Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 15007

Product Name: Doxorubicin (hydrochloride)

Synonyms: (8S,10S)-10-[(3-amino-2,3,6-trideoxy-a-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-8-(2-hydroxyacetyl)-1-methoxy-5,12-naphthacenedione, monohydrochloride; Adriacin; DOX; NSC 123127;

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company

1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300

CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Oral, Category 4
Skin Corrosion/Irritation, Category 2
Serious Eye Damage/Eye Irritation, Category 2
Carcinogenicity, Category 1B

2.2 Label Elements:

GHS Signal Word: Danger

GHS Hazard Phrases:

H302: Harmful if swallowed.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H350: May cause cancer.

GHS Precaution Phrases:

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P264: Wash (hands) thoroughly after handling.
P280: Wear (protective gloves/protective clothing/eye protection/face protection).

GHS Response Phrases:

P301+312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P302+352: IF ON SKIN: Wash with plenty of soap and water.
P305+351+338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+313: IF exposed or concerned: Get medical attention/advice.
P330: Rinse mouth.
P332+313: If skin irritation occurs, get medical advice/attention.
P337+313: If eye irritation persists, get medical advice/attention.
P362+364: Take off contaminated clothing and wash it before reuse.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.

Carcinogenic Hazard: 2; Reproductive Hazard: 2; Mutagenic Hazard: 2

2.3 Adverse Human Health Effects and Symptoms:
Causes serious eye irritation.
Causes skin irritation.
Harmful if swallowed.
Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation or skin absorption.
May cause cancer.
May cause respiratory system irritation.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>25316-40-9</td>
<td>5,12-Naphthacenedione, 10-[(3-Amino-2,3,6-trideoxy-.alpha.-L-L...</td>
<td>100.0 %</td>
<td>246-818-3 NA</td>
<td>Acute Tox.(O) 4: H302 Carcinogen 1B: H350 Skin Corr. 2: H315 Eye Damage 2A: H319</td>
</tr>
</tbody>
</table>

Section 4. First Aid Measures

4.1 Description of First Aid Measures:
In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.
In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.
In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.
In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards:
No data available.
Flash Pt: No data.
Explosive Limits: LEL: No data. UEL: No data.
Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.
Section 6. Accidental Release Measures

6.1 Protective Precautions, Equipment and Emergency Procedures:

- **Avoid raising and breathing dust, and provide adequate ventilation.**
- **As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).**

6.2 Environmental Precautions:

- **Take steps to avoid release into the environment, if safe to do so.**

6.3 Methods and Material For Containment and Cleaning:

- **Contain spill and collect, as appropriate.**
- **Transfer to a chemical waste container for disposal in accordance with local regulations.**

Section 7. Handling and Storage

7.1 Precautions To Be Taken:

- **Avoid breathing dust/fume/gas/mist/vapours/spray.**
- **Avoid prolonged or repeated exposure.**

7.2 Precautions To Be Taken in Handling:

- **Keep container tightly closed.**
- **Store in accordance with information listed on the product insert.**

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

- **Engineering Controls:**
  - Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- **Personal protection equipment:**
  - **Eye Protection:** Safety glasses
  - **Protective Gloves:** Compatible chemical-resistant gloves
  - **Other Protective Clothing:** Lab coat
  - **Respiratory Equipment (Specify Type):**
    - NIOSH approved respirator, as conditions warrant.
  - **Work/Hygienic/Maintenance Practices:**
    - Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower.
    - Wash thoroughly after handling.
    - No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

- **Physical States:** [ ] Gas [ ] Liquid [ X ] Solid
- **Appearance and Odor:** A crystalline solid
- **pH:** No data.
- **Melting Point:** No data.
- **Boiling Point:** No data.
- **Flash Pt:** No data.
- **Evaporation Rate:** No data.
- **Flammability (solid, gas):** No data available.
- **Explosive Limits:** LEL: No data. UEL: No data.
- **Vapor Pressure (vs. Air or mm Hg):** No data.
- **Vapor Density (vs. Air = 1):** No data.
SAFETY DATA SHEET
Doxorubicin (hydrochloride)

Specific Gravity (Water = 1): No data.
Solubility in Water: ~10 mg/ml
Solubility Notes: ~0.5 mg/ml in a 1:1 solution of DMSO:PBS (pH 7.2); ~10 mg/ml in DMSO;
Octanol/Water Partition No data.
Coefficient:
Autoignition Pt: No data.
Decomposition Temperature: No data.
Viscosity: No data.

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ] Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
Polymerization: Will occur [ ] Will not occur [ X ]
10.4 Conditions To Avoid: No data available.
10.5 Incompatibility - Materials strong oxidizing agents
To Avoid:
10.6 Hazardous carbon dioxide
Decomposition or carbon monoxide
Byproducts: hydrogen chloride gas
nitrogen oxides

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
Doxorubicin (hydrochloride) - Toxicity Data: Intraperitoneal LD50 (rat): 16030 ug/kg; Subcutaneous LD50 (rat): 21840 ug/kg; Oral LD50 (mouse): 570 mg/kg; Subcutaneous LD50 (mouse): 7678 ug/kg; Intrapерitoneal LD50 (mouse): 11160 ug/kg;
Chronic Toxicological Effects: Doxorubicin (hydrochloride) - Investigated as a drug, mutagen, natural product, reproductive effector, and tumorigen.

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>25316-40-9</td>
<td>5,12-Naphthacenedione, 10-[(3-Amino-2,3,6-trideoxy-.alpha.-L-l...</td>
<td>Possible</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.
12.2 Persistence and Degradability: No data available.
12.3 Bioaccumulative Potential: No data available.
12.4 Mobility in Soil: No data available.
12.5 Results of PBT and vPvB: No data available.
Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):
   DOT Proper Shipping Name: Not dangerous goods.
   DOT Hazard Class: UN/NA Number:

14.1 LAND TRANSPORT (European ADR/RID):
   ADR/RID Shipping Name: Not dangerous goods.
   UN Number: Hazard Class:

14.3 AIR TRANSPORT (ICAO/IATA):
   ICAO/IATA Shipping Name: Not dangerous goods.
   Additional Transport Information: Transport in accordance with local, state, and federal regulations.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25316-40-9</td>
<td>5,12-Naphthacenedione, 10-[(3-Amino-2,3,6-trideoxy-.alpha.-L-l...)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

CAS # Hazardous Components (Chemical Name) | Other US EPA or State Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>CAA HAP,ODC: No; CWA NPDES: No; TSCA: No; CA PROP.65: No</th>
</tr>
</thead>
<tbody>
<tr>
<td>25316-40-9</td>
<td>5,12-Naphthacenedione, 10-[(3-Amino-2,3,6-trideoxy-.alpha.-L-l...)</td>
<td></td>
</tr>
</tbody>
</table>

European Community Hazard Symbol codes:

T

Carcinogenic Hazard: 2; Reproductive Hazard: 2; Mutagenic Hazard: 2

European Community Risk and Safety Phrases:

R22 Harmful if swallowed.
R45 May cause cancer.
R46 May cause heritable genetic damage.
R60 May impair fertility.
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 (show the label whenever possible.)
S53 Avoid exposure - obtain special instructions before use.

Regulatory Information Statement:

This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.
Section 16. Other Information

Revision Date: 08/30/2017

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.