

MATERIAL SAFETY DATA SHEET

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

Product identifier: FYFANON ULV

Product use: Active ingredient in insecticides.

Supplier's name and address:

Cheminova Inc.

1700 Route 23, Suite 300

Wayne, NJ, USA

07470

Phone #: (973) 305-6600 (8 AM to 5:00 PM EST, Monday to Friday)

Manufacturer's name and address:

Cheminova A/S.

P.O. Box 9

DK-7620 Lemvig

Denmark

Emergency Telephone #: 1-866-303-6950 (Medical Emergencies)
1-800-424-9300 (24 Hr. Chemtrec Number)

MSDS Prepared by: Cheminova Inc.

MSDS Preparation date: August 19, 2003

Revision date: October 24, 2005

Revision reasons: Refer to Section 16.

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

<u>Ingredients</u>	<u>CAS #</u>	<u>% (weight)</u>	<u>ACGIH TLV (mg/m³)</u>	<u>OSHA PEL (mg/m³)</u>
Malathion	121-75-5	60 - 100	1 (inhalable)	15 (total dust)

This material is classified as hazardous under OSHA regulations (29CFR 1910.1200).

SECTION 3 — HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Colorless to light yellow liquid, slightly aromatic odor.

Warning! Dangerous exothermic decomposition may occur at temperatures greater than 212°F / 100°C.

May be harmful if inhaled or swallowed. May cause eye irritation.

Contains material which can cause nervous system damage. May be dangerous for the environment.

Malathion is toxic to birds, fish, aquatic invertebrates, aquatic life stages of amphibians and highly toxic to bees.

POTENTIAL HEALTH EFFECTS

Target organs: Eyes, skin, respiratory system, digestive system, nervous system.

Signs and symptoms of short-term (acute) exposure:

Inhalation: Fyfanon (Malathion) is a cholinesterase inhibitor of low mammalian toxicity. However storage at too high temperatures may induce formation of the much more toxic and synergistic contaminant isomalathion (LD₅₀, acute oral, rat = 89 mg/kg). Malathion and isomalathion can affect you when breathed in and can cause organophosphorous poisoning. Symptoms of poisoning may include headache, nausea, vomiting, blurred vision, tightness in chest, drooling, frothing of mouth and nose, convulsions, coma and death.

Skin contact: Direct skin contact may cause slight irritation. Malathion and isomalathion can be rapidly absorbed through all skin surfaces. Causes symptoms similar to those listed for inhalation.

Eye contact: Direct eye contact causes irritation. Malathion and isomalathion can be rapidly absorbed through all skin and eye surfaces. Causes symptoms similar to those listed for inhalation.

Ingestion: Malathion and isomalathion are poisons through ingestion. Causes symptoms similar to those listed for inhalation.

Effects of long-term (chronic) exposure: Prolonged or repeated overexposure may cause behavioural changes.

Carcinogenicity: See TOXICOLOGICAL INFORMATION (Section 11).

Other important hazards: Cholinesterase inhibitor. May cause Central Nervous System depression. May cause damage to the peripheral nervous system. See TOXICOLOGICAL INFORMATION (Section 11).

Potential environmental effects: Malathion is toxic to birds, fish, aquatic invertebrates, aquatic life stages of amphibians and highly toxic to bees. See ECOLOGICAL INFORMATION (Section 12).

SECTION 4 — FIRST AID MEASURES

- Inhalation:** Immediately remove victim to fresh air. If breathing has stopped, begin artificial respiration immediately. Transport to a clinic or hospital immediately.
- Skin:** Immediately flush skin with running water for at least 15 minutes, while removing contaminated clothing and shoes. Obtain medical attention immediately. Thoroughly clean contaminated clothing before re-use.
- Eyes:** Immediately flush eyes with running water for at least 15 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Get medical attention immediately.
- Ingestion:** If ingested, have victim rinse mouth, then drink 6 to 8 ounces of water. Induce vomiting immediately only under the direct supervision of qualified medical personnel. Never give anything by mouth if victim is unconscious or convulsing. Transport to a clinic or hospital immediately.
- Note to physician:** Malathion is a cholinesterase inhibitor affecting the central and peripheral nervous systems and producing respiratory and cardiac depression. Decontamination procedures such as whole body washing, gastric lavage and administration of activated charcoal are often required. If symptoms are present, administer atropine sulphate in large doses. Two to four mg intravenously or intramuscularly as soon as possible. Repeat at 5 to 10 minute intervals until signs of atropinization appear and maintain full atropinization until all organophosphorous is metabolised. Obidoxime chloride (Toxogonin), alternatively pralidoxime chloride (2-PAM), is a pharmacological antidote and may be administered as an adjunct to, but not a substitute for atropine, which is a symptomatic and often life-saving antidote. At first sign of pulmonary edema, the patient should be given supplemental oxygen and treated symptomatically. Continued absorption of Malathion may occur and relapse may occur after initial improvement. VERY CLOSE SUPERVISION OF THE PATIENT IS INDICATED FOR AT LEAST 48 HOURS.

SECTION 5 — FIRE FIGHTING MEASURES

- Fire hazards/conditions of flammability:** This product is not considered to be flammable. Material will decompose rapidly when exposed to heat (>212°F / 100°C) and flame, increasing the risk of explosion. Heat of decomposition may cause closed containers to build up pressure and explode.
- Flammability classification (OSHA 29 CFR 1910.1200):** Non-flammable.
- Flash point (Method):** 325°F (163°C) (PMCC).
- Lower flammable limit (% by volume):** Not available.
- Upper flammable limit (% by volume):** Not available.
- Explosion data:**
Sensitivity to mechanical impact: Not sensitive.
Sensitivity to static discharge: Not expected to be sensitive to static discharge.
- Auto-ignition temperature:** 532°F / 278°C
- Suitable extinguishing media:** For small fires, use dry chemical or carbon dioxide. For large fires, use water spray or foam.
- Special fire-fighting procedures/equipment:** Firefighters should wear proper chemically protective equipment and self-contained breathing apparatus operated in positive pressure mode. Move containers from fire area if it can be done without risk. Dike area to prevent water run-off. Water spray may be useful in cooling equipment and containers. Avoid spreading burning material with water jet.
- Hazardous combustion products:** Dimethyl sulfide, carbon oxides, phosphorous oxides, sulfur oxides.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

- Personal precautions:** Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. All persons dealing with clean-up should wear the appropriate chemically protective equipment. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment.
- Environmental precautions:** Ensure spilled product does not enter drains, sewers, waterways, or confined spaces. Dike far ahead of the spill for later recovery or disposal. Washings must be prevented from entering surface water drains. Uncontrolled discharge into water courses must be alerted to the appropriate regulatory body.
- Spill response/Cleanup:** It is recommended to have a predetermined plan for the handling of spills. Eliminate all sources of heat, sparks and flame. Ventilate area of release. Stop leak if you can do so without risk. Contain the spill to prevent any further contamination of surface soil or water. Notify the appropriate authorities. For spills on the floor or other impervious surfaces, absorb spill with inert, non-combustible absorbent material, such as universal binder, hydrated

FYFANON ULV

Page 3 of 6

Revision Date: October 24, 2005

lime, Fuller's earth or other absorbent clays. Scoop up and place contaminated absorbent material into suitable containers for later disposal (see Section 13). Rinse spill area with soda lye. Do not flush to sewer or allow to enter

SECTION 6 — ACCIDENTAL RELEASE MEASURES CONTINUED

confined spaces. Large spills that soak into the ground should be dug up, placed in suitable containers and disposed of appropriately (see Section 13). Spills in water should be contained as much as possible by isolation of the contaminated water. The contaminated water must be collected and removed for treatment or disposal. Uncontrolled discharge into water courses must be alerted to the appropriate regulatory body. The used containers should be properly closed and labelled. Notify the appropriate authorities.

Prohibited materials: None known.

Special spill response procedures: If a spill/release in excess of EPA reportable quantity is made into the environment, immediately notify the national response center (phone: 1-800-424-8002).

EPA/CERCLA Reportable quantity: Malathion (RQ 100 lbs.)

SECTION 7 — HANDLING AND STORAGE

Safe handling procedures: This material is a toxic liquid. Wear full chemically protective equipment during handling. Use only in well ventilated area. Avoid all contact with eyes, skin and clothing. Do not inhale vapors or mists. Keep away from all unprotected persons and children. Do not use near sources of heat, flame or direct sunlight. Malathion should never be heated above 131°F / 55°C and also local heating above this temperature should be avoided. Keep away from alkalis and incompatibles. Use caution when opening containers. Keep container tightly closed when not in use. Wash thoroughly after handling.

Storage recommendations: Store in a cool, dry, well ventilated area away from incompatibles. Store in closed, labelled containers. Product should be stored at temperatures not exceeding 68 to 77°F (20 to 25°C). Protect container from physical damage. No smoking in the area. Inspect containers periodically for damage or leaks.

Special packaging materials: Always keep in containers made of the same materials as the supply container.

SECTION 8 — EXPOSURE CONTROLS AND PERSONAL PROTECTION

Ventilation and engineering controls: If handled indoors, provide mechanical exhaust ventilation to keep concentrations below specified TLV's and PEL's.

Respiratory protection: Respiratory protection is required. Wear a pesticide respirator jointly approved by the MSHA and NIOSH. Advice should be sought from respiratory protection specialists.

Protective gloves: Wear impervious chemical gloves, such as barrier laminate, butyl rubber, nitrile rubber or viton. Advice should be sought from glove suppliers on the proper selection of gloves.

Eye protection: Wear safety glasses with side shields or chemical splash goggles to prevent splashes from entering the eyes.

Other protective equipment: Wear appropriate protective clothing to prevent skin contact, such as coveralls or long sleeved shirt, long pants, and shoes and socks. Other protective equipment, such as an eyewash station and safety shower, may be required depending on exposure and on workplace standards.

Permissible exposure levels: See Section 2.

General hygiene considerations: Do not breathe vapors or mists. Avoid contact all contact with eyes, skin and clothing. Before removing gloves, wash them with soap and water. Always wash hands, face and arms with soap and water before smoking, eating or drinking. After work, take off all protective equipment, work clothes and shoes, and wash with soap and water. Respirator should be cleaned and filter replaced according to manufacturer's instructions. Wear only clean, uncontaminated clothes when leaving place of work. Persons working with this product for a longer period should have frequent blood tests for cholinesterase levels. If the cholinesterase levels fall below a critical point, no further exposure should be allowed until it has been determined, by means of blood tests, that cholinesterase levels have returned to normal.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Physical state, odor and appearance: Colorless to light yellow or light pink liquid, slightly aromatic odor.

Odor threshold: N/A

Specific gravity (water = 1): 1.23 g/mL @ 68°F / 20°C

Solubility in water: 148.2 mg/L @ 77°F / 25°C.

Solubility in organic solvents: acetone; methanol; ethyl acetate; 1,2-dichloromethane; and xylene: >250 g/l at 20°C
heptane: 57-67 g/l at 20°C

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES CONTINUED

pH: 3.7 – 3.8 @ 68°F / 20°C (equal amounts of Fyfanon and distilled water).

Melting/freezing point: 37.1°F / 2.85°C.

Boiling point: 313 - 315°F (156 - 157°C) @ 0.7 mmHg (however, refer to Section 10, Stability and reactivity information).

Vapour pressure: 3.4×10^{-6} mmHg @ 77°F / 25°C
 1.4×10^{-4} mmHg @ 113°F / 45°C

Viscosity: 16.4 centipoise @ 104°F / 40°C

30.0 centipoise @ 77°F / 25°C

Surface tension: 57.8 mN/m @ 68°F / 20°C (saturated aqueous solution)

Vapour density (Air=1.0): N/Av

Percent Volatile by Weight: N/Av

Evaporation rate (n-BuAc=1.0): N/Av

Coefficient of n-Octanol/water distribution: $K_{ow} = 560$

Solubility in organic solvents: Soluble in most organic solvents such as aromatic hydrocarbons, esters and alcohols.
Moderately soluble in aliphatic hydrocarbons.

SECTION 10 — REACTIVITY AND STABILITY DATA

Stability and reactivity: Stable if handled below 131°F / 55°C. At higher temperatures decomposition may take place, and the released heat from decomposition can raise the temperature further and accelerate decomposition. Malathion can corrode iron, steel, tin plate and copper. It can be rapidly hydrolysed at pH >7.

Hazardous polymerization: Above 284°F / 140°C Fyfanon will decompose rapidly, significantly increasing the risk of inducing explosions. Direct local heating such as electric heating or by steam must be avoided. The decomposition is to a considerable extent dependant on time as well as temperature due to self-accelerating exothermic and autocatalytic reactions. The reactions involve rearrangements and polymerisation releasing volatile, malodorous and inflammable compounds such as dimethyl sulfide.

Conditions to avoid: Avoid heat, flame and direct sunlight.

Materials to avoid (incompatibles): Strong alkalis, amines and strong oxidizing compounds. The product can corrode iron, steel, tin plate and copper. Fyfanon is rapidly hydrolysed at pH > 7.0.

Hazardous decomposition products: Storage at too high temperatures may induce formation of the more toxic and synergistic contaminant isomalathion. Refer to 'Hazardous combustion products', Section 5.

SECTION 11 — TOXICOLOGICAL INFORMATION

Routes of exposure: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

Toxicological data:

Fyfanon: LC_{50} (mg/L/4 hrs) = >5.2

LD_{50} , oral, rat (mg/kg) = ~ 5500

LD_{50} , dermal, rat (mg/kg) = >2000

Carcinogenicity: Malathion is not classified as carcinogenic by IARC, ACGIH, OSHA or NTP.

Teratogenicity, mutagenicity, other reproductive effects: None observed in test animals.

Sensitization to material: None known.

Synergistic materials: Not available.

Conditions aggravated by exposure: Repeated exposures to cholinesterase inhibitors, such as Malathion, may without warning cause increased susceptibility to doses of any cholinesterase inhibitor.

SECTION 12 — ECOLOGICAL INFORMATION

Chemical fate information: The active ingredient, Malathion, is readily biodegradable. It undergoes rapid degradation in the environment and, without problems, in sewage treatment plants. No adverse effects are observed at concentrations up to 100 mg/L in waste water treatment plants. Degradation occurs both aerobically and anaerobically, and biologically as well as abiotically. Under normal conditions, Malathion is of medium mobility in soil, but is degraded rapidly. The product should not be allowed to enter drains or water courses or be deposited where it can affect ground or surface waters. Do not discharge product unmonitored into the environment.

Ecotoxicological information: The bioconcentration factor (BCF) of Malathion is 95 (average for several fish species). Malathion is toxic to birds, fish, aquatic invertebrates, aquatic life stages of amphibians and highly toxic to bees. The acute toxicity to wildlife species is:

Fish – 96-Hr LC_{50} , Rainbow trout (*Salmo gairdneri*) = 0.18 mg/L; 37-day NOEC: 21µg/L

SECTION 12 — ECOLOGICAL INFORMATION CONTINUED

Invertebrates – 48-Hr EC₅₀, Daphnids (*Daphnia magna*) = 0.72 µg/L; 21-day NOEC: 0.06 µg/L
Algae – Green algae (*Selenastrum capricornutum*) 72-Hr LC₅₀ = 4.06 mg/L
Birds – LD₅₀, Bobwhite quail (*Colinus virginianus*) = 359 mg/kg; 5-day dietary LC₅₀: 3497 mg/kg
LD₅₀, Mallard duck (*Anas platyrhynchos*) = 1485 mg/kg
Earthworms – 14-day LC₅₀, (*Eisenia foetida foetida*) = 613 mg/kg soil
Bees - LD₅₀, worker honey-bees, acute oral = 0.38 µg/bee.
LD₅₀, worker honey-bees, topical = 0.27 µg/bee

SECTION 13 — DISPOSAL CONSIDERATIONS

Handling for disposal: Handle waste according to recommendations in Section 7.

Methods of disposal: Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Triple rinse (or equivalent) containers, then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill. Disposal must be in accordance with all applicable federal, state and local regulations. Contact your local, state or federal environmental agency for specific rules.

SECTION 14 — TRANSPORTATION INFORMATION

US 49 CFR information:

Proper Shipping Name: Environmentally hazardous substance, liquid, N.O.S. (Malathion).
Primary Hazard Class: 9.
Label Codes: None.
Identification Number: UN3082
Packing Group: III.
Reportable Quantity: 100 lbs.
Marine Pollutant: Yes (P).

Canadian Transportation of Dangerous Goods Clear Language (CLR) information: Not regulated for transport, unless intended for Marine transport. If this product is intended for marine transport, refer to the following information:

Shipping description: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Malathion), Class 9, UN3082, PGIII.

SECTION 15 — REGULATORY INFORMATION

Canada:

WHMIS information: This product is a Pest Control Product and is not regulated as a Controlled Product under the Hazardous Products Act (HPA). However, for reference purposes only, this product would have the following WHMIS Classification if it were regulated as a Controlled Product under the HPA: **Class D2B** (*Materials causing other toxic effects, Toxic Material*); **Class F** (*Dangerously Reactive Material*).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and this MSDS contains all the information required by the CPR.

United States:

California Proposition 65 information: This product does not contain any chemicals known to the state of California to cause cancer or reproductive harm.

EPA/CERCLA Reportable Quantity (RQ): 100 lbs. (Malathion).

SARA TITLE III: Sec. 313, *Toxic Chemicals Notification*, 40 CFR 372: This material may be subject to the TSCA notification requirements, since it may contain Malathion (CAS# 121-75-5) a Toxic Chemical constituent.

SECTION 16 — OTHER INFORMATION

HMIS Rating: *1 Health; 1 Flammability; 1 Reactivity

Legend: ACGIH – American Conference of Governmental Industrial Hygienists

CAS - Chemical Abstract Service

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act of 1980

CFR – Code of Federal Regulations

EPA – Environmental Protection Agency

SECTION 16 — OTHER INFORMATION CONTINUED

HMIS – Hazardous Materials Identification System
IARC – International Agency for Research on Cancer
Inh – Inhalation
MSHA – Mine Safety and Health Administration
N/Ap – Not Applicable
N/Av – Not Available
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEHHA – Office of Environmental Health Hazard Assessment
OSHA – Occupational Safety and Health Act
PEL - Permissible Exposure Limit
PMCC – Pensky Martins Closed Cup
SARA - Superfund Amendments & Reauthorization Act
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
TWA - Time Weighted Average
WHMIS – Workplace Hazardous Materials Information System

References:

1. ACGIH, Threshold Limit Values and Biological Exposure Indices for 2003.
2. Canadian Centre for Occupational Health and Safety, CCInfoWeb databases, 2003 (Chempendium and RTECs).
3. Material Safety Data Sheet from manufacturer.
4. International Agency for Research on Cancer Monographs, Supplement 7, 1987.
5. US EPA Title III List of Lists – October 2001 version.
6. California's OEHHA Proposition 65 List – July 11, 2003 version.

Prepared by: Cheminova Inc.

Telephone #: (973) 305-6600 (8 AM to 5:00 PM EST, Monday to Friday)

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Revision reasons: 1. Update first aid, Section 4.

2. Update accidental release information, Section 6.
3. Update storage directions, Section 7.
4. Update physical properties, Section 9.
5. Update stability and reactivity data, Section 10.
6. Additional data updating ecological information, Section 12.