Date of Preparation or Revision: March 4, 1998

IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY:
Catalog Number: 29110
Product Name: Actinomycin D, *Streptomyes* sp.
Supplier: OXIS International Inc.
   6040 N. Cutter Circle, Suite 317
   Portland, OR   97217-3935   USA
Telephone: 503-283-3911
           800-547-3686
Fax: 503-283-4058

COMPOSITION/INFORMATION ON INGREDIENTS:
Chemical Name: Actinomycin D
Synonyms: Dactinomycin; Dilactone Actinomycindioic D Acid
Hazardous Ingredient: Actinomycin D
CAS Registry Number: 50-76-0
Molecular Weight: 1255.5
Molecular Formula: C_{62}H_{86}N_{12}O_{16}

HAZARDS IDENTIFICATION:
T+, Very Toxic
Acute Effects: May be harmful by ingestion, inhalation or absorption through skin.
Exposure to material may cause the following: malaise, fatigue, lethargy, nausea,
vomiting, muscle pain, and fever. Material may cause serious local tissue damage,
including phlebitis and cellulitis.

Chronic Effects: Prolonged exposure may cause bone marrow depression. Long-term
exposure may also cause kidney and liver abnormalities. There is limited evidence that
Actinomycin D is teratogenic and tumorogenic in laboratory animals. There is also limited
evidence that Actinomycin D is mutagenic in laboratory cell cultures. Until further testing
has been done, it should be treated as a possible teratogen, tumorigen, and mutagen in
humans.

FIRST AID MEASURES:
In cases of skin contact, wash immediately with copious amounts of water for at least 15
minutes. Remove contaminated clothing and shoes and wash before wearing. Consult a
physician.
In cases of eye contact, flush immediately with copious amounts of water for at least 15
minutes. Assure adequate flushing by separating the eyelids with fingers. Consult a
physician.
In cases of inhalation, remove to fresh air and monitor breathing. If breathing becomes
difficult, give oxygen and consult a physician. If breathing stops, give artificial respiration
and consult a physician.
In cases of ingestion, wash mouth out with water and consult the local poison center and
a physician.

FIRE-FIGHTING MEASURES:
Extinguishing Media: Dry chemical powder, carbon dioxide, water spray, alcohol or
polymer foam.
Special Fire Fighting Procedures: Wear self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes.
Unusual Fire and Explosive Hazards: Upon thermal decomposition, it may **EMIT TOXIC GASES**.

**ACCIDENTAL RELEASE MEASURES:**
Steps to be Taken if Material is Released or Spilled: Evacuate area. Wear a self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Sweep up and place in a suitable container. Avoid raising dust. Hold for appropriate disposal. Wash spill site and ventilate area after material pickup is complete.

**HANDLING AND STORAGE:**
Store in a tightly closed container at 2-8°C. Protect from light and moisture. Material is toxic. Possible teratogen, mutagen, and tumorigen. Avoid contact with material. Avoid prolonged or repeated exposure. Lab should be equipped with a safety shower and an eye wash station. Wash thoroughly after handling material.

**EXPOSURE CONTROLS/ PERSONAL PROTECTION:**
Protective Equipment: Wear suitable protective clothing, such as chemical resistant gloves and chemical safety goggles. Respiratory Protection and Ventilation: Use a NIOSH/MSHA approved respirator. Handle in a chemical fume hood with adequate ventilation.

**PHYSICAL AND CHEMICAL PROPERTIES:**
Appearance: Lyophilized solid.
Solubility: Soluble in methanol.

**STABILITY AND REACTIVITY:**
Stability: Stable under normal handling procedures.
Incompatibilities and Conditions to Avoid: Avoid contact with strong oxidizing agents, strong acids, and strong bases.
Hazardous Combustion or Decomposition Products: Upon thermal decomposition, may emit toxic gases including carbon monoxide, carbon dioxide, and nitrogen oxides.

**TOXICOLOGICAL INFORMATION:**
RTECS Number: AU1575000

Toxicity Data and References:
- Orl; rat; LD₅₀: 7200 µg/kg Hypermotility and diarrhea
  ANYAA9 89:348, 1960
- Orl; mus; LD₅₀: 13 mg/kg Hypermotility and diarrhea
  ANYAA9 89:348, 1960
- Ipr; rat; LD₅₀: 100 µg/kg
  AOGLAR 23:219, 1976
- Ipr; mus; LD₅₀: 750 µg/kg Changes in bone marrow and decreased immune response
  CTRRDO 61:103, 1977
- Scu; rat; LD₅₀: 800 µg/kg Hypermotility and diarrhea
  ANYAA9 89:348, 1960
- Ivn; hmn; TDLo: 40 µg/kg/4D-I Dermatitis
  NEJMAG 281:1094, 1969
- Unr; rbt; LD₅₀: 150 µg/kg
  ARZNAD 30:236, 1980

Irritation Data References:
- Skn; rbt; Dose: 5 mg/24H Reaction not reported
  TXCYAC 14:117, 1979
Reproductive Effects and References:
Orl; mus; Dose: 20 mg/kg  TCMUD8 6:361, 1986
Ipr; rat; Dose: 70 ng/kg  Musculoskeletal system developmental abnormalities  AOGLR 23:219, 1976
Ipr; rat; Dose: 150 µg/kg  Central nervous system and craniofacial developmental abnormalities  SEIJO 11:5, 1971
Ipr; mus; Dose: 100 µg/kg  Musculoskeletal system developmental abnormalities  DABBBA 39:1624, 1978
Ipr; mus; Dose: 214 µg/kg  Body wall developmental abnormalities  APJAAG 18:267, 1968
Scu; rat; Dose: 200 µg/kg  Fetal death and musculoskeletal system developmental abnormalities  PSEBAA 157:553, 1978
Par; rbt; Dose: 13 mg/kg  Fetal death  ARZNAD 30:236, 1980

Genetic Data and References:
Oth; rat; Dose: 500 nmol/L  DNA damage  CBINA8 77:25, 1991
Leu; mus; Dose: 1500 µg/L  DNA damage  BBACAQ 654:129, 1981
Lvr; rat; Dose: 50 nmol/L  Unscheduled DNA synthesis  MUREAV 221:263, 1989
Oth; hmn; Dose: 300 pmol/L  DNA inhibition  CNREA8 44:2421, 1984
Fbr; hmn; Dose: 1 mg/L  Mutations in mammalian somatic cells  CNJGA8 21:435, 1979
Lym; mus; Dose: 4 µg/L  Mutations in mammalian somatic cells  MUREAV 192:151, 1987
Ovr; ham; Dose: 40 µg/L  Mutations in mammalian somatic cells  MUREAV 94:449, 1982
Lng; ham; Dose: 20 µg/L  Cytogenetic analysis  GMCRCDC 27:95, 1981
Ovr; ham; Dose: 100 µg/L  Cytogenetic analysis  ENMUDM 2:455, 1980
Lym; hmn; Dose: 1 nmol/L  Sister chromatid exchange  MUREAV 241:109, 1990

Tumorigenic Data and References:
Ipr; rat; Dose: 2600 µg/kg/17W-I  Tumors at the site of application  CNREA8 30:2271, 1970
Ipr; rat; Dose: 1700 µg/kg/26W-I  Tumors at the site of application  RRCRBU 52:1, 1975
Scu; mus; Dose: 280 µg/kg/18W-I  Tumors at the site of application  APJAAG 17:495, 1967

Reviews:
IARC Cancer Review: Group 3 Reference  IMSUDL 7:80, 1987
Toxicology Review Reference  CLPTAT 5:480, 1964
Toxicology Review Reference: "Teratology"  32XPAD -:49, 1975
Toxicology Review Reference  JPETAB 144:429, 1964
Toxicology Review Reference  ARVPAK 5:447, 1965
Toxicology Review Reference  ADVPAA 4:263, 1966
Toxicology Review Reference  DMCNAN 7:353, 1965
Toxicology Review Reference  CRTXBR 2:159, 1973
Refer to the Registry of Toxic Effects of Chemical Substances (RTECS) for a definition of abbreviations used in the above text and for additional information. This report contains only selected information from the RTECS.

ECOLOGICAL INFORMATION:
No information available.

DISPOSAL CONSIDERATIONS:
Country, federal, state, and local regulations are varied and change frequently. For this reason, we recommend that you contact your local Department of Health Services for information on the disposal of this product or arrange for disposal by a licensed disposal company.

TRANSPORT INFORMATION:
UN Number: UN3172
Proper Shipping Name: Toxins, extracted from living sources, solid, n.o.s.
IATA Class: 6.1
IATA Packing Group: II

REGULATORY INFORMATION:
Risks:
R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed
R38: Irritating to skin
S45: May cause cancer
S46: May cause heritable genetic damage
S47: May cause birth defects
S48: Danger of serious damage to health by prolonged exposure

Safety:
S22: Do not breathe dust
S24/25: Avoid contact with skin and eyes
S36/37/39: Wear suitable protective clothing, gloves and eye/face protection
S45: In case of accident or if you feel unwell, seek medical advice immediately
S53: Avoid exposure-obtain special instructions before use

EINECS Number: N/A

OTHER INFORMATION:
The information contained in this MSDS is believed to be correct to the best of our knowledge. However, we make no warranty, expressed or implied, with respect to such information. The information may not be all inclusive, the user should make an independent determination of the suitability of the information based on all sources available and adopt appropriate safety precautions. OXIS International Inc. shall not be liable for any damage resulting from contact or handling of this product.