

A. <u>Information on the likely routes of exposure</u>	Routes of entry anticipated: Oral, Dermal, Inhalation, Eyes.
<u>Potential acute health effects</u>	
Respiratory	Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.
Oral	No known significant effects or critical hazards.
Skin	Causes skin irritation.
Eyes	Causes serious eye damage.
<u>Over-exposure signs/symptoms</u>	
Inhalation	Adverse symptoms may include the following: respiratory tract irritation coughing
Ingestion	Adverse symptoms may include the following: stomach pains
Skin contact	Adverse symptoms may include the following: pain or irritation redness blistering may occur

Eye contact

Adverse symptoms may include the following:

pain
watering
redness

B. Health hazards**Acute toxicity****Product/ingredient name**

SUCCINIC ACID

POTASSIUM CHLORIDE

SODIUM PHOSPHATE MONOBASIC

L-(-)-LEUCINE

L-serine

L-(+)-LYSINE MONOHYDROCHLORIDE

L-valine

L-(+)-ARGININE MONOHYDROCHLORIDE

ASPARTIC ACID

L-(-)-METHIONINE

L-(-)-TRYPTOPHANE

Result**Rat - Oral - LD50**

2260 mg/kg

Rat - Male - Oral - LD50

2600 mg/kg

Toxic effects: Gastrointestinal - Hypermotility, diarrhea Gastrointestinal - Nausea or vomiting**Rat - Oral - LD50**

8290 mg/kg

Rat - Oral - LD50

16000 mg/kg

Rat - Oral - LD50

14 g/kg

Rat - Oral - LD50

10 g/kg

Toxic effects: Behavioral - Altered sleep time (including change in righting reflex) Behavioral - Ataxia Lung, Thorax, or Respiration - Dyspnea**Rat - Oral - LD50**

2000 mg/kg

Rat - Oral - LD50

12 g/kg

Toxic effects: Behavioral - Altered sleep time (including change in righting reflex) Behavioral - Ataxia Lung, Thorax, or Respiration - Dyspnea**Rat - Oral - LD50**

5000 mg/kg

Rabbit - Dermal - LD50

5000 mg/kg

Rat - Oral - LD50

36 g/kg

Toxic effects: Behavioral - Changes in motor activity (specific assay) Immunological including allergic - Uncharacterized**Rat - Oral - LD50**

>16 g/kg

Toxic effects: Eye - Ptosis Behavioral - Coma Changes in Chemistry or Temperature - Body temperature decrease**Conclusion/Summary
[Product]**

Not available.

Skin corrosion/irritation

Not available.

**Conclusion/Summary
[Product]**

Not available.

Ingredient name

L-(-)-LEUCINE

L-serine

L-(+)-LYSINE MONOHYDROCHLORIDE

L-valine

L-(-)-THREONINE

L-(-)-METHIONINE

L-(-)-TRYPTOPHANE

Conclusion/Summary

May cause skin irritation.

May cause skin irritation.

May cause skin irritation.

May cause skin irritation.

May cause skin irritation.

May cause skin irritation.

May cause skin irritation.

Serious eye damage/eye irritation**Product/ingredient name**

L-(-)-TRYPTOPHANE

Result**Rabbit - Eyes - Severe irritant**Amount/concentration applied: 100 mg**Conclusion/Summary
[Product]**

Not available.

Ingredient name**Conclusion/Summary**

L-(-)-LEUCINE	May cause eye irritation.
L-serine	May cause eye irritation.
L-(+)-LYSINE MONOHYDROCHLORIDE	May cause eye irritation.
L-valine	May cause eye irritation.
L-(-)-THREONINE	May cause eye irritation.
L-(-)-METHIONINE	May cause eye irritation.
L-(-)-TRYPTOPHANE	May cause eye irritation.

Respiratory corrosion/irritation

Not available.

Conclusion/Summary [Product]	Not available.
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Respiratory or skin sensitization

Not available.

Skin

Conclusion/Summary [Product]	Not available.
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Respiratory

Conclusion/Summary [Product]	Not available.
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Not available.

Germ cell mutagenicity

Not available.

Conclusion/Summary [Product]	Not available.
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Carcinogenicity

Not available.

Conclusion/Summary [Product]	Not available.
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Reproductive toxicity

Not available.

Conclusion/Summary [Product]	Not available.
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Specific target organ toxicity (single exposure)**Product/ingredient name**

POTASSIUM CHLORIDE

Result

SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) -
Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE)
(Respiratory tract irritation) - Category 3

L-(-)-THREONINE

ASPARTIC ACID

L-(-)-METHIONINE

L-(-)-TRYPTOPHANE

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Potential chronic health effects

Not available.

**Conclusion/Summary
[Product]** Not available.

General	Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
Carcinogenicity	No known significant effects or critical hazards.
Mutagenicity	May cause genetic defects.
Reproductive toxicity	No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
HyClone™ ActiCHO™ P	15531.1	102506.4	N/A	N/A	N/A
SUCCINIC ACID	2260	N/A	N/A	N/A	N/A
POTASSIUM CHLORIDE	2600	N/A	N/A	N/A	N/A
SODIUM PHOSPHATE MONOBASIC	8290	N/A	N/A	N/A	N/A
L-(-)-LEUCINE	16000	N/A	N/A	N/A	N/A
L-serine	14000	N/A	N/A	N/A	N/A
L-(+)-LYSINE MONOHYDROCHLORIDE	10000	N/A	N/A	N/A	N/A
L-valine	2000	N/A	N/A	N/A	N/A
L-(+)-ARGININE MONOHYDROCHLORIDE	12000	N/A	N/A	N/A	N/A
ASPARTIC ACID	5000	5000	N/A	N/A	N/A
L-(-)-METHIONINE	36000	N/A	N/A	N/A	N/A

Section 12. Ecological information

A. Ecotoxicity

Product/ingredient name	Result
SUCCINIC ACID	Acute - EC50 - Fresh water Daphnia - Water flea - <i>Daphnia magna</i> - Larvae Age: <24 hours 374.2 mg/l [48 hours] Effect: Intoxication
POTASSIUM CHLORIDE	Acute - LC50 - Fresh water Crustaceans - Water flea - <i>Pseudosida ramosa</i> - Neonate Age: ≤24 hours 9.68 mg/l [48 hours] Effect: Mortality Acute - EC50 - Fresh water ISO Algae - Green algae - <i>Desmodesmus subspicatus</i> 9.24 g/l [72 hours] Effect: Population Acute - LC50 - Fresh water Fish - Zebra danio - <i>Danio rerio</i> 509.65 mg/l [96 hours] Effect: Mortality
SODIUM PHOSPHATE MONOBASIC	Acute - LC50 - Fresh water Fish - Western mosquitofish - <i>Gambusia affinis</i> - Adult 720 ppm [96 hours] Effect: Mortality
L-serine	Acute - EC50 Daphnia 83 mg/l [48 hours] Acute - NOEC Algae 1000 mg/l [72 hours]
L-valine	LC50 Fish 10000 mg/l [96 hours]
MAGNESIUM SULFATE	Chronic - NOEC - Fresh water Daphnia - Water flea - <i>Daphnia magna</i> - Neonate Age: <24 hours 360 mg/l [3 weeks] Effect: Reproduction Chronic - IC10 - Fresh water Aquatic plants - Lesser Duckweed - <i>Lemna aequinoctialis</i> 1.9 mg/l [96 hours] Effect: Population Acute - IC50 - Fresh water Aquatic plants - Lesser Duckweed - <i>Lemna aequinoctialis</i> 4.4 mg/l [96 hours]

Effect: Population**Acute - LC50 - Fresh water**Fish - Purple Spotted Gudgeon - *Mogurnda mogurnda* - Larvae

40 mg/l [96 hours]

Effect: Mortality**Acute - EC50 - Fresh water**Daphnia - Water flea - *Daphnia magna*

343.56 mg/l [48 hours]

Effect: Intoxication

Conclusion/Summary Not available.
[Product]

Ingredient name

L-(-)-LEUCINE
 L-serine
 L-(+)-LYSINE MONOHYDROCHLORIDE
 L-valine
 L-(-)-THREONINE
 L-(+)-ARGININE MONOHYDROCHLORIDE
 ASPARTIC ACID
 L-(-)-METHIONINE
 L-(-)-TRYPTOPHANE

Conclusion/Summary

Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance
 Naturally occurring substance

B. Persistence/degradability**Product/ingredient name**

L-valine

Result

82% [28 days]

Conclusion/Summary Not available.
[Product]

Ingredient name

L-(-)-LEUCINE
 L-serine
 L-(+)-LYSINE MONOHYDROCHLORIDE
 L-valine
 L-(+)-ARGININE MONOHYDROCHLORIDE
 ASPARTIC ACID
 L-(-)-METHIONINE
 L-(-)-TRYPTOPHANE

Conclusion/Summary

Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance
 Not expected to bioaccumulate. Naturally occurring substance

Product/ingredient name

L-valine

Aquatic half-life

-

Photolysis

-

Biodegradability

Readily

C. Bioaccumulative potential**Product/ingredient name****LogP_{ow}****BCF****Potential**

succinic acid	-0.59	-	Low
L-leucine	-1.52	0.849	Low
L-serine	-3.07	0.609	Low
lysine hydrochloride	<-3.3	1.041	Low
L-valine	-2.26	0.846	Low
L-threonine	-2.94	0.811	Low
aspartic acid	-3.89	-	Low
L-methionine	-1.87	0.221	Low
L-tryptophan	-1.06	1.37	Low

D. Mobility in soil

Soil/Water partition coefficient Not available.

E. Other adverse effects No known significant effects or critical hazards.

Section 13. Disposal considerations**A. Disposal methods**

The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

B. Disposal precautions

This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

UN

A. UN number	Not regulated.
B. Proper shipping name	Not regulated.
C. Classes	Not regulated.
D. Packing group	Not regulated.
E. Marine pollutant	No.
F. Additional information	-
Label	

IMDG

A. UN number	Not regulated.
B. Proper shipping name	Not regulated.
C. Classes	Not regulated.
D. Packing group	Not regulated.
E. Marine pollutant	No.
F. Additional information	-
Label	

IATA

A. UN number	Not regulated.
B. Proper shipping name	Not regulated.
C. Classes	Not regulated.
D. Packing group	Not regulated.
E. Marine pollutant	No.
F. Additional information	-
Label	

Special precautions for user **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments Not available.

Section 15. Regulatory information

A. Regulation according to ISHA

ISHA article 117 (Harmful substances prohibited from manufacture) None of the components are listed.

ISHA article 118 (Harmful substances requiring permission) None of the components are listed.

Exposure Limits of Chemical Substances and Physical Factors

None of the components have an OEL.

ISHA Enforcement Regs Annex 19 (Exposure standards established for harmful factors) The following components are listed: manganese and its inorganic compounds

ISHA Enforcement Regs Annex 21 (Harmful factors subject to Work Environment Measurement) None of the components are listed.

ISHA Enforcement Regs Annex 22 (Harmful Factors Subject to Special Health Check-up) None of the components are listed.

Standard of Industrial Safety and Health Annex 12 (Hazardous substances subject to control) None of the components are listed.

B. Regulation according to Chemicals Control Act

Article 11 (TRI)	None of the components are listed.
Article 18 Prohibited (K-Reach Article 27)	None of the components are listed.
Article 19 Candidate substances subject to authorization (K-Reach Article 25)	None of the components are listed.
Article 19 Subject to authorization (K-Reach Article 25)	None of the components are listed.
Article 20 Toxic Chemicals (K-Reach Article 20)	Not applicable
Article 20 Restricted (K-Reach Article 27)	None of the components are listed.

Article 39 (Accident Precaution Chemicals)

Not listed.

MoE 2021-51 - Regulations on the quantity of toxic substances, restricted substances, prohibited substances and permitted substances

Ingredient name	Higher regulated quantity	Lower regulated quantity
inorganic zinc, salts	400 tonnes	20 tonnes
selenium compounds	200 tonnes	5 tonnes
inorganic tin, salts	-	20 tonnes
Existing Chemical Substances Subject to Registration	The following components are listed: Sulfuric acid, zinc salt (1:1), heptahydrate, Sulfuric acid copper (2+) salt (1:1), hydrate (1:5), Sulfuric acid, nickel(2+) salt, hydrate (1:1:6), Tin chloride (SnCl ₂), dihydrate	

C. Dangerous Materials Safety Management Act

Not applicable.

D. Wastes regulation

Dispose of contents and container in accordance with all local, regional, national and international regulations.

E. Regulation according to other foreign laws

Article 2 of Youth Protection Act on Substances Hazardous to Youth	Not applicable.
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International regulations**Chemical Weapon Convention List Schedules I, II & III Chemicals**

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Republic of Korea	Not determined.
United States	Not determined.
China	Not determined.
Japan	Japan inventory (CSCL): Not determined. Japan inventory (ISHL): Not determined.

Section 16. Other information

A. References

- B. First issue date 25 April 2024
- C. Date of issue/Date of revision 25 April 2024 / 25 October 2025
- D. Version 1.02
- Date of printing 25 October 2025
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E. Other

 Indicates information that has changed from previously issued version.

- Key to abbreviations
- ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- N/A = Not available
- UN = United Nations

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