SAFETY DATA SHEET

Ketamine (10%) Formulation

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Ketamine (10%) Formulation

Manufacturer or supplier’s details
Company name of supplier: MSD
Address: 2000 Galloping Hill Road
         Kenilworth - New Jersey - U.S.A. 07033
Telephone: 908-740-4000
Emergency telephone: 1-908-423-6000
E-mail address: EHSDATASTEWARD@msd.com

Recommended use of the chemical and restrictions on use
Recommended use: Veterinary product

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification
Acute toxicity (Oral): Category 5
Skin irritation: Category 2
Eye irritation: Category 2B
Reproductive toxicity: Category 2
Specific target organ toxicity - repeated exposure (Dermal): Category 2 (Kidney, Liver, Brain)

GHS label elements
Hazard pictograms: ![Hazard Pictogram]

Signal Word: Warning

Hazard Statements: H303 May be harmful if swallowed.
H315 + H320 Causes skin and eye irritation.
H361d Suspected of damaging the unborn child.
H373 May cause damage to organs (Kidney, Liver, Brain) through prolonged or repeated exposure in contact with skin.

Precautionary Statements: Prevention:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe mist or vapors.
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
P302 + P352 IF ON SKIN: Wash with plenty of water.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a POISON CENTER or doctor/physician if you feel unwell.
P332 + P313 If skin irritation occurs: Get medical advice/attention.
P337 + P313 If eye irritation persists: Get medical advice/attention.
P362 + P364 Take off contaminated clothing and wash it before reuse.

Storage:
P405 Store locked up.

Disposal:
P501 Dispose of contents/container to an approved waste disposal plant.

Other hazards
None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture: Mixture

<table>
<thead>
<tr>
<th>Components</th>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ketamine hydrochloride</td>
<td>1867-66-9</td>
<td>&gt;= 10 &lt;= 20</td>
</tr>
</tbody>
</table>

SECTION 4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately.
When symptoms persist or in all cases of doubt seek medical advice.

If inhaled: If inhaled, remove to fresh air.
Get medical attention.

In case of skin contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Get medical attention.
Wash clothing before reuse.
Thoroughly clean shoes before reuse.

In case of eye contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.
If easy to do, remove contact lens, if worn.
Get medical attention.

If swallowed: If swallowed, DO NOT induce vomiting.
Get medical attention.
**SAFETY DATA SHEET**

**Ketamine (10%) Formulation**

<table>
<thead>
<tr>
<th>Version</th>
<th>Revision Date:</th>
<th>SDS Number:</th>
<th>Date of last issue:</th>
<th>Date of first issue:</th>
</tr>
</thead>
</table>

Most important symptoms and effects, both acute and delayed:
- Rinse mouth thoroughly with water.
- May be harmful if swallowed.
- Causes skin and eye irritation.
- Suspected of damaging the unborn child.
- May cause damage to organs through prolonged or repeated exposure in contact with skin.

Protection of first-aiders:
- First Aid responders should pay attention to self-protection, and use the recommended personal protective equipment when the potential for exposure exists (see section 8).

Notes to physician:
- Treat symptomatically and supportively.

**SECTION 5. FIRE-FIGHTING MEASURES**

- **Suitable extinguishing media**:
  - Water spray
  - Alcohol-resistant foam
  - Carbon dioxide (CO2)
  - Dry chemical

- **Unsuitable extinguishing media**:
  - None known.

- **Specific hazards during fire fighting**:
  - Exposure to combustion products may be a hazard to health.

- **Hazardous combustion products**:
  - Carbon oxides
  - Chlorine compounds
  - Nitrogen oxides (NOx)

- **Specific extinguishing methods**:
  - Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
  - Use water spray to cool unopened containers.
  - Remove undamaged containers from fire area if it is safe to do so.
  - Evacuate area.

- **Special protective equipment for fire-fighters**:
  - In the event of fire, wear self-contained breathing apparatus.
  - Use personal protective equipment.

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

- **Personal precautions, protective equipment and emergency procedures**:
  - Use personal protective equipment.
  - Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8).

- **Environmental precautions**:
  - Avoid release to the environment.
  - Prevent further leakage or spillage if safe to do so.
  - Prevent spreading over a wide area (e.g., by containment or oil barriers).
  - Retain and dispose of contaminated wash water.
  - Local authorities should be advised if significant spillages cannot be contained.

- **Methods and materials for containment and cleaning up**:
  - Soak up with inert absorbent material.
  - For large spills, provide diking or other appropriate containment to keep material from spreading. If diked material can be pumped, store recovered material in appropriate container.
  - Clean up remaining materials from spill with suitable absorbent.
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable. Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

SECTION 7. HANDLING AND STORAGE

Technical measures: See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section.

Local/Total ventilation: Use only with adequate ventilation.

Advice on safe handling:
- Do not get on skin or clothing.
- Do not breathe mist or vapors.
- Do not swallow.
- Do not get in eyes.
- Wash skin thoroughly after handling.

Hygiene measures:
- If exposure to chemical is likely during typical use, provide eye flushing systems and safety showers close to the working place.
- When using do not eat, drink or smoke.
- Wash contaminated clothing before re-use.
- The effective operation of a facility should include review of engineering controls, proper personal protective equipment, appropriate degowning and decontamination procedures, industrial hygiene monitoring, medical surveillance and the use of administrative controls.

Conditions for safe storage:
- Keep in properly labeled containers.
- Store locked up.
- Store in accordance with the particular national regulations.

Materials to avoid:
- Do not store with the following product types:
  - Strong oxidizing agents

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value type (Form of exposure)</th>
<th>Control parameters / Permissible concentration</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine hydrochloride</td>
<td>1867-66-9</td>
<td>TWA</td>
<td>10 µg/m³ (OEB 3)</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wipe limit</td>
<td>100 µg/100 cm²</td>
<td>Internal</td>
</tr>
</tbody>
</table>

Engineering measures:
- Use appropriate engineering controls and manufacturing technologies to control airborne concentrations (e.g., dripless quick connections).
- All engineering controls should be implemented by facility design and operated in accordance with GMP principles to
Protect products, workers, and the environment. Containment technologies suitable for controlling compounds are required to control at source and to prevent migration of the compound to uncontrolled areas (e.g., open-face containment devices). Minimize open handling.

**Personal protective equipment**

**Respiratory protection**
- If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection.
- **Filter type**:
  - Particulates type

**Hand protection**
- **Material**:
  - Chemical-resistant gloves

**Eye protection**
- **Remarks**:
  - Consider double gloving.
  - Wear safety glasses with side shields or goggles.
  - If the work environment or activity involves dusty conditions, mists or aerosols, wear the appropriate goggles.
  - Wear a faceshield or other full face protection if there is a potential for direct contact to the face with dusts, mists, or aerosols.

**Skin and body protection**
- **Remarks**:
  - Work uniform or laboratory coat.
  - Additional body garments should be used based upon the task being performed (e.g., sleevelets, apron, gauntlets, disposable suits) to avoid exposed skin surfaces.
  - Use appropriate degowning techniques to remove potentially contaminated clothing.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

- **Appearance**:
  - liquid
- **Color**:
  - No data available
- **Odor**:
  - No data available
- **Odor Threshold**:
  - No data available
- **pH**:
  - No data available
- **Melting point/freezing point**:
  - No data available
- **Initial boiling point and boiling range**:
  - No data available
- **Flash point**:
  - No data available
- **Evaporation rate**:
  - No data available
- **Flammability (solid, gas)**:
  - Not applicable
- **Flammability (liquids)**:
  - No data available
Upper explosion limit / Upper flammability limit: No data available
Lower explosion limit / Lower flammability limit: No data available
Vapor pressure: No data available
Relative vapor density: No data available
Relative density: No data available
Density: No data available
Solubility(ies)
  Water solubility: soluble
Partition coefficient: n-octanol/water: Not applicable
Autoignition temperature: No data available
Decomposition temperature: No data available
Viscosity
  Viscosity, kinematic: No data available
Explosive properties: Not explosive
Oxidizing properties: The substance or mixture is not classified as oxidizing.
Molecular weight: No data available
Particle size: Not applicable

SECTION 10. STABILITY AND REACTIVITY

Reactivity: Not classified as a reactivity hazard.
Chemical stability: Stable under normal conditions.
Possibility of hazardous reactions: Can react with strong oxidizing agents.
Conditions to avoid: None known.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: No hazardous decomposition products are known.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure
Inhalation
Skin contact
Ingestion
Eye contact
SAFETY DATA SHEET

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Acute toxicity
May be harmful if swallowed.

**Product:**
Acute oral toxicity : Acute toxicity estimate: 4,470 mg/kg
Method: Calculation method

**Components:**

**Ketamine hydrochloride:**

Acute oral toxicity : LD50 (Rat): 447 mg/kg
LD50 (Mouse): 617 mg/kg

Acute toxicity (other routes of administration) :
LD50 (Rat): 59 mg/kg
Application Route: Intravenous
LD50 (Mouse): 59 mg/kg
Application Route: Intramuscular
LD50 (Mouse): 356 mg/kg
Application Route: Intramuscular
LD50 (Guinea pig): 361 mg/kg
Application Route: Intramuscular
LD50 (Rat): 224 mg/kg
Application Route: Intraperitoneal

Skin corrosion/irritation
Causes skin irritation.

**Components:**

**Ketamine hydrochloride:**
Species : Rabbit
Result : irritating

Serious eye damage/eye irritation
Causes eye irritation.

**Components:**

**Ketamine hydrochloride:**
Species : Rabbit
Result : irritating

Respiratory or skin sensitization

Skin sensitization
Not classified based on available information.

Respiratory sensitization
Not classified based on available information.
**Germ cell mutagenicity**
Not classified based on available information.

**Carcinogenicity**
Not classified based on available information.

**Reproductive toxicity**
Suspected of damaging the unborn child.

**Components:**

**Ketamine hydrochloride:**

Effects on fetal development:
- **Test Type:** Development
- **Species:** Rat
  - **Application Route:** Intramuscular
  - **Developmental Toxicity:** NOAEL: 120 mg/kg body weight
  - **Target Organs:** Kidney, Liver, Heart
  - **Result:** No teratogenic effects.

- **Test Type:** Development
  - **Species:** Rabbit
  - **Application Route:** Intramuscular
  - **Developmental Toxicity:** LOAEL: 20 mg/kg body weight
  - **Symptoms:** Skeletal and visceral variations.
  - **Result:** Effects on prenatal and postnatal growth.

- **Test Type:** Development
  - **Species:** Rat
  - **Application Route:** Intramuscular
  - **Symptoms:** Skeletal and visceral variations.
  - **Result:** Effects on prenatal and postnatal growth.

- **Test Type:** Development
  - **Species:** Rabbit
  - **Application Route:** Intramuscular
  - **Developmental Toxicity:** LOAEL: 60 mg/kg body weight
  - **Symptoms:** Skeletal and visceral variations.
  - **Result:** Effects on prenatal and postnatal growth.

- **Test Type:** Development
  - **Species:** Monkey
  - **Application Route:** Intramuscular
  - **Target Organs:** Brain
  - **Result:** Effects on prenatal and postnatal growth.

**Reproductive toxicity - Assessment**
Suspected of damaging the unborn child.

**STOT-single exposure**
Not classified based on available information.

**STOT-repeated exposure**
May cause damage to organs (Kidney, Liver, Brain) through prolonged or repeated exposure in contact with skin.
SAFETY DATA SHEET

Ketamine (10%) Formulation

Components:

Ketamine hydrochloride:
Routes of exposure: Skin contact
Target Organs: Kidney, Liver, Brain
Assessment: May cause damage to organs through prolonged or repeated exposure.

Repeated dose toxicity

Components:

Ketamine hydrochloride:
Species: Mouse
LOAEL: 30 mg/kg
Application Route: Intraperitoneal
Exposure time: 3 Months
Target Organs: Kidney, Liver, Bladder
Remarks: Significant toxicity observed in testing

Species: Mouse
LOAEL: 30 mg/kg
Application Route: Intraperitoneal
Exposure time: 6 Months
Target Organs: Kidney, Liver, Bladder
Remarks: Significant toxicity observed in testing

Species: Mouse
LOAEL: 30 mg/kg
Application Route: Intraperitoneal
Exposure time: 28 Weeks
Target Organs: Kidney
Remarks: Significant toxicity observed in testing

Species: Mouse
LOAEL: 30 mg/kg
Application Route: Intraperitoneal
Exposure time: 30 Days
Target Organs: Brain, Liver
Remarks: Significant toxicity observed in testing

Species: Monkey
LOAEL: 1 mg/kg
Application Route: Intraperitoneal
Exposure time: 6 Months
Target Organs: Brain
Remarks: Significant toxicity observed in testing

Aspiration toxicity
Not classified based on available information.
Experience with human exposure

Components:
Ketamine hydrochloride:
Ingestion: Symptoms: The most common side effects are: central nervous system effects, hypertension, Dizziness, Headache, Nausea, Drowsiness

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity
Components:
Ketamine hydrochloride:
Ecotoxicology Assessment
Acute aquatic toxicity: Toxic effects cannot be excluded
Chronic aquatic toxicity: Toxic effects cannot be excluded

Persistence and degradability
No data available
Bioaccumulative potential
Components:
Ketamine hydrochloride:
Partition coefficient: n-octanol/water: log Pow: 2.18
Mobility in soil
No data available
Other adverse effects
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods
Waste from residues: Dispose of in accordance with local regulations.
Contaminated packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal. If not otherwise specified: Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

International Regulations
UNRTDG
Not regulated as a dangerous good
IATA-DGR
SAFETY DATA SHEET

Ketamine (10%) Formulation

Not regulated as a dangerous good

**IMDG-Code**
Not regulated as a dangerous good

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**
Not applicable for product as supplied.

**Domestic regulation**

**NOM-002-SCT**
Not regulated as a dangerous good

**Special precautions for user**
Not applicable

### SECTION 15. REGULATORY INFORMATION

**Safety, health and environmental regulations/legislation specific for the substance or mixture**

Federal Law for the control of chemical precursors, essential chemical products and machinery for producing capsules, tablets and pills. : Not applicable

The ingredients of this product are reported in the following inventories:

- **AICS** : not determined
- **DSL** : not determined
- **IECSC** : not determined

### SECTION 16. OTHER INFORMATION

**Full text of other abbreviations**

AIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect

Revision Date: 10.10.2020

The information is considered as correct, but not exhaustive, and will be used only as a guide, which is based in the current knowledge of the substance or mixture, and is applicable to proper safety precautions for the product.

MX / Z8