SAFETY DATA SHEET

Fenbendazole Paste Formulation

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Fenbendazole Paste Formulation

Manufacturer or supplier’s details
Company : MSD
Address : Rua Coronel Bento Soares, 530
          Cruzeiro - Sao Paulo - Brazil  CEP 12730-340
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 in accordance with ABNT NBR 14725 Standard
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 in accordance with ABNT NBR 14725 Standard
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.
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.

Other hazards which do not result in classification
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>Classification</th>
<th>Concentration (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fenbendazole</td>
<td>43210-67-9</td>
<td>Reproductive toxicity, Category 2     Specific target organ toxicity - repeated exposure (Oral) (Liver, Lymph nodes, Stomach, Nervous system), Category 2 Short-term (acute) aquatic hazard, Category 2 Long-term (chronic) aquatic hazard, Category 1</td>
<td>&gt;= 10 - &lt;= 18,75</td>
</tr>
<tr>
<td></td>
<td>Ethanol#</td>
<td>64-17-5</td>
<td>Flammable liquids, Category 2 Eye irritation, Category 2A</td>
<td>&lt;= 0,04</td>
</tr>
<tr>
<td></td>
<td>Diethyl malonate#</td>
<td>105-53-3</td>
<td>Flammable liquids, Category 4 Eye irritation, Category 2A Short-term (acute) aquatic hazard, Category 3</td>
<td>&lt;= 0,006</td>
</tr>
<tr>
<td></td>
<td>2-Furaldehyde#</td>
<td>98-01-1</td>
<td>Flammable liquids, Category 3 Acute toxicity (Oral), Category 3 Acute toxicity (Inhalation), Category 2</td>
<td>&lt;= 0,006</td>
</tr>
</tbody>
</table>
### Safety Data Sheet

**Fenbendazole Paste Formulation**

<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS Number</th>
<th>Classification</th>
<th>Limit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinnamaldehyde#</td>
<td>104-55-2</td>
<td>Acute toxicity (Oral), Category 5</td>
<td>&lt;= 0.002</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Acute toxicity (Dermal), Category 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin irritation, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eye irritation, Category 2A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carcinogenicity, Category 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specific target organ toxicity - single exposure, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-term (acute) aquatic hazard, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long-term (chronic) aquatic hazard, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isovaleraldehyde#</td>
<td>590-86-3</td>
<td>Flammable liquids, Category 2</td>
<td>&lt;= 0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute toxicity (Dermal), Category 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin irritation, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eye irritation, Category 2A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin sensitization, Sub-category 1B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specific target organ toxicity - single exposure, Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-term (acute) aquatic hazard, Category 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetaldehyde#</td>
<td>75-07-0</td>
<td>Flammable liquids, Category 1</td>
<td>&lt;= 0.0002</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute toxicity (Oral), Category 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute toxicity (Dermal), Category 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- SDS Number: 887494-00016
- Date of last issue: 09.04.2021
- Date of first issue: 16.09.2016

**Contact Information:**
- MSD Public Information Center
- Email: publicinfo@msd.com
- Phone: +1-800-332-1111
- Website: www.msd.com/publicinfo
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 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. Get medical attention if irritation develops and persists.

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).
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

**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 breathe vapors.
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.

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>fenbendazole</td>
<td>43210-67-9</td>
<td>TWA</td>
<td>100 µg/m³ (OEB 2)</td>
<td>Internal</td>
</tr>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
<td>LT</td>
<td>780 ppm 1.480 mg/m³</td>
<td>BR OEL</td>
</tr>
</tbody>
</table>

Further information: Degree of harmfulness: minimum

<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>2-Furaldehyde</td>
<td>98-01-1</td>
<td>TWA</td>
<td>0.2 ppm</td>
<td>ACGIH</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
<td>LT</td>
<td>78 ppm 140 mg/m³</td>
<td>BR OEL</td>
</tr>
</tbody>
</table>

Further information: Degree of harmfulness: maximum

<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>2-Furaldehyde</td>
<td>98-01-1</td>
<td>furoic acid</td>
<td>Urine End of workday 200 mg/l</td>
<td>BR BEI</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>
<tbody>
<tr>
<td>2-Furaldehyde</td>
<td>98-01-1</td>
<td>furoic acid Urine</td>
<td>End of workday</td>
<td>200 mg/l</td>
<td>BR BEI</td>
<td></td>
</tr>
</tbody>
</table>

| Furoic acid | Urine | End of workday 200 mg/l | ACGIH |
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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>

**Engineering measures**

Use appropriate engineering controls and manufacturing technologies to control airborne concentrations (e.g., drip-less 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 vapor type

**Hand protection**
- 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.

### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- **Appearance**: paste
- **Color**: white to off-white
- **Odor**: cinnamon-like
- **Odor Threshold**: No data available
- **pH**: 6 - 8
- **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: insoluble
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: No data available

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

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

Ethanol:
Acute oral toxicity: LD50 (Rat): > 5.000 mg/kg
Method: OECD Test Guideline 401

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: vapor
Acute dermal toxicity: LD50 (Rat): > 2.000 mg/kg
Method: OECD Test Guideline 402
Assessment: The substance or mixture has no acute dermal toxicity

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: vapor
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

**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:**
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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

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
Method : OECD Test Guideline 405

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 sensitization
Skin sensitization
Not classified based on available information.
Respiratory sensitization
Not classified based on available information.

Components:

Ethanol:
Test Type: Local lymph node assay (LLNA)
Routes of exposure: Skin contact
Species: Mouse
Result: negative

Diethyl malonate:
Test Type: Buehler Test
Routes of exposure: Skin contact
Species: Guinea pig
Method: OECD Test Guideline 406
Result: negative
Remarks: Based on data from similar materials

2-Furaldehyde:
Test Type: Maximization Test
Routes of exposure: Skin contact
Species: Guinea pig
Method: OECD Test Guideline 406
Result: negative

Cinnamaldehyde:
Test Type: Local lymph node assay (LLNA)
Routes of exposure: Skin contact
Species: Mouse
Result: positive
Assessment: Probability or evidence of low to moderate skin sensitization rate in humans

Isovaleraldehyde:
Test Type: Maximization Test
Routes of exposure: 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 sensitization rate in humans

Acetaldehyde:
Test Type: Maximization Test
Routes of exposure: Skin contact
Species: Guinea pig
Method: OECD Test Guideline 406
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Result: negative

Trans-hex-2-en-1-ol:
Test Type: Local lymph node assay (LLNA)
Routes of exposure: 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 test
Test system: mouse lymphoma cells
Metabolic activation: Metabolic activation
Result: equivocal

Ethanol:
Genotoxicity in vitro: Test Type: In vitro mammalian cell gene mutation test
Result: negative
Test Type: Bacterial reverse mutation assay (AMES)
Result: negative
Genotoxicity in vivo:
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 synthesis in mammalian cells (in vitro)
  Result: positive

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

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

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

**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

2-Furaldehyde:
Species: Mouse
Application Route: Ingestion
Exposure time: 103 weeks
Method: OECD Test Guideline 451
## Fenbendazole Paste Formulation

### Carcinogenicity - Assessment

<table>
<thead>
<tr>
<th>Species</th>
<th>Application Route</th>
<th>Exposure time</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamster</td>
<td>Inhalation (vapor)</td>
<td>52 weeks</td>
<td>positive</td>
<td>The mechanism or mode of action is not relevant in humans.</td>
</tr>
<tr>
<td>Mouse</td>
<td>Skin contact</td>
<td>47 weeks</td>
<td>negative</td>
<td></td>
</tr>
</tbody>
</table>

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

**Isovaleraldehyde:**
- **Species:** Rat
- **Application Route:** Inhalation (vapor)
- **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**

<table>
<thead>
<tr>
<th>Species</th>
<th>Application Route</th>
<th>Exposure time</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rat</td>
<td>Oral (feed)</td>
<td>Three-Generation reproduction toxicity study</td>
<td>positive</td>
<td></td>
</tr>
</tbody>
</table>

### 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 fetal 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-fetal development
    - Species: Rabbit
    - Application Route: Oral
    - Developmental Toxicity: NOAEL: 25 mg/kg body weight
    - Result: Fetotoxicity.

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

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

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 fetal development:
  - 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
## 2-Furaldehyde:
**Effects on fetal development**
- **Test Type:** Embryo-fetal development
- **Species:** Rat
- **Application Route:** Ingestion
- **Result:** negative

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

## Acetaldehyde:
**Effects on fetal development**
- **Test Type:** Embryo-fetal 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 fetal development**
- **Test Type:** Embryo-fetal 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 prolonged or repeated exposure if swallowed.

Components:

fenbendazole:
Routes of exposure: 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 concentrations 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

Ethanol:
Species: Rat
NOAEL: 1.280 mg/kg
LOAEL: 3.156 mg/kg
Application Route: Ingestion
Exposure time: 90 Days
### 2-Furaldehyde:
- **Species**: Rat
- **NOAEL**: 53 mg/kg
- **Application Route**: Ingestion
- **Exposure time**: 13 Weeks

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

### Acetaldehyde:
- **Species**: Rat
- **NOAEL**: 125 mg/kg
- **LOAEL**: 675 mg/kg
- **Application Route**: Ingestion
- **Exposure time**: 28 Days
- **Species**: Rat
- **NOAEL**: 0.3 mg/kg
- **LOAEL**: 1 mg/kg
- **Application Route**: Inhalation (vapor)
- **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, Diarrhea
SECTION 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

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):
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
Exposure time: 30 min
Method: OECD Test Guideline 209

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 : ErC50 (Desmodesmus subspicatus (green algae)): 137,37
plants

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:

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:

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

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

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
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.

Domestic regulation

ANTT
UN number: UN 3082
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (fenbendazole)

Class: 9
Packing group: III
Labels: 9
Hazard Identification Number: 90

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.

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture
National List of Carcinogenic Agents for Humans - (LINACH): Not applicable

Brazil. List of chemicals controlled by the Federal Police: Not applicable

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

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

### SECTION 16. OTHER INFORMATION

#### Further information

Sources of key data used to compile the Material Safety Data Sheet:  

#### Full text of other abbreviations

- **ACGIH** : USA. ACGIH Threshold Limit Values (TLV)  
- **ACGIH BEI** : ACGIH - Biological Exposure Indices (BEI)  
- **BR BEI** : Brazil. NR7. Parameters for Biological Control of Occupational Exposure to Some Chemical Agents  
- **BR OEL** : Brazil. NR 15 - Unhealthy activities and operations  
- **ACGIH / TWA** : 8-hour, time-weighted average  
- **ACGIH / STEL** : Short-term exposure limit  
- **ACGIH / C** : Ceiling limit  
- **BR OEL / LT** : Up to 48 hours /week

**AIIC** - 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; **TECI** - Thailand Existing Chemicals Inventory; **TSCA** - Toxic Substances Control Act (United States); **UN** - United Nations; **UNRTDG** - United Nations Recomm
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.