SAFETY DATA SHEET

Fenbendazole Paste Formulation

Version: 4.1
Revision Date: 09.04.2021
SDS Number: 887509-00014
Date of last issue: 18.12.2020
Date of first issue: 16.09.2016

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Fenbendazole Paste Formulation

Manufacturer or supplier’s details
Company: MSD
Address: 50 Tuas West Drive
Singapore - Singapore 638408
Telephone: +1-908-740-4000
Emergency telephone number: 65 6697 2111 (24/7/365)
E-mail address: EHSDATASTEWARD@msd.com

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

2. HAZARDS IDENTIFICATION

GHS Classification
Reproductive toxicity: Category 2
Specific target organ toxicity - repeated exposure (Oral): Category 2 (Liver, Lymph nodes, Stomach, Nervous system)
Short-term (acute) aquatic hazard: Category 1
Long-term (chronic) aquatic hazard: Category 1

GHS label elements
Hazard pictograms:
Signal word: Warning
Hazard statements:
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.
H373 May cause damage to organs (Liver, Lymph nodes, Stomach, Nervous system) through prolonged or repeated exposure if swallowed.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements:
Prevention:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read
SAFETY DATA SHEET

Fenbendazole Paste Formulation

and understood.
P260 Do not breathe vapours.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.

Storage:
P405 Store locked up.

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

Other hazards which do not result in classification
None known.

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>fenbendazole</td>
<td></td>
<td>43210-67-9</td>
<td>&gt;= 10 - &lt;= 18.75</td>
</tr>
<tr>
<td>Glycerine</td>
<td></td>
<td>56-81-5</td>
<td>10</td>
</tr>
<tr>
<td>Ethanol#</td>
<td></td>
<td>64-17-5</td>
<td>&lt;= 0.04</td>
</tr>
<tr>
<td>Diethyl malonate#</td>
<td></td>
<td>105-53-3</td>
<td>&lt;= 0.006</td>
</tr>
<tr>
<td>2-Furaldehyde#</td>
<td></td>
<td>98-01-1</td>
<td>&lt;= 0.006</td>
</tr>
<tr>
<td>Cinnamaldehyde#</td>
<td></td>
<td>104-55-2</td>
<td>&lt;= 0.002</td>
</tr>
<tr>
<td>Isovaleraldehyde#</td>
<td></td>
<td>590-86-3</td>
<td>&lt;= 0.002</td>
</tr>
<tr>
<td>Acetaldehyde#</td>
<td></td>
<td>75-07-0</td>
<td>&lt;= 0.0002</td>
</tr>
<tr>
<td>Trans-hex-2-en-1-ol#</td>
<td></td>
<td>928-95-0</td>
<td>&lt;= 0.0002</td>
</tr>
</tbody>
</table>

# Voluntarily-disclosed non-hazardous substance

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 soap and plenty of water.
Remove contaminated clothing and shoes.
Get medical attention.
Wash clothing before reuse.
Thoroughly clean shoes before reuse.

In case of eye contact : Flush eyes with water as a precaution.
SAFETY DATA SHEET
Fenbendazole Paste Formulation

If swallowed: If swallowed, DO NOT induce vomiting. Get medical attention. Rinse mouth thoroughly with water.
Most important symptoms and effects, both acute and delayed: Suspected of damaging fertility. Suspected of damaging the unborn child. May cause damage to organs through prolonged or repeated exposure if swallowed.
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.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water spray
Alcohol-resistant foam
Carbon dioxide (CO2)
Dry chemical
Unsuitable extinguishing media: None known.
Specific hazards during firefighting: Exposure to combustion products may be a hazard to health.
Hazardous combustion products: Carbon oxides
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 firefighters: In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment.

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 dyeing or other appropriate containment to keep material from spreading. If dyed 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.

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 breathe vapours.
                        : Do not swallow.
                        : Avoid contact with eyes.
                        : Avoid prolonged or repeated contact with skin.
                        : Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment
                        : Take care to prevent spills, waste and minimize release to the environment.
Conditions for safe storage : Keep in properly labelled 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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components 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>fenbendazole</td>
<td>43210-67-9</td>
<td>TWA</td>
<td>100 µg/m³ (OEB 2)</td>
<td>Internal</td>
</tr>
<tr>
<td>Glycerine</td>
<td>56-81-5</td>
<td>PEL (long term) (Mist)</td>
<td>10 mg/m³</td>
<td>SG OEL</td>
</tr>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
<td>PEL (long term)</td>
<td>1,000 ppm, 1,880 mg/m³</td>
<td>SG OEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>1,000 ppm</td>
<td>ACGIH</td>
</tr>
<tr>
<td>2-Furaldehyde</td>
<td>98-01-1</td>
<td>PEL (long term)</td>
<td>2 ppm, 7.9 mg/m³</td>
<td>SG OEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>0.2 ppm</td>
<td>ACGIH</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
<td>PEL (short term)</td>
<td>25 ppm, 45 mg/m³</td>
<td>SG OEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>25 ppm</td>
<td>ACGIH</td>
</tr>
</tbody>
</table>

Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Control parameters</th>
<th>Biological specimen</th>
<th>Sampling time</th>
<th>Permissible concentration</th>
<th>Basis</th>
</tr>
</thead>
</table>

4 / 28
SAFETY DATA SHEET

Fenbendazole Paste Formulation


<table>
<thead>
<tr>
<th>2-Furaldehyde</th>
<th>98-01-1</th>
<th>Furoic acid</th>
<th>Urine</th>
<th>End of shift (As soon as possible after exposure ceases)</th>
<th>200 mg/l</th>
<th>ACGIH BEI</th>
</tr>
</thead>
</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.
- Laboratory operations do not require special containment.

**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: Combined particulates and organic vapour type

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

**Eye protection**
- 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**
- Work uniform or laboratory coat.

**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.

9. PHYSICAL AND CHEMICAL PROPERTIES

- **Appearance**: paste
- **Colour**: white to off-white
- **Odour**: cinnamon-like
- **Odour Threshold**: No data available
- **pH**: 6 - 8
- **Melting point/freezing point**: No data available
### 10. STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactivity</td>
<td>Not classified as a reactivity hazard.</td>
</tr>
<tr>
<td>Chemical stability</td>
<td>Stable under normal conditions.</td>
</tr>
<tr>
<td>Possibility of hazardous reactions</td>
<td>Can react with strong oxidizing agents.</td>
</tr>
<tr>
<td>Conditions to avoid</td>
<td>None known.</td>
</tr>
<tr>
<td>Incompatible materials</td>
<td>Oxidizing agents</td>
</tr>
</tbody>
</table>

- **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
- **Vapour pressure**: No data available
- **Relative vapour density**: No data available
- **Relative density**: No data available
- **Density**: No data available
- **Solubility(ies)**
  - **Water solubility**: insoluble
- **Partition coefficient: n-octanol/water**: Not applicable
- **Auto-ignition 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**: No data available
Hazardous decomposition products: No hazardous decomposition products are known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:
- Inhalation
- Skin contact
- Ingestion
- Eye contact

Acute toxicity
Not classified based on available information.

Components:

fenbendazole:
Acute oral toxicity: LD50 (Rat): > 10,000 mg/kg
LD50 (Mouse): > 10,000 mg/kg

Glycerine:
Acute oral toxicity: LD50 (Rat): > 5,000 mg/kg
Acute dermal toxicity: LD50 (Guinea pig): > 5,000 mg/kg

Ethanol:
Acute oral toxicity: LD50 (Rat): > 5,000 mg/kg
Method: OECD Test Guideline 401

Acute inhalation toxicity: LC50 (Rat): 124.7 mg/l
Exposure time: 4 h
Test atmosphere: vapour

Diethyl malonate:
Acute oral toxicity: LD50 (Rat): > 5,000 mg/kg
Acute dermal toxicity: LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 402
Remarks: Based on data from similar materials

2-Furaldehyde:
Acute oral toxicity: LD50 (Rat): 108 mg/kg
Method: OECD Test Guideline 401

Acute inhalation toxicity: LC50 (Rat): 1 mg/l
Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity: LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 402
Assessment: The substance or mixture has no acute dermal toxicity
SAFETY DATA SHEET

Fenbendazole Paste Formulation

Cinnamaldehyde:
Acute oral toxicity : LD50 (Rat): 2,200 mg/kg
Acute dermal toxicity : LD50 (Rabbit): 1,260 mg/kg

Isovaleraldehyde:
Acute oral toxicity : LD50 (Rat): 5,740 mg/kg
Acute inhalation toxicity : LC50 (Rat): 42.7 mg/l

Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 (Rabbit): 2,534 mg/kg

Acetaldehyde:
Acute oral toxicity : LD50 (Rat): 661 mg/kg
Acute dermal toxicity : LD50 (Rabbit): 3,540 mg/kg

Trans-hex-2-en-1-ol:
Acute oral toxicity : LD50 (Rat): 3,500 mg/kg
Acute inhalation toxicity : Assessment: Corrosive to the respiratory tract.
Acute dermal toxicity : LD50 (Rabbit): 4,500 mg/kg

Skin corrosion/irritation
Not classified based on available information.

Components:

fenbendazole:
Species : Rabbit
Result : No skin irritation

Glycerine:
Species : Rabbit
Result : No skin irritation

Ethanol:
Species : Rabbit
Method : OECD Test Guideline 404
Result : No skin irritation

Diethyl malonate:
Species : Rabbit
Result : No skin irritation

2-Furaldehyde:
Species: Rabbit
Method: OECD Test Guideline 404
Result: Mild skin irritation

Cinnamaldehyde:
Species: human skin
Result: Skin irritation

Isovaleraldehyde:
Species: Rabbit
Method: OECD Test Guideline 404
Result: Mild skin irritation

Acetaldehyde:
Species: Rabbit
Method: OECD Test Guideline 404
Result: No skin irritation

Trans-hex-2-en-1-ol:
Species: reconstructed human epidermis (RhE)
Method: OECD Test Guideline 431
Result: Corrosive after 3 minutes to 1 hour of exposure

Serious eye damage/eye irritation
Not classified based on available information.

Components:
fenbendazole:
Species: Rabbit
Result: No eye irritation

Glycerine:
Species: Rabbit
Result: No eye irritation

Ethanol:
Species: Rabbit
Result: Irritation to eyes, reversing within 21 days
Method: OECD Test Guideline 405

Diethyl malonate:
Species: Rabbit
Result: Irritation to eyes, reversing within 21 days

2-Furaldehyde:
Species: Rabbit
Result: Irritation to eyes, reversing within 21 days
## Method

**OECD Test Guideline 405**

### Cinnamaldehyde:
- **Species**: Rabbit
- **Result**: Irritation to eyes, reversing within 21 days

### Isovaleraldehyde:
- **Species**: Rabbit
- **Result**: Irritation to eyes, reversing within 21 days

### Acetaldehyde:
- **Species**: Rabbit
- **Result**: Irritation to eyes, reversing within 21 days

### Trans-hex-2-en-1-ol:
- **Result**: Irreversible effects on the eye
- **Remarks**: Based on skin corrosivity.

### Respiratory or skin sensitisation

#### Skin sensitisation
Not classified based on available information.

#### Respiratory sensitisation
Not classified based on available information.

### Components:

#### Ethanol:
- **Test Type**: Local lymph node assay (LLNA)
- **Exposure routes**: Skin contact
- **Species**: Mouse
- **Result**: negative

#### Diethyl malonate:
- **Test Type**: Buehler Test
- **Exposure routes**: Skin contact
- **Species**: Guinea pig
- **Method**: OECD Test Guideline 406
- **Result**: negative
- **Remarks**: Based on data from similar materials

#### 2-Furaldehyde:
- **Test Type**: Maximisation Test
- **Exposure routes**: Skin contact
- **Species**: Guinea pig
- **Method**: OECD Test Guideline 406
- **Result**: negative
Cinnamaldehyde:
- Test Type: Local lymph node assay (LLNA)
- Exposure routes: Skin contact
- Species: Mouse
- Result: positive
- Assessment: Probability or evidence of low to moderate skin sensitisation rate in humans

Isovaleraldehyde:
- Test Type: Maximisation Test
- Exposure routes: Skin contact
- Species: Guinea pig
- Method: OECD Test Guideline 406
- Result: positive
- Remarks: Based on data from similar materials
- Assessment: Probability or evidence of low to moderate skin sensitisation rate in humans

Acetaldehyde:
- Test Type: Maximisation Test
- Exposure routes: Skin contact
- Species: Guinea pig
- Method: OECD Test Guideline 406
- Result: negative

Trans-hex-2-en-1-ol:
- Test Type: Local lymph node assay (LLNA)
- Exposure routes: Skin contact
- Species: Mouse
- Method: OECD Test Guideline 429
- Result: negative
- Remarks: Based on data from similar materials

Germ cell mutagenicity
Not classified based on available information.

Components:
fenbendazole:
- Genotoxicity in vitro
  - Test Type: Bacterial reverse mutation assay (AMES)
    - Result: negative
  - Test Type: DNA Repair
    - Result: negative
  - Test Type: Chromosomal aberration
    - Result: negative
  - Test Type: in vitro assay
    - Test system: mouse lymphoma cells
Metabolic activation: Metabolic activation
Result: equivocal

Glycerine:
Genotoxicity in vitro
: Test Type: In vitro mammalian cell gene mutation test
   Result: negative

   Test Type: Bacterial reverse mutation assay (AMES)
   Result: negative

   Test Type: Chromosome aberration test in vitro
   Result: negative

   Test Type: DNA damage and repair, unscheduled DNA synthesis in mammalian cells (in vitro)
   Result: negative

Ethanol:
Genotoxicity in vitro
: Test Type: In vitro mammalian cell gene mutation test
   Result: negative

   Test Type: Bacterial reverse mutation assay (AMES)
   Result: negative

   Test Type: Rodent dominant lethal test (germ cell) (in vivo)
   Species: Mouse
   Application Route: Ingestion
   Result: equivocal

Diethyl malonate:
Genotoxicity in vitro
: Test Type: Bacterial reverse mutation assay (AMES)
   Result: negative

   Test Type: Chromosome aberration test in vitro
   Method: OECD Test Guideline 473
   Result: negative
   Remarks: Based on data from similar materials

2-Furaldehyde:
Genotoxicity in vitro
: Test Type: Bacterial reverse mutation assay (AMES)
   Method: OECD Test Guideline 471
   Result: negative

   Test Type: In vitro mammalian cell gene mutation test
   Result: positive

   Test Type: Chromosome aberration test in vitro
   Method: OECD Test Guideline 473
   Result: positive

   Test Type: DNA damage and repair, unscheduled DNA syn-
SAFETY DATA SHEET
Fenbendazole Paste Formulation

Genotoxicity in vivo:
- Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo
  - Species: Rat
  - Application Route: Ingestion
  - Result: negative

- Test Type: Transgenic rodent somatic cell gene mutation assay
  - Species: Mouse
  - Application Route: Ingestion
  - Result: negative

Cinnamaldehyde:
- Genotoxicity in vitro:
  - Test Type: Bacterial reverse mutation assay (AMES)
    - Result: negative

  - Test Type: In vitro mammalian cell gene mutation test
    - Result: negative

  - Test Type: Chromosome aberration test in vitro
    - Result: negative

- Genotoxicity in vivo:
  - Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
    - Species: Mouse
    - Application Route: Ingestion
    - Result: negative
    - Remarks: Based on data from similar materials

  - Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
    - Species: Mouse
    - Application Route: Intraperitoneal injection
    - Result: negative

  - Test Type: Mutagenicity (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)
    - Species: Mouse
    - Application Route: Ingestion
    - Result: negative

  - Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo
    - Species: Rat
    - Application Route: Ingestion
    - Result: negative
Isovaleraldehyde:
Genotoxicity in vitro: Test Type: Bacterial reverse mutation assay (AMES)
Method: OECD Test Guideline 471
Result: negative
Remarks: Based on data from similar materials

Test Type: DNA damage and repair, unscheduled DNA synthesis in mammalian cells (in vitro)
Result: positive
Remarks: Based on data from similar materials

Genotoxicity in vivo:
Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Mouse
Application Route: Intraperitoneal injection
Method: OECD Test Guideline 474
Result: negative

Acetaldehyde:
Genotoxicity in vitro: Test Type: Bacterial reverse mutation assay (AMES)
Result: negative

Test Type: In vitro mammalian cell gene mutation test
Result: positive

Test Type: Chromosome aberration test in vitro
Result: positive

Test Type: in vitro micronucleus test
Result: positive

Test Type: In vitro sister chromatid exchange assay in mammalian cells
Result: positive

Test Type: DNA damage and repair, unscheduled DNA synthesis in mammalian cells (in vitro)
Result: positive

Genotoxicity in vivo:
Test Type: In vivo micronucleus test
Species: Rat
Application Route: Intraperitoneal injection
Result: positive

Test Type: Mammalian bone marrow sister chromatid exchange
Species: Mouse
Application Route: Intraperitoneal injection
Result: positive

Germ cell mutagenicity - Assessment: Positive result(s) from in vivo mammalian somatic cell mutagenicity tests.

Trans-hex-2-en-1-ol:
Genotoxicity in vitro: Test Type: Bacterial reverse mutation assay (AMES)
   Method: OECD Test Guideline 471
   Result: negative

   Test Type: in vitro micronucleus test
   Method: OECD Test Guideline 487
   Result: negative

Genotoxicity in vivo: Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
   Species: Mouse
   Application Route: Intraperitoneal injection
   Method: OECD Test Guideline 474
   Result: negative
   Remarks: Based on data from similar materials

Carcinogenicity
Not classified based on available information.

Components:

fenbendazole:
   Species: Mouse
   Application Route: oral (feed)
   Exposure time: 2 Years
   NOAEL: 405 mg/kg body weight
   Result: negative

   Species: Rat
   Application Route: Oral
   Exposure time: 2 Years
   NOAEL: 5 mg/kg body weight
   Result: negative
   Target Organs: Lymph nodes, Liver

Glycerine:
   Species: Rat
   Application Route: Ingestion
   Exposure time: 2 Years
   Result: negative

2-Furaldehyde:
   Species: Mouse
   Application Route: Ingestion
   Exposure time: 103 weeks
   Method: OECD Test Guideline 451
   Result: positive
   Remarks: The mechanism or mode of action is not relevant in humans.

   Species: Hamster
   Application Route: inhalation (vapour)
   Exposure time: 52 weeks
   Result: negative
Species: Mouse
Application Route: Skin contact
Exposure time: 47 weeks
Result: positive

Carcinogenicity - Assessment: Limited evidence of carcinogenicity in animal studies

Cinnamaldehyde:
Species: Rat
Application Route: Ingestion
Exposure time: 106 weeks
Result: negative
Remarks: Based on data from similar materials

Species: Mouse
Application Route: Intraperitoneal injection
Exposure time: 24 weeks
Result: negative

Isovaleraldehyde:
Species: Rat
Application Route: inhalation (vapour)
Exposure time: 2 Years
Result: negative
Remarks: Based on data from similar materials

Acetaldehyde:
Species: Rat
Application Route: Inhalation
Exposure time: 121 weeks
Result: positive

Carcinogenicity - Assessment: Sufficient evidence of carcinogenicity in animal experiments

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

Components:

fenbendazole:
Effects on fertility: Test Type: Three-generation reproduction toxicity study
Species: Rat
Application Route: oral (feed)
General Toxicity - Parent: NOAEL: 15 mg/kg body weight
Fertility: LOAEL: 45 mg/kg body weight
Result: Effects on fertility

Effects on foetal development: Test Type: Development
Species: Dog, female
Application Route: Oral
Developmental Toxicity: LOAEL: 100 mg/kg body weight
Result: Embryotoxic effects and adverse effects on the offspring were detected. No teratogenic effects

Test Type: Embryo-foetal development
Species: Rabbit
Application Route: Oral
Developmental Toxicity: NOAEL: 25 mg/kg body weight
Result: Fetotoxicity

Test Type: Embryo-foetal development
Species: Rabbit
Application Route: Oral
Developmental Toxicity: LOAEL: 63 mg/kg body weight

Test Type: Embryo-foetal development
Species: Rat
Application Route: Oral
Developmental Toxicity: NOAEL: 120 mg/kg body weight
Result: No effects on foetal development

Reproductive toxicity - Assessment: Some evidence of adverse effects on sexual function and fertility, based on animal experiments. Some evidence of adverse effects on development, based on animal experiments.

Glycerine:
Effects on fertility: Test Type: Two-generation reproduction toxicity study
Species: Rat
Application Route: Ingestion
Result: negative

Effects on foetal development: Test Type: Embryo-foetal development
Species: Rat
Application Route: Ingestion
Result: negative

Ethanol:
Effects on fertility: Test Type: Two-generation reproduction toxicity study
Species: Mouse
Application Route: Ingestion
Result: negative

Diethyl malonate:
Effects on fertility: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: Ingestion
Method: OECD Test Guideline 422
Result: negative
Remarks: Based on data from similar materials

Effects on foetal development: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
### SAFETY DATA SHEET

**Fenbendazole Paste 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>

Species: Rat  
Application Route: Ingestion  
Method: OECD Test Guideline 422  
Result: negative  
Remarks: Based on data from similar materials

#### 2-Furaldehyde:
- **Effects on foetal development**: Test Type: Embryo-foetal development  
  Species: Rat  
  Application Route: Ingestion  
  Result: negative  
  Remarks: Based on data from similar materials

#### Cinnamaldehyde:
- **Effects on foetal development**: Test Type: Embryo-foetal development  
  Species: Mouse  
  Application Route: Ingestion  
  Result: negative

#### Acetaldehyde:
- **Effects on foetal development**: Test Type: Embryo-foetal development  
  Species: Rat  
  Application Route: Ingestion  
  Result: negative

#### Trans-hex-2-en-1-ol:
- **Effects on fertility**: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
  Species: Rat  
  Application Route: Ingestion  
  Method: OECD Test Guideline 422  
  Result: negative  
  Remarks: Based on data from similar materials  
  **Effects on foetal development**: Test Type: Embryo-foetal development  
  Species: Rat  
  Application Route: Ingestion  
  Method: OECD Test Guideline 414  
  Result: negative  
  Remarks: Based on data from similar materials

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

### Components:

#### 2-Furaldehyde:
- **Assessment**: May cause respiratory irritation.

#### Isovaleraldehyde:
- **Assessment**: May cause respiratory irritation.
Acetaldehyde:
Assessment : May cause respiratory irritation.

STOT - repeated exposure
May cause damage to organs (Liver, Lymph nodes, Stomach, Nervous system) through pro-
longed or repeated exposure if swallowed.

Components:

fenbendazole:
Exposure routes : Ingestion
Target Organs : Liver, Lymph nodes, Stomach, Nervous system
Assessment : May cause damage to organs through prolonged or repeated
exposure.

2-Furaldehyde:
Assessment : No significant health effects observed in animals at concentra-
tions of 100 mg/kg bw or less.

Repeated dose toxicity

Components:

fenbendazole:
Species : Rat
LOAEL : 500 mg/kg
Application Route : Oral
Exposure time : 2 Weeks
Target Organs : Kidney, Liver

Species : Rat
NOAEL : > 2,500 mg/kg
Application Route : Oral
Exposure time : 30 Days
Remarks : No significant adverse effects were reported

Species : Rat
LOAEL : 1,600 mg/kg
Application Route : Oral
Exposure time : 90 Days
Target Organs : Central nervous system
Symptoms : Tremors

Species : Dog
NOAEL : 4 mg/kg
LOAEL : 8 mg/kg
Exposure time : 6 Months
Target Organs : Stomach, Lymph nodes, Nervous system

Glycerine:
Species : Rat
NOAEL : 0.167 mg/l
LOAEL : 0.622 mg/l
## Application Routes and Exposure Times

### Inhalation (dust/mist/fume)
- **Species**: Rat
- **NOAEL**: 8,000 - 10,000 mg/kg
- **Exposure time**: 13 Weeks

### Ingestion
- **Species**: Rat
- **NOAEL**: 5,040 mg/kg
- **Exposure time**: 2 yr

### Skin contact
- **Species**: Rabbit
- **NOAEL**: 5,040 mg/kg
- **Exposure time**: 45 Weeks

### Ethanol
- **Species**: Rat
- **NOAEL**: 1,280 mg/kg
- **LOAEL**: 3,156 mg/kg
- **Exposure time**: 90 Days

### 2-Furaldehyde
- **Species**: Rat
- **NOAEL**: 53 mg/kg
- **Exposure time**: 13 Weeks

### Cinnamaldehyde
- **Species**: Rat
- **NOAEL**: 200 mg/kg
- **Exposure time**: 12 Weeks

### Acetaldehyde
- **Species**: Rat
- **NOAEL**: 125 mg/kg
- **LOAEL**: 675 mg/kg
- **Exposure time**: 28 Days
- **Species**: Rat
- **NOAEL**: 0.3 mg/kg
- **LOAEL**: 1 mg/kg
- **Application Route**: Inhalation (vapour)
- **Exposure time**: 13 Weeks

### Trans-hex-2-en-1-ol
- **Species**: Rat
- **NOAEL**: > 100 mg/kg
- **Application Route**: Ingestion
Exposure time: 98 Days
Remarks: Based on data from similar materials

Aspiration toxicity
Not classified based on available information.

Components:
fenbendazole:
No aspiration toxicity classification

Experience with human exposure

Components:
fenbendazole:
Ingestion: Symptoms: Rapid respiration, Salivation, anorexia, Diarrhoea

12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:
fenbendazole:
Toxicity to fish: LC50 (Oncorhynchus mykiss (rainbow trout)): > 7.5 mg/l
Exposure time: 96 h
Remarks: No toxicity at the limit of solubility

Toxicity to daphnia and other aquatic invertebrates: EC50 (Daphnia magna (Water flea)): 0.008 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

M-Factor (Acute aquatic toxicity): 100
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity): NOEC (Daphnia magna (Water flea)): 0.0015 mg/l
Exposure time: 21 Days
Method: OECD Test Guideline 211

M-Factor (Chronic aquatic toxicity): 10

Glycerine:
Toxicity to fish: LC50 (Oncorhynchus mykiss (rainbow trout)): 54,000 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates: EC50 (Daphnia magna (Water flea)): 1,955 mg/l
Exposure time: 48 h

Toxicity to microorganisms: NOEC (Pseudomonas putida): > 10,000 mg/l
Exposure time: 16 h
Method: DIN 38 412 Part 8

Ethanol:
Toxicity to fish: LC50 (Pimephales promelas (fathead minnow)): > 1,000 mg/l  
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates: EC50 (Ceriodaphnia (water flea)): > 1,000 mg/l  
Exposure time: 48 h

Toxicity to algae/aquatic plants: ErC50 (Chlorella vulgaris (Fresh water algae)): 275 mg/l  
Exposure time: 72 h

EC10 (Chlorella vulgaris (Fresh water algae)): 11.5 mg/l  
Exposure time: 72 h

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity): NOEC (Daphnia magna (Water flea)): 9.6 mg/l  
Exposure time: 9 d

Toxicity to algae/aquatic plants: NOEC (Microcystis aeruginosa (blue-green algae)): 2.7 mg/l  
Exposure time: 8 d

Toxicity to microorganisms: EC50 (Pseudomonas putida): 6,500 mg/l  
Exposure time: 16 h

**Diethyl malonate:**

Toxicity to fish: LC50 (Pimephales promelas (fathead minnow)): 12 - 17 mg/l  
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates: EC50 (Daphnia magna (Water flea)): 179 mg/l  
Exposure time: 48 h  

Toxicity to algae/aquatic plants: ErC50 (Desmodesmus subspicatus (green algae)): > 800 mg/l  
Exposure time: 72 h

EC10 (Desmodesmus subspicatus (green algae)): 115 mg/l  
Exposure time: 72 h

Toxicity to microorganisms: EC50 (Pseudomonas putida): 3,097 mg/l  
Exposure time: 16 h  
Method: DIN 38 412 Part 8

**2-Furaldehyde:**

Toxicity to fish: EC50 (Leuciscus idus (Golden orfe)): 29 mg/l  
Exposure time: 48 h

Toxicity to daphnia and other aquatic invertebrates: EC50 (Daphnia magna (Water flea)): 29 mg/l  
Exposure time: 24 h

Toxicity to algae/aquatic plants: NOEC (Microcystis aeruginosa (blue-green algae)): 2.7 mg/l  
Exposure time: 8 d

Toxicity to fish (Chronic toxicity): NOEC (Danio rerio (zebra fish)): 0.33 mg/l  
Exposure time: 12 d

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity): NOEC (Daphnia magna (Water flea)): 1.9 mg/l  
Exposure time: 21 d  
Method: OECD Test Guideline 211

Toxicity to microorganisms: EC50: 760 mg/l
Cinnamaldehyde:
Toxicity to fish : LC50 (Danio rerio (zebra fish)): 4.15 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 3.21 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : ErC50 (Chlorella vulgaris (Fresh water algae)): 16.09 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201

Toxicity to microorganisms : EC50: 71 mg/l
Exposure time: 3 h
Method: ISO 8192

Isovaleraldehyde:
Toxicity to fish : LC50 (Pimephales promelas (fathead minnow)): 3.25 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 177 mg/l
Exposure time: 48 h

Toxicity to algae/aquatic plants : ErC50 (Desmodesmus subspicatus (green algae)): 137.37 mg/l
Exposure time: 96 h
EC10 (Desmodesmus subspicatus (green algae)): 101.83 mg/l
Exposure time: 96 h

Toxicity to microorganisms : EC10 (Pseudomonas putida): 310 mg/l
Exposure time: 17 h
Method: DIN 38 412 Part 8

Acetaldehyde:
Toxicity to fish : LC50 (Pimephales promelas (fathead minnow)): 30.8 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 57.4 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201
EC10 (Pseudokirchneriella subcapitata (green algae)): > 100
mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201

**Trans-hex-2-en-1-ol:**

**Toxicity to fish:**
- LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l
- Exposure time: 96 h
- Method: OECD Test Guideline 203
- Remarks: Based on data from similar materials

**Toxicity to daphnia and other aquatic invertebrates:**
- EC50 (Daphnia magna (Water flea)): 163 mg/l
- Exposure time: 48 h
- Method: OECD Test Guideline 202

**Toxicity to algae/aquatic plants:**
- ErC50 (Pseudokirchneriella subcapitata (green algae)): 226 mg/l
- Exposure time: 72 h
- Method: OECD Test Guideline 201

**Persistence and degradability**

**Components:**

**Glycerine:**

Biodegradability: Result: Readily biodegradable.
- Biodegradation: 92 %
- Exposure time: 30 d
- Method: OECD Test Guideline 301D

**Ethanol:**

Biodegradability: Result: Readily biodegradable.
- Biodegradation: 84 %
- Exposure time: 20 d

**Diethyl malonate:**

Biodegradability: Result: Readily biodegradable.
- Biodegradation: 99 %
- Exposure time: 28 d

**2-Furaldehyde:**

Biodegradability: Result: Readily biodegradable.
- Biodegradation: 93.5 %
- Exposure time: 14 d

**Cinnamaldehyde:**

Biodegradability: Result: Readily biodegradable.
- Biodegradation: 100 %
- Exposure time: 28 d
- Method: OECD Test Guideline 301B
## Isovaleraldehyde:
Biodegradability: Result: Not readily biodegradable.  
Biodegradation: 49.5%  
Exposure time: 28 d  
Method: OECD Test Guideline 301D

## Acetaldehyde:
Biodegradability: Result: Readily biodegradable.  
Biodegradation: 80%  
Exposure time: 14 d  
Method: OECD Test Guideline 301C

## Trans-hex-2-en-1-ol:
Biodegradability: Result: Readily biodegradable.  
Remarks: Based on data from similar materials

## Bioaccumulative potential

### Components:

**fenbendazole:**  
Bioaccumulation: Species: *Lepomis macrochirus* (Bluegill sunfish)  
Bioconcentration factor (BCF): 240

Partition coefficient: n-octanol/water: log Pow: 2.3

**Glycerine:**  
Partition coefficient: n-octanol/water: log Pow: -1.75

**Ethanol:**  
Partition coefficient: n-octanol/water: log Pow: -0.35

**Diethyl malonate:**  
Partition coefficient: n-octanol/water: log Pow: 0.96

**2-Furaldehyde:**  
Partition coefficient: n-octanol/water: log Pow: 0.83  
Remarks: Calculation

**Cinnamaldehyde:**  
Partition coefficient: n-octanol/water: log Pow: 2.107

**Isovaleraldehyde:**  
Partition coefficient: n-octanol/water: log Pow: 1.5

**Acetaldehyde:**  
Partition coefficient: n-octanol/water: log Pow: 0.45
Trans-hex-2-en-1-ol:
Partition coefficient: n-octanol/water: log Pow: 1.61
Remarks: Calculation

Mobility in soil

Components:

fenbendazole:
Distribution among environmental compartments: log Koc: 4.37

Other adverse effects
No data available

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.

14. TRANSPORT INFORMATION

International Regulations

UNRTDG
UN number: UN 3082
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (fenbendazole)
Class: 9
Packing group: III
Labels: 9

IATA-DGR
UN/ID No.: UN 3082
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (fenbendazole)
Class: 9
Packing group: III
Labels: Miscellaneous
Packing instruction (cargo aircraft): 964
Packing instruction (passenger aircraft): 964
Environmentally hazardous: yes

IMDG-Code
UN number: UN 3082
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (fenbendazole)
Class: 9
Packing group : III
Labels : 9
EmS Code : F-A, S-F
Marine pollutant : yes

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

**Special precautions for user**
The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

15. **REGULATORY INFORMATION**

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

**Workplace Safety and Health Act and Workplace Safety and Health (General Provisions) Regulations:** This product is subjected to the SDS, labelling, PEL and other requirements in the Act/Regulations.

Environmental Protection and Management Act and Environmental Protection and Management (Hazardous Substances) Regulations : Not applicable

Fire Safety (Petroleum and Flammable Materials) Regulations : Not applicable

**The components of this product are reported in the following inventories:**

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<tr>
<th>Inventory</th>
<th>Status</th>
</tr>
</thead>
<tbody>
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<tr>
<td>DSL</td>
<td>not determined</td>
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<tr>
<td>IECSC</td>
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16. **OTHER INFORMATION**

**Further information**

Date format : dd.mm.yyyy

**Full text of other abbreviations**

ACGIH : USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI : ACGIH - Biological Exposure Indices (BEI)
SG OEL : Singapore. Workplace Safety and Health Act - First Schedule Permissible Exposure Limits of Toxic Substances
SAFETY DATA SHEET
Fenbendazole Paste Formulation

Version 4.1
Revision Date: 09.04.2021
SDS Number: 887509-00014
Date of last issue: 18.12.2020
Date of first issue: 16.09.2016

ACGIH / TWA : 8-hour, time-weighted average
ACGIH / STEL : Short-term exposure limit
ACGIH / C : Ceiling limit
SG OEL / PEL (long term) : Permissible Exposure Level (PEL) Long Term
SG OEL / PEL (short term) : Permissible Exposure Level (PEL) Short Term

AllIC - 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 Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user’s end product, if applicable.

SG / EN