Material Safety Data Sheet: Glucose (Component #1 of the XF Glycolysis Stress Test Kit)

Date of Issue: May 28, 2013

Section I - Material Identification

Chemical Name: D-(+)-Glucose solution
Trade Name: D-(+)-Glucose solution

Section II - Composition/Identity Information

Formula: C6H12O6
Molecular Weight: 180.16 g/mol
No ingredients are hazardous according to OSHA criteria.

Section III - Hazards Information

Emergency Overview
OSHA Hazards: No known OSHA hazards.
Not a dangerous substance or mixture according to the Globally Harmonized System (GHS).
HMIS Classification
Health hazard: 0
Flammability: 0
Physical hazards: 0
NFPA Rating
Health hazard: 0
Fire: 0
Reactivity Hazard: 0
Potential Health Effects
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation.
Skin: May be harmful if absorbed through skin. May cause skin irritation.
Eyes: May cause eye irritation.
Ingestion: May be harmful if swallowed.

Section IV - First Aid Measures

If inhaled: Move person into fresh air. If not breathing, give artificial respiration.
In case of skin contact: Wash off with soap and plenty of water.
In case of eye contact: Flush eyes with water as a precaution.
If swallowed: Never give anything by mouth to an unconscious person. Rinse mouth with water.

Section V - Fire and Explosion Hazard Data

Conditions of flammability: Not flammable or combustible.
Suitable extinguishing media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special protective equipment for firefighters: Wear self-contained breathing apparatus for fire-fighting if necessary.
Hazardous decomposition products formed under fire conditions: Carbon oxides

Section VI - Stability and Reactivity Data

Chemical stability: Stable under recommended storage conditions.
Possibility of hazardous reactions: no data available
Conditions to avoid: no data available
Materials to avoid: Strong oxidizing agents
Hazardous decomposition products formed under fire conditions: Carbon oxides

Section VII - Physical/Chemical Characteristics

Appearance: Form liquid
Color: no data available
Safety data
pH: no data available
Melting point/freezing point: no data available
Boiling point: no data available
Flash point: no data available
Ignition temperature: no data available
Autoignition temperature: no data available
Lower explosion limit: no data available
Upper explosion limit: no data available
Vapour pressure: no data available
Density: no data available
Water solubility: no data available
Partition coefficient: n-octanol/water
Relative vapour density: no data available
Odour: no data available
Odour Threshold: no data available
Evaporation rate: no data available

Section VIII - Accidental Release Measures

Personal precautions: Avoid breathing vapors, mist or gas.
Environmental precautions: Do not let product enter drains.
Methods and materials for containment and cleaning up: Keep in suitable, closed containers for disposal.

Section IX - Handling and Storage

Conditions for safe storage: Keep container tightly closed in a dry and well-ventilated place.

Section X - Exposure Controls / Personal Protection

Contains no substances with occupational exposure limit values.
Respiratory protection: Respiratory protection not required. For nuisance exposures use type OV/AG (US) or type ABEK (EU EN 14387) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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Hand protection: 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.
Eye protection: Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin and body protection: impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Hygiene measures: General industrial hygiene practice.

Section XI - Disposal Considerations

Product: Offer surplus and non-recyclable solutions to a licensed disposal company.
Contaminated packaging: Dispose of as unused product.

Section XII - Transport Information

DOT (US): Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

Section XIII - Toxicological Information

Acute toxicity
Oral LD50: no data available
Inhalation LC50: no data available
Dermal LD50: no data available
Other information on acute toxicity: no data available
Skin corrosion/irritation: no data available
Serious eye damage/eye irritation: no data available
Respiratory or skin sensitization: no data available
Germ cell mutagenicity: no data available
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.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Reproductive toxicity: no data available
Teratogenicity: no data available
Specific target organ toxicity - single exposure (Globally Harmonized System): no data available
Specific target organ toxicity - repeated exposure (Globally Harmonized System): no data available
Aspiration hazard: no data available

Potential health effects
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion: May be harmful if swallowed.
Skin: May be harmful if absorbed through skin. May cause skin irritation.
Eyes: May cause eye irritation.
Signs and Symptoms of Exposure: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Synergistic effects: no data available
RTECS: Not available

Section XIV - Ecological Information

Toxicity: no data available
Persistence and degradability: no data available
Bioaccumulative potential: no data available
Mobility in soil: no data available
PBT and vPvB assessment: no data available
Other adverse effects: no data available

Section XV - Regulatory Information

OSHA Hazards: No known OSHA hazards
SARA 302 Components: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313 Components: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards: No SARA Hazards
Massachusetts Right To Know Components: No components are subject to the Massachusetts Right to Know Act.
Pennsylvania Right To Know Components:
Water
CAS-No. 7732-18-5
Revision Date
Glucose 50-99-7
New Jersey Right To Know Components:
Water
CAS-No. 7732-18-5
Revision Date
Glucose 50-99-7
California Prop. 65 Components: This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

Section XVI - Other Information

For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: Oligomycin (Component #2 of the XF Glycolysis Stress Test Kit)

Section I – Chemical Product Identification

Synonyms: Oligomycin, Oligomycin A
Molecular formula: C45H74O11
Molecular weight: 791.06

Section II – Composition/Information On Ingredients

Hazardous ingredients: Oligomycin A
CAS number: 579-13-5
EINECS: 209-437-3
Weight: N/A
OSHA PEL: not established

Section III – Hazardous Identification

Warning! Harmful by ingestion.
Physical appearance: white powder
Odor: none detected
Effects of overexposure:
- **General:** oligomycin a has shown toxic symptoms in humans. The most common are nausea, skin rashes.
- **Inhalation:** may be harmful if inhaled. May cause respiratory tract irritation.
- **Eyes:** may cause eye irritation.
- **Skin:** may be harmful if absorbed through skin. May cause skin irritation.
- **Ingestion:** a high ingestion hazard.

HMIS & NFPA hazard ratings: health–1, flammability–0, chemical reactivity–0.

Section IV – First Aid Measures

Never give fluids or include vomiting if patient is unconscious or is having convulsions.
General advice: remove contaminated clothing promptly (launder before reuse)
Eye contact: flush thoroughly with running water (including under eyelids) for at least 15 minutes. If irritation persists after flushing, seek medical attention.
Skin contact: wash contaminated skin with water. Seek medical attention if irritation persists.
Ingestion: seek immediate medical care. Do not induce vomiting.
Inhalation: remove to fresh air. If breathing has stopped, provide artificial respiration, keep the victim warm & seek medical attention.
Special advice: chemical should be treated with care, respect & common sense.

Section V – Fire Fighting Measures

Extinguishing media: Foam, carbon dioxide, dry powder & water spray.
Special protective equipment for fire-fighters: wear a self-contained breathing apparatus (SCBA).
Special exposure hazards: wear rubber gloves, SCBA, & rubber suit.
Flashpoint & method: n/a
LEL: 3.0 – n/a
UEL: 42 – n/a
Auto ignition temperature: n/a

Section VI –Accidental Release Measures

Personal precautions: avoid formation of dust; use a respirator or self-contained breathing apparatus (SCBA).
Environmental precautions: do not let enter drains. Contact environmental supervisor. Ventilate the area. Do not breathe the dust or aerosol.
Spill clean-up methods: dilute & flush to wastewater treatment or absorb with inert material. Do not allow the material to enter streams or waterways.
Recommended decontamination facilities: eye, bath, water washing facilities.

Section VII – Handling & Storage

Usage/handling precautions: avoid formation of dust & aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventative fire protection. Avoid contact with skin, eyes, or clothing.
Storage precautions: keep container tightly closed, in a well ventilated place.

Section VIII – Exposure Controls/Personal Protection

Exposure limits:
- **ACGIH threshold limit value (TLV):** not established
- **OSHA (USA) permissible exposure limit (PEL, 1989 table z-1-a values or section specific standards):** not established
- **AIHA workplace environmental exposure level "weel" guideline for airborne concentrations in the workplace:** 250 ppm (8-hr TWA)

Ventilation: good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. Use process enclosures, local exhaust ventilation, or other engineering controls to maintain ventilation.
Respiratory protection: in case of dust or aerosol formation use a respirator of SCBA.
Respirator type: hygroscopic powder. If respirators are used, a program should be instituted to assure compliance with OSHA standards.
Hand protection: butyl rubber or nitrile (NBR) rubber gloves.
Eye protection: tightly fitting safety goggles.

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Section IX – Physical & Chemical Properties

Appearance: fine white powder
Odor: essentially odorless
Odor threshold: n/a
pH: n/a
Boiling point: n/a
Flashpoint & method: n/a
Sensitivity to static discharge: material may accumulate a static charge.

Section X – Stability & Reactivity

Stability: Stable.
Conditions to avoid: prolonged heating above 150°C (302°F) can cause rapid, exothermic decomposition
Materials to avoid: strong oxidizing agents.
Hazardous decomposition products: carbon oxides

Section XI – Toxicological Information

Acute toxicity data:
- **Oral ld-50 (male rat):** 1.500mg/kg
- **Inhalation (rat):** N/A
- **Dermal ld-50 (rat):** N/A
- **Skin irritation (human):** mild
- **Repeated skin application (human):** slight irritation
- **Skin sensitization (human):** N/A
- **Eye irritation (human):** N/A

Developmental toxicity data: may be fatal if enters into blood stream

Section XII – Ecological Information

Elimination information (persistence & degradability): no data available.
Ecotoxicity effects: no data available.
Further information on ecology: no data available.

Section XIII – Disposal Considerations

Disposal methods: waste disposal. Dilute & flush to an approved wastewater treatment system.

Section XIV – Transportation Information

Dot USA status: not dangerous good

Section XV – Regulatory Information

OSHA hazards: harmful by ingestion.
DSL status: this product contains the following components that are not on the Canadian DSL nor the NDSL lists: oligomycin a. CAS #579-13-5
Sara 302 components: no chemicals in this material are subject to the reporting requirements of SARA title iii, section 302.
Sara 313: this material does not contain any chemical components with known cas numbers that exceed the Threshold (de minimis) reporting levels established by SARA title iii, section 313.
Sara 311/312 hazards: acute health hazard.

Material Safety Data Sheet: 2-DG (Component #3 of the XF Glycolysis Stress Test Kit)

Section I – Chemical Product Identification

Chemical Name: 2-Deoxy-D-glucose
Trade Name: 2-Deoxy-D-glucose

Section II – Composition/Information On Ingredients

Synonyms: 2-Deoxy-D-arabinohexose
Formula: C6H12O5
Molecular Weight: 164.16 g/mol
CAS No: 154-17-6
EC No: 205-823-0

Section III - Hazards Information

Emergency Overview
OSHA Hazards: No known OSHA hazards.
Not a dangerous substance or mixture according to the Globally Harmonized System (GHS).
HMIS Classification
Health hazard: 0
Flammability: 0
Physical hazards: 0
NFPA Rating
Health hazard: 0
Fire: 0
Reactivity Hazard: 0
Potential Health Effects
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation.
Skin: May be harmful if absorbed through skin. May cause skin irritation.
Eyes: May cause eye irritation.
Ingestion: May be harmful if swallowed.

Section IV - First Aid Measures

If inhaled: Move person into fresh air. If not breathing, give artificial respiration.
In case of skin contact: Wash off with soap and plenty of water.
In case of eye contact: Flush eyes with water as a precaution.
If swallowed: Never give anything by mouth to an unconscious person. Rinse mouth with water.

Section V - Fire and Explosion Hazard Data

Suitable extinguishing media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special protective equipment for firefighters: Wear self-contained breathing apparatus for fire-fighting if necessary.
Hazardous decomposition products formed under fire conditions: Carbon oxides

Section VI - Stability and Reactivity Data

Chemical stability: Stable under recommended storage conditions.
Possibility of hazardous reactions: no data available
Conditions to avoid: no data available
Materials to avoid: Strong oxidizing agents
Hazardous decomposition products formed under fire conditions: Carbon oxides

Section VII - Physical/Chemical Characteristics

Appearance: Form crystalline
Color: white
Safety data
pH: no data available
Melting point/range: 146 - 147 °C (295 - 297 °F)
Freezing point: no data available
Boiling point: no data available
Flash point: no data available
Ignition temperature: no data available
Autoignition temperature: no data available
Lower explosion limit: no data available
Upper explosion limit: no data available
Vapour pressure: no data available
Density: no data available
Water solubility: no data available
Partition coefficient: n-octanol/water
Relative vapour density: no data available
Odour: no data available
Odour Threshold: no data available
Evaporation rate: no data available

Section VIII - Accidental Release Measures

Personal precautions: Avoid breathing vapors, mist or gas.
Environmental precautions: Do not let product enter drains.
Methods and materials for containment and cleaning up: Sweep up and shovel. Keep in suitable, closed containers for disposal.

Section IX - Handling and Storage

Precautions for safe handling: Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
Conditions for safe storage: Keep container tightly closed in a dry and well-ventilated place.

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Section X - Exposure Controls / Personal Protection

Contains no substances with occupational exposure limit values.
Respiratory protection: Respiratory protection not required. For nuisance exposures use type OV/AG (US) or type ABEK (EU EN 14387) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).
Hand protection: 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.
Eye protection: Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin and body protection: impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Hygiene measures: General industrial hygiene practice.

Section XI - Disposal Considerations

Product: Offer surplus and non-recyclable solutions to a licensed disposal company.
Contaminated packaging: Dispose of as unused product.

Section XII - Transport Information

DOT (US): Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

Section XIII - Toxicological Information

Acute toxicity
Oral LD50: no data available
Inhalation LC50: no data available
Dermal LD50: no data available
Other information on acute toxicity: LD50 Subcutaneous - rat - 250 mg/kg
Skin corrosion/irritation: no data available
Serious eye damage/eye irritation: no data available
Respiratory or skin sensitization: no data available
Germ cell mutagenicity: no data available
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.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Reproductive toxicity: rat - Oral
Effects on Fertility: no data available
Developmental Toxicity: rat - Oral
Effects on Embryo or Fetus: no data available
Specific target organ toxicity: no data available
Aspiration hazard: no data available
Potential health effects
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion: May be harmful if swallowed.
Skin: May be harmful if absorbed through skin. May cause skin irritation.
Eyes: May cause eye irritation.
Synergistic effects: no data available
RTECS: Not available

Section XIV - Ecological Information

Toxicity: no data available
Persistence and degradability: no data available
Bioaccumulative potential: no data available
Mobility in soil: no data available
PBT and vPvB assessment: no data available
Other adverse effects: no data available

Section XV - Regulatory Information

OSHA Hazards: No known OSHA hazards
SARA 302 Components: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313 Components: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards: No SARA Hazards
Massachusetts Right To Know Components: No components are subject to the Massachusetts Right to Know Act.
Pennsylvania Right To Know Components:
Water
CAS-No. 7732-18-5
Revision Date
Glucose 50-99-7
New Jersey Right To Know Components:
Water
CAS-No. 7732-18-5
Revision Date
Glucose 50-99-7
California Prop. 65 Components: This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

Section XVI - Other Information

For R&D use only. Not for drug, household or other uses.

Material Safety Data Sheet: DMSO (Diluent Component of the XF Glycolysis Stress Test Kit)

Section I – Chemical Product Identification

Synonyms: Dimethyl Sulfoxide
Molecular formula: c2h6os
Molecular weight: 78.13

Section II – Composition/Information on Ingredients

Hazardous ingredients: dimethyl sulfoxide
CAS number: 67-68-5
EINECS: 200-664-3
Weight: >99%
OSHA PEL: not established

Section III – Hazardous Identification

Warning! Combustible liquid & vapor.
Physical appearance: clear liquid
Odor: essentially odorless
Effects of overexposure:

General: DMSO has shown very few toxic symptoms in humans. The most common are nausea, skin rashes & an unusual garlic-onion-oyster smell on body & breath.

Inhalation: high vapor concentrations ay cause headache, dizziness & sedation.

Eyes: low hazard for usual industrial/commercial handling by trained personnel.

Skin: stinging & burning of the skin as well as rashes & vesicles have been seen. A heat reaction may occur if applied to wet skin. Avoid contact with DMSO solutions containing toxic material or materials whose toxicological properties are not known. DMSO easily penetrates the skin and may enhance the rate of skin absorption of skin-permeable substances. But substances with it through the skin, it can be concluded that DMSO does not pose a significant threat by skin absorption.

Ingestion: a low ingestion hazard.

HMIS & NFPA hazard ratings: health–1, flammability–1, Chemical reactivity–0.

Section IV – First Aid Measures

Never give fluids or include vomiting if patient is unconscious or is having convulsions.
General advice: remove contaminated clothing promptly (launder before reuse)
Eye contact: flush thoroughly with running water (including under eyelids) for at least 15 minutes. If irritation persists after flushing, seek medical attention.
Skin contact: wash contaminated skin with water. Seek medical attention if irritation persists.
Ingestion: seek immediate medical care. Do not induce vomiting.
Inhalation: remove to fresh air. If breathing has stopped, provide artificial respiration, keep the victim warm and seek medical attention.
Special advice: in general, DMSO is not dangerous to people, but like any other chemical, it should be treated with care, respect, & common sense.

Section V – Fire Fighting Measures

Combustible liquid & vapor!
Extinguishing media: foam, carbon dioxide, dry powder & water spray.
Special protective equipment for fire-fighters: wear a self-contained breathing apparatus (SCBA).
Special exposure hazards: burning dimethyl sulfoxide produces poisonous gases (sulfur oxides) wear rubber gloves, scba, & rubber suit.
Flashpoint & method: 89°C (192°F) closed cup, 95°C (203°F) open cup.
Flammable limits (% in air)

Lel: 3.0-3.5% By volume

Uel: 42-63% by volume

Auto ignition temperature: 300-302°C (572-575°F)

Section VI – Accidental Release Measures

Personal precautions: in case of mist formation, use a respirator or self-contained breathing apparatus (SCBA).
Environmental precautions: if a spill or leak occurs, immediately consult your environmental supervisor. Remove ignition if a spill or leak occurs, remove ignition sources. Ventilate the area. Do not breathe the vapor or get liquid in eyes or on skin/clothing.
Spill clean-up methods: dilute & flush to wastewater treatment or absorb with inert material. Do not allow the material to enter streams or waterways.
Recommended decontamination facilities: eye, bath, water washing facilities.

Section VII – Handling & Storage

Usage/handling precautions: keep away from sources of ignition. No smoking. Do not breathe vapor or mist. Avoid contact with skin, eyes, or clothing.
Storage precautions: keep container tightly closed, in a well-ventilated place. Freezes (solidifies) at 18°C (64°F).

Section VIII – Exposure Controls/Personal Protection

Exposure limits:

ACGIH threshold limit value (TLV): not established

OSHA (USA) permissible exposure limit (pel, 1989 table z-1-a values or section specific standards): not established

AIHA workplace environmental exposure level "weel" guideline for airborne concentrations in the workplace: 250 ppm (8-hr TWA)

Ventilation: good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. Use process enclosures, local exhaust ventilation, or other engineering controls to maintain ventilation.

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Respiratory protection: in case of mist formation use a respirator of SCBA. Respirator type: organic vapor. If respirators are used, a program should be instituted to assure compliance with OSHA standards.
Hand protection: butyl rubber or nitrile (NBR) rubber gloves.
Eye protection: tightly fitting safety goggles.

Section IX – Physical & Chemical Properties

Appearance: colorless liquid
Odor: essentially odorless
Odor threshold: N/A
pH: 8.5 (50/50 In water)
Boiling point: 189°C (372°F)
Flashpoint & method: 89°C (192°F) closed cup, 95°C (203°F) open cup.
Flammable limits (% in air): LEL: 3.0-3.5% By volume
UEL: 42-63% by volume
Autoignition temperature: 300-302°C (572-575°F)
Vapor pressure: 0.55 mbar (0.46 mmhg) at 20°C (68°F)
Specific gravity: 1.1 At 20°C (68°F)(water=1)
Solubility in water at 20°C: miscible
Melting point: 18°C (64°F)
Sensitivity to static discharge: material is unlikely to accumulate a static charge, which could act as an ignition source.

Section X – Stability & Reactivity

Stability: stable
Conditions to avoid: prolonged heating above 150°C (302°F) can cause rapid, exothermic decomposition.
Materials to avoid: organic & inorganic acid chlorides, strong oxidizing agents, alkali metals, hydrobromic acid, acidic solutions of alkali bromides.
Hazardous decomposition products: sulfur dioxide, formaldehyde, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and bis (methylthio) methane.
Hazardous polymerization: will not occur. No stabilizers are needed or present.

Section XI – Toxicological Information

Acute toxicity data:
- **Oral ld-50 (male rat):** 14,500-28,300mg/kg
- **Inhalation (rat):** no mortality rate at 2,900 mg/m3 (900 ppm)/24 hrs.
- **Dermal ld-50 (rat):** 40,000 mg/kg
- **Skin irritation (human):** mild
- **Repeated skin application (human):** slight irritation
- **Skin sensitization (human):** none by EC protocols
- **Eye irritation (human):** none by EC protocols

Developmental toxicity data: DMSO is not considered to be directly embryotoxic & has been shown to be a successful cryoprotectant for mammalian semen & embryos.
Mutagenicity/genotoxicity data: salmonella typhimurium assay
Ames test: negative (+/-) activiation) DMSO is used as a neutral solvent in the ames mutagen test.

Section XII – Ecological Information

Introduction: this environmental effects summary is written to assist in addressing emergencies created by an accidental spill which might occur during shipment or handling of this material. It is not meant to address discharges to sanitary sewers or publicly owned treatment works.
Aquatic toxicity: the lc50 (96 hrs) for ten species of fish range from 32,500, to 43,000 ppm. The lc50 for two species of protozoans are 32,000 & 38,000 ppm. The concentration required to inhibit growth (ec50) for five species of blue -green algae & one green algae species is ranged from 0.4 To 4.0% DMSO is non-bio-accumulating since the log of the octanol/water partition coefficient is -2.03.
Phytotoxicity: soaking tomato, cucumber, & bean seeds for 18hrs in up to 8% DMSO solutions had no effect on germination rate. DMSO has no effect on the growth rate of corn when sprayed on at rates up to 30 gallon/acre. When diluted with a large amount of water, release of DMSO, directly or indirectly, to the environment is not expected to have significant effect.
Biological oxygen demand:
- **Theoretical oxygen demand at 10ppm:** 123 mg oxygen
- **Chemical oxygen demand at 10ppm:** 107 mg/l
- **Biological oxygen demand-5 at 10ppm:** <1.0Mg/l

Section XIII – Disposal Considerations

Waste disposal: dilute & flush to an approved wastewater treatment system. Bacterial decomposition of dimethyl sulfoxide during wastewater treatment can result in the release of dimethyl sulfide (a volatile substance with a strong disagreeable odor). Waste DMSO can also be incinerated in an approved furnace where permitted. Consult federal, state or local authorities for proper disposal procedures.
Empty containers: should be transported/delivered using a registered waste carrier for recycling or waste disposal in accordance with local regulations.

Section XIV – Transportation Information

Dot USA status: bulk
- **Proper shipping name:** combustible liquid, N.O.S. (dimethyl sulfoxide)
- **Hazard class:** combustible liquid
- **ID Number:** NA 1993
- **Packing group:** iii
- **Reportable quantity:** N/A
- **Placards:** 1993 (combustible)
- **Quantity limitations:** drum (<119 gallons per container)
- **Label(s):** none

TDG (Canada) status: unregulated
- **ID number:** none
- **Packing group:** none
- **Label(s):** none

ICAO–international civil aviation organization status: unregulated
IATA–international air transport agency status: unregulated
ADR & IMDG–international dangerous goods status: unregulated.

Section XV – Regulatory Information

This document has been prepared in accordance with the MSDS requirements of the OSHA hazard communication standard 29 CFR 1910.1200.
Occupational safety & health administration "OSHA" hazardous chemical(s): dimethyl sulfoxide.
Material(s) known to the state of California to cause cancer: none.
Material(s) known to the state of California to cause adverse reproductive effects: none
Massachusetts substance list: none
New Jersey workplace hazardous substance list: none
Pennsylvania hazardous substance list: none
This document has been prepared in accordance with the MSDS requirements of the WHMIS controlled products regulation.
WHMIS (Canada) ingredient disclosure list: listed
WHMIS (Canada) status: regulated
WHMIS (Canada) hazard classification: none
IARC–international agency for research on cancer carcinogenicity classification (components present at 0.1% or more): not listed
ACGIH–american conference of governmental industrial hygienists: not listed.
NTP–national toxicology program: not listed
Reporting requirements of section 313 or title iii of the superfund amendments & reauthorization act (SARA) of 1986 & 40 cfr part 372: none
SARA (USA) sections 311 & 312 hazard classification(s): fire hazard
TSCA–us toxic substances control act: this product is listed on the TSCA inventory
CEPA/DSL–Canadian environmental protection act/domestic substances list: listed.
EINECS–European inventory of existing commercial chemical substances: no. 200-664-3.
AICS/NICNAS–Australian inventory of chemical substances/ national industrial chemical notification & assessment scheme: this product is listed on AICS.
Japanese handbook of existing & new chemical substances: listed
EC classification & user label information (council directive 67/548/eec & 1999/45/ec): hazard symbols & risk phrases – none required
ICH (international council on harmonization): class iii – solvent with low toxic potential.

Section XVI – Other Information

US/Canadian label statements: Warning! Combustible liquid & vapor. High vapor concentration may cause drowsiness. Store away from heat & light. Distill with caution. Keep away from heat & flame. Avoid breathing high vapor concentrations. Keep container closed. Use with adequate ventilation & proper protective equipment given elsewhere in this MSDS.
First aid: if inhaled, move to fresh air. Treat symptomatically. Get medical attention if symptoms persist.
In case of fire: eliminate all ignition sources. Flush spill area water spray. Prevent runoff from entering drains, sewers, & streams. Since emptied containers retain product residue, follow label warnings even after container is emptied.

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