SAFETY DATA SHEET

Fenbendazole Paste Formulation

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
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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

Components

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>fenbendazole</td>
<td>43210-67-9</td>
<td>&gt;= 10 &lt;= 18.75</td>
</tr>
<tr>
<td>Glycerine</td>
<td>56-81-5</td>
<td>10</td>
</tr>
<tr>
<td>Ethanol#</td>
<td>64-17-5</td>
<td>&lt;= 0.04</td>
</tr>
<tr>
<td>Diethyl malonate#</td>
<td>105-53-3</td>
<td>&lt;= 0.006</td>
</tr>
<tr>
<td>2-Furaldehyde#</td>
<td>98-01-1</td>
<td>&lt;= 0.006</td>
</tr>
<tr>
<td>Cinnamaldehyde#</td>
<td>104-55-2</td>
<td>&lt;= 0.002</td>
</tr>
<tr>
<td>Isovaleraldehyde#</td>
<td>590-86-3</td>
<td>&lt;= 0.002</td>
</tr>
<tr>
<td>Acetaldehyde#</td>
<td>75-07-0</td>
<td>&lt;= 0.0002</td>
</tr>
<tr>
<td>Trans-hex-2-en-1-ol#</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.
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 dyking or other appropriate containment to keep material from spreading. If dyked 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>

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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
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

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
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
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:
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<table>
<thead>
<tr>
<th>Species</th>
<th>Method</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cinnamaldehyde</strong></td>
<td><strong>OECD Test Guideline 404</strong></td>
<td>Mild skin irritation</td>
</tr>
<tr>
<td><strong>Isovaleraldehyde</strong></td>
<td><strong>OECD Test Guideline 404</strong></td>
<td>Mild skin irritation</td>
</tr>
<tr>
<td><strong>Acetaldehyde</strong></td>
<td><strong>OECD Test Guideline 404</strong></td>
<td>No skin irritation</td>
</tr>
<tr>
<td><strong>Trans-hex-2-en-1-ol</strong></td>
<td><strong>OECD Test Guideline 431</strong></td>
<td>Corrosive after 3 minutes to 1 hour of exposure</td>
</tr>
<tr>
<td><strong>Serious eye damage/eye irritation</strong></td>
<td></td>
<td>Not classified based on available information.</td>
</tr>
</tbody>
</table>

**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
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Version 4.2 Revision Date: 27.08.2021 SDS Number: 887509-00015 Date of last issue: 09.04.2021

Date of first issue: 16.09.2016

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

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 syn-
<table>
<thead>
<tr>
<th>Test Type</th>
<th>Result</th>
<th>Species</th>
<th>Application Route</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>thesis in mammalian cells (in vitro)</td>
<td>positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In vitro sister chromatid exchange assay in mammalian cells</td>
<td>positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo</td>
<td>negative</td>
<td>Rat</td>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Test Type: Transgenic rodent somatic cell gene mutation assay</td>
<td>negative</td>
<td>Mouse</td>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Genotoxicity in vivo</td>
<td>Test Type: Bacterial reverse mutation assay (AMES)</td>
<td>negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Type: In vitro mammalian cell gene mutation test</td>
<td>negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Type: Chromosome aberration test in vitro</td>
<td>negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genotoxicity in vitro</td>
<td>Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)</td>
<td>negative</td>
<td>Mouse</td>
<td>Based on data from similar materials</td>
</tr>
<tr>
<td>Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)</td>
<td>negative</td>
<td>Mouse</td>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)</td>
<td>negative</td>
<td>Mouse</td>
<td>Intraperitoneal injection</td>
<td></td>
</tr>
<tr>
<td>Cinnamaldehyde</td>
<td>Test Type: Mutagenicity (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)</td>
<td>negative</td>
<td>Mouse</td>
<td></td>
</tr>
<tr>
<td>Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)</td>
<td>negative</td>
<td>Mouse</td>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo</td>
<td>negative</td>
<td>Rat</td>
<td>Ingestion</td>
<td></td>
</tr>
</tbody>
</table>
### 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
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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>

<table>
<thead>
<tr>
<th>Species</th>
<th>Mouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Route</td>
<td>Skin contact</td>
</tr>
<tr>
<td>Exposure time</td>
<td>47 weeks</td>
</tr>
<tr>
<td>Result</td>
<td>positive</td>
</tr>
</tbody>
</table>

**Carcinogenicity - Assessment**
Limited evidence of carcinogenicity in animal studies

**Cinnamaldehyde:**
<table>
<thead>
<tr>
<th>Species</th>
<th>Rat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Route</td>
<td>Ingestion</td>
</tr>
<tr>
<td>Exposure time</td>
<td>106 weeks</td>
</tr>
<tr>
<td>Result</td>
<td>negative</td>
</tr>
<tr>
<td>Remarks</td>
<td>Based on data from similar materials</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Mouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Route</td>
<td>Intraperitoneal injection</td>
</tr>
<tr>
<td>Exposure time</td>
<td>24 weeks</td>
</tr>
<tr>
<td>Result</td>
<td>negative</td>
</tr>
</tbody>
</table>

**Isovaleraldehyde:**
<table>
<thead>
<tr>
<th>Species</th>
<th>Rat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Route</td>
<td>Inhalation (vapour)</td>
</tr>
<tr>
<td>Exposure time</td>
<td>2 Years</td>
</tr>
<tr>
<td>Result</td>
<td>negative</td>
</tr>
<tr>
<td>Remarks</td>
<td>Based on data from similar materials</td>
</tr>
</tbody>
</table>

**Acetaldehyde:**
<table>
<thead>
<tr>
<th>Species</th>
<th>Rat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Route</td>
<td>Inhalation</td>
</tr>
<tr>
<td>Exposure time</td>
<td>121 weeks</td>
</tr>
<tr>
<td>Result</td>
<td>positive</td>
</tr>
</tbody>
</table>

**Carcinogenicity - Assessment**
Sufficient evidence of carcinogenicity in animal experiments

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

**Components:**

**fenbendazole:**
<table>
<thead>
<tr>
<th>Effects on fertility</th>
<th>Test Type: Three-generation reproduction toxicity study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>Rat</td>
</tr>
<tr>
<td>Application Route</td>
<td>oral (feed)</td>
</tr>
<tr>
<td>General Toxicity - Parent: NOAEL</td>
<td>15 mg/kg body weight</td>
</tr>
<tr>
<td>Fertility: LOAEL</td>
<td>45 mg/kg body weight</td>
</tr>
<tr>
<td>Result: Effects on fertility</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effects on foetal development</th>
<th>Test Type: Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>Dog, female</td>
</tr>
<tr>
<td>Application Route</td>
<td>Oral</td>
</tr>
<tr>
<td>Developmental Toxicity: LOAEL</td>
<td>100 mg/kg body weight</td>
</tr>
</tbody>
</table>
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
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

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.
SAFETY DATA SHEET

Fenbendazole Paste Formulation

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 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

Glycerine:
Species : Rat
NOAEL : 0.167 mg/l
LOAEL : 0.622 mg/l
Application Route : inhalation (dust/mist/fume)
Exposure time : 13 Weeks
Species : Rat
NOAEL : 8,000 - 10,000 mg/kg
Application Route : Ingestion
Exposure time : 2 yr
Species : Rabbit
NOAEL : 5,040 mg/kg
Application Route : Skin contact
Exposure time : 45 Weeks

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 (vapour)
Exposure time : 13 Weeks

Trans-hex-2-en-1-ol:
Species : Rat
NOAEL : > 100 mg/kg
Application Route : Ingestion
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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 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
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Version 4.2  Revision Date: 27.08.2021  SDS Number: 887509-00015  Date of last issue: 09.04.2021

Date of first issue: 16.09.2016

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

Fire Safety (Petroleum and Flammable Materials) Regulations

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

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

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)
# SAFETY DATA SHEET

## Fenbendazole Paste Formulation

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

### SDS Number: 887509-00015

**AICGITH / TWA**

- 8-hour, time-weighted average

**AICGITH / STEL**

- Short-term exposure limit

**AICGITH / 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

### Alliances

- AICGTH - 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
- ICS0 - 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
- KEI - 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
- Chnl - 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
- TDS - Safety Data Sheet
- TCS - Taiwan Chemical Substance Inventory
- TECI - Thailand Existing Chemicals Inventory
- TSCA - Toxic Substances Control Act (United States)
- TCSI - Taiwan Chemical Substance Inventory
- 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

### Information

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