



MATERIAL SAFETY DATA SHEET

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Prepared: October 1, 2006
Revised: April 1, 2009

TREHA™

1. Chemical Product and Company Identification

Product Name : TREHA™
Synonym(s) : Trehalose
General Use : Food ingredient
Product Description : Non-reducing disaccharide

Manufacturer
Company Name : Hayashibara Company, Limited
Address : 2-3 Shimoishii 1-chome, Kita-ku, Okayama 700-0907, JAPAN
Telephone : +81-86-224-4311
Fax : +81-86-225-5644

Supplier (Contact in Emergency)
Company Name : Hayashibara Shoji, Inc.
Head Office (Japan)

Address : 1-2-3 Shimoishii, Kita-ku, Okayama 700-0907, JAPAN
Telephone : +81 (0)86-224-4311
Fax : +81 (0)86-225-5644

Department Issuing MSDS

Company Name : Hayashibara Company, Limited
Overseas Business Development
Address : 2-3 Shimoishii 1-chome, Kita-ku, Okayama 700-0907, JAPAN
Telephone : +81-86-224-4311 (9 am-5:30 pm Japan Time M-F)
Fax : +81-86-225-5644

2. Composition / Information on Ingredients

Chemical Identity : α -D-Glucofuranosyl α -D-glucofuranoside dihydrate (Trehalose dihydrate)
Purity : Not less than 98.0%
CAS No. : 6138-23-4
EINECS No. : 202-739-6
Chemical Formula : $C_{12}H_{22}O_{11} \cdot 2H_2O$

3. Hazards Identification

No applicable hazardous criteria.

Emergency Overview

Product is a non-flammable white crystalline powder. Highly safe material enzymatically produced from starch similar to glucose or corn syrup. Found naturally in insects, plants, organism such as mushrooms and baker's yeast. Has a long history of consumption by humans.

Potential Health Effects

Eye : Contact may cause physical irritation. Significant irritation would not be expected.
Skin : No skin irritation can be expected.
Ingestion : Ingestion of small amounts would not be expected to produce toxicity.



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Inhalation : Overexposure to dusts may cause irritation of the respiratory system.

4. First Aid Measures

Eye Contact : Immediately flush eyes with a sufficient amount of water.
Skin Contact : Wash areas thoroughly with water.
Ingestion : If material is swallowed in large amounts, get medical attention.
Inhalation : Remove to fresh air.
Consult doctor, if symptoms develop or persist after taking the measures above.

5. Fire Fighting Measures

Flammable Properties
Flashpoint : Not applicable
Flammable Limit : Not applicable
Autoignition : Not applicable
Flammability Classification : Non-flammable

Extinguish Media

Dry chemical, foam, carbon dioxide, water fog

Fire Fighting Instruction

Keep personnel removed from and upwind of fire. Wear full fire-fighting turn-out gear (full bunker gear) and respiratory protection. Cool container with water spray.

6. Accidental Release Measures

Overview

The product is easily biodegradable. No special measures are needed.

Land Spill

Sweep up the spill and dispose of in general trash. Wash residual with water. Spill area can be washed with water for approved disposal. Follow all regulatory requirements for non-hazardous waste disposal.

7. Handling and Storage

Handling

Ensure good ventilation/exhaustion at the workplace. Likely to become sticky when humidity exceeds 90%.

Storage

Keep container tightly closed. Preferably store at room temperature in a clean, odor free and dry area.

8. Exposure Controls / Personal Protection

Engineering controls

No specific controls are needed.

Personal Protective Equipment



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Eye/Face Protection	: Generally, protective apparel such as safety glass or goggles is not required.
Skin Protection	: Wear impervious gloves for prolonged contact.
Respiratory Protection	: If ventilation is not sufficient to effectively remove and prevent buildup of dusts, appropriate respiratory protection should be provided.
Exposure Guidelines	Not established

9. Physical & Chemical Properties¹

Appearance	: White crystalline powder
Odor	: Odorless
pH of the solution	: 4.5 – 6.5 (30% water solution)
Melting point	: 97 °C
Solubility in Water	: 68.9 g/100 g water (20 °C)

10. Stability and Reactivity

Chemical Stability

Stable under ordinary storage conditions.

Condition to Avoid

Avoid accumulation of airborne dusts.

Incompatibility with Other materials

The product may react with strong oxidizing agents.

Hazardous Decomposition Products

Upon decomposition, the product emits carbon monoxide, carbon dioxide and/or low molecule weight hydrocarbons.

Hazardous Polymerization

No data available

11. Toxicological Information

Eye Irritation²

: No irritation was observed in rabbit eyes given a single dose of a volume of 0.1 mL of approximately 9% trehalose solution. It elicited transient, very slight to well-defined irritation, resolving completely by two days after treatment.

Skin Irritation³

: No dermal irritation was observed to intact rabbit skin following a single semi-occlusive application of Trehalose.

Acute Oral Toxicity⁴

: No toxicity was observed in male or female rats given a single dose of 16 g/kg bw of trehalose in distilled water by oral administration.

Subacute Oral Toxicity⁵

: A no-toxic-effect level of 50,000 ppm was reported after 13 weeks in feed of mice (7.27 g/kg bw/day for males and 9.27 g/kg bw/day for females).

Carcinogenicity

: No data available

Mutagenicity^{6, 7, 8}

: No mutagenicity reported. Standardized AMES assays, mouse micronucleus and CHO chromosome aberration assays performed.



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Embryotoxicology/Teratology^{9, 10}	: No maternal or developmental toxicity was noted. Trehalose was given at up to 10% of the diet to mated female rats and rabbits. The NOAEL was 6.94 g/kg bw/day in rats and 1.99 g/kg bw/day in rabbits.
Two-Generation Reproduction¹¹	: No Trehalose-associated toxicity was reported. Two generations of male and female rats were fed a maximum of 10% trehalose in the diet. The NOAEL for male rats was 7.09 g/kg bw/day, while it was 6.16 g/kg bw/day for females.

12. Ecological Information

Ecotoxicity

No data available

Environmental fate

The product is easily biodegradable.¹²

Physical/Chemical properties

No data available

Notes: Trehalose is a material commonly found in animals and plants.

13. Disposal Considerations

Comply with each local regulation.

Do not dump this material into sewers, on the ground or into any body of water.

14. Transport Information

International transportation regulations:

Not regulated as a dangerous material.

Product to be kept in sealed container. Keep away from moisture, high temperatures, and direct sunlight. Additional care should be taken to comply with the conditions listed under Handling and Storage.

15. Regulatory Information

The product is not subject to any hazardous classification according to the sources of literature known to us.

Please refer to national measures that may be relevant.

Trehalose is approved in many countries and by several recognized international agencies: Japan (listed in the List of Existing Food Additives published in 1996 by the Ministry of Health and Welfare), USA (GRAS substance), EU (Novel Food), JECFA (ADI not specified), China, etc.

16. Other Information

This information is furnished without warranty, express or implied, except that it is accurate to the best knowledge of Hayashibara Co., Ltd. It relates only to the specific material designated herein, and



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does not relate to use in combination with any other material or in any process. Hayashibara Co., Ltd. assumes no legal responsibility for use of or reliance upon this information.

References:

1. Trehalose Technical Information, Hayashibara Biochemical Labs., Inc., Okayama, Japan
2. Trehalose Eye Irritation to the Rabbit. Huntingdon Life Science Ltd., Cambridgeshire, England. Study Number HBL 002/013070/SE.
3. Trehalose Skin Irritation to the Rabbit. Huntingdon Life Science Ltd., Cambridgeshire, England. Study Number HBL 001/013015/SE.
4. Trehalose Crystals Acute Oral Toxicity in the Rat. Huntingdon Research Centre Ltd., Cambridgeshire, England. Study Number HBL 4/940826/AC.
5. Subchronic 13-Week Oral Toxicity (Feeding) Study with Trehalose in Mice. RCC, Research & Consulting Company Ltd., Itingen, Switzerland, Study Number 639213.
6. Trehalose (Crystals) Bacterial Mutation Assay. Huntingdon Research Centre Ltd., Cambridgeshire, England. Study No. HBL 3/941649.
7. Evaluation of Trehalose in the Mouse Micronucleus Assay. SRI International, Menlo Park, California, U.S.A. Study Number G019-97.
8. Evaluation of Trehalose in the CHO Chromosome Aberration Assay. SRI International, Menlo Park, California, U.S.A. Study Number G018-97.
9. Oral Embryotoxicity/Teratogenicity Study with Trehalose in Rats. TNO Nutrition and Food Research Institute, Zeist, Netherlands. Study Number 471003.
10. Oral Embryotoxicity/Teratogenicity Study with Trehalose in New Zealand White Rabbits. TNO Nutrition and Food Research Institute, Zeist, Netherlands. Study Number 471005.
11. Oral Two-Generation Study with Trehalose in Rats. TNO Nutrition and Food Research Institute, Zeist, Netherlands. Study Number 471004.
12. Biodegradation test of trehalose. Institute of Gakusyuin ecotoxicology, Gakusyuin University, Tokyo, Japan. Study Number D-136. Report Number G4-9723-D136-HS.