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AMMONIUM SULFAMATE

HAZARDTEXT(R) - Hazard Management

1.0 IDENTIFICATION

1.1 SYNONYMS

Ammonium sulfamate
Amcide
Amicide
AMMAT
Ammate
Ammate X
Ammonium amidosulfonate
Ammonium amidosulphate
Ammoniumsalz der Amidosulfonsaure (German)
Ammonium sulphamate
Ammonium sulphamidate
AMS
Ikumn
Monoammonium sulfamate
Sulfamate
Sulfamate dammonium
Sulfamic acid, monoammonium salt
Sulfaminsaure (German)
Sulphamate

1.2 IDENTIFIERS

1.2.1 CAS REGISTRY NUMBER:
CAS 7773-06-0

1.2.2 NIOSH/RTECS NUMBER:
RTECS/NIOSH WO 6125000

1.2.3 UN/NA NUMBER:
9089 - Ammonium sulphamate
9089 - Ammonium sulfamate

1.2.6 MOLECULAR FORMULA:
H2-N-03-S.H4-N

1.2.7 NAERG GUIDE NUMBER:
171 - SUBSTANCES (LOW TO MODERATE HAZARD)
(UN/NA 9089)

1.4 USES/FORMS/SOURCES

A. Reagent grade is 99% pure; technical product is at least 97% pure; commercial grade is 80% pure (CHRIS, 1989).
B. As a commercial product weed killer it is available as a brownish-gray, crystalline, hygroscopic material (Budavari, 1989).
C. Ammonium sulfamate is prepared by the chemical reaction of ammonia with sulfamic acid. It is very soluble in water and slightly soluble in ethanol (Budavari, 1989).

water and slightly soluble in ethanol (Budavari, 1989).
D. Ammonium sulfamate is used in various weed killing formulations (Ammate(R), Ikurin(R)). Ammate contains a minumum of 80% ammonium sulfamate (HSDB, 1989).
E. It is also used in formulations as a fire retardant in such products as paper and textiles.
F. Other industrial uses include gilding, generation of nitrous oxide, and electroplating.
G. Ammonium sulfamate is added to cigarette paper to reduce the hazard of tumor formation from tobacco smoke (HSDB, 1989), presumably by controlling the burn rate.

3.0 CLINICAL EFFECTS

3.1 GENERAL CLINICAL EFFECTS

A. Ammonium sulfamate is of low toxicity. There are no reports of toxic exposures in humans and animal data are limited.
B. GI distress, and respiratory stimulation are possible.
C. The dust may irritate the eyes, nose and throat. Inhaling the dust may cause coughing and breathing difficulty.
D. 1996 NAERG INFORMATION
1. HEALTH HAZARDS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
   a. Inhalation of material may be harmful.
   b. Contact may cause burns to skin and eyes.
   c. Inhalation of Asbestos dust may have a damaging effect on the lungs.
   d. Fire may produce irritating, corrosive and/or toxic gases.
   e. Runoff from fire control may cause pollution.
   f. Reference: NAERG, 1996.

5.0 MEDICAL TREATMENT

5.1 LIFE SUPPORT

A. Support respiratory and cardiovascular function.

5.2 SUMMARY

A. This substance has a very low oral or dermal toxicity. There have been no reports of human exposures or symptoms. Sketchy animal studies indicate possible GI and respiratory toxicity.
B. 1996 NAERG INFORMATION -
1. FIRST AID - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
   a. Move victim to fresh air.
   b. Call emergency medical care.
   c. Apply artificial respiration if victim is not breathing.
   d. Administer oxygen if breathing is difficult.
   e. Remove and isolate contaminated clothing and shoes.
   f. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
   g. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.
   h. Reference: NAERG, 1996.
C. GENERAL - This substance has a very low oral or dermal toxicity. There have been no reports of adverse human exposures or symptoms. Animal studies indicate possible GI and respiratory toxicity.
D. INHALATION EXPOSURE -
1. DECONTAMINATION: Move patient to fresh air. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer 100 percent humidified supplemental oxygen with assisted ventilation as required.
E. DERMAL EXPOSURE -
1. DECONTAMINATION: Wash exposed area extremely thoroughly with soap and water. A physician may need to

1. DECONTAMINATION: Wash exposed area extremely thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists.
F. EYE EXPOSURE -
1. DECONTAMINATION: Exposed eyes should be irrigated with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist, the patient should be seen in a health care facility.
G. ORAL EXPOSURE -
1. EMESIS: May be indicated in recent substantial ingestion unless the patient is or could rapidly become obtunded, comatose or convulsing. Is most effective if initiated within 30 minutes. (Dose of Ipecac Syrup: ADULT: 30 mL; CHILD 1 to 12 years: 15 mL).
2. GASTRIC LAVAGE: May be indicated if performed soon after ingestion, or in patients who are comatose or at risk of convulsing. Protect airway by placement in Trendelenburg and left lateral decubitus position or by cuffed endotracheal intubation.
    a. After control of any seizures present, perform gastric lavage. Volume of lavage return should approximate fluid given.
3. ACTIVATED CHARCOAL/CATHARTIC: Administer charcoal slurry, aqueous or mixed with saline cathartic or sorbitol. The FDA suggests 240 mL of diluent/30 g of charcoal. Usual charcoal dose is 30 to 100 grams in adults and 15 to 30 grams in children (1 to 2 g/kg in infants).
    a. Administer one dose of a cathartic, mixed with charcoal or given separately. See "Treatment: Prevention of Absorption" in the main document.

6.0 RANGE OF TOXICITY

6.3 TOXICITY VALUES

A. References: RTECS, 1988
- LD50 - (ORAL) RAT: 1600-3900 mg/kg
- LD50 - (ORAL) MOUSE: 3100-5760 mg/kg
- LD50 - (ORAL) QUAIL: 3000 mg/kg

7.0 STANDARDS AND LABELS

7.1 WORKPLACE STANDARDS

A. ACGIH-TLV: 10 mg/m(3) TWA; no STEL (ACGIH, 1997)
1. Skin Notation: Not Listed
2. Carcinogen: Not Listed
B. OSHA PEL: Listed (OSHA, 1996a) The PELs are 8-hour TWAs unless otherwise noted; a (CEILING) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.
1. Limit(s) for Air Contaminant (Table Z-1): Listed
    a. ppm: Not Listed
    b. total dust: 15 mg/m(3) TWA respirable fraction: 5 mg/m(3) TWA Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.
    c. Skin Notation: Not Listed
2. Limit(s) for Air Contaminant (Table Z-2): Not Listed
3. Limit(s) for Air Contaminant (Table Z-3): Not Listed
C. OSHA List of Highly Hazardous Chemicals, Toxics and Reactives: Not Listed (OSHA, 1996)
D. NIOSH VALUES: (NIOSH, 1996)
1. REL: (total) 10 mg/m(3) TWA; (resp) 5 mg/m(3) TWA; no STEL
    a. Skin Notation: Not Listed
    b. NOTE: A TWA concentration is for up to a 10-hour work-day during a 40-hour workweek. A STEL value is a 15 minute TWA exposure that should not be exceeded at any time during a workday. A Ceiling value should not be exceeded at any time.
2. IDLH VALUE: 1500 mg/m(3)

2. IDLH VALUE: 1500 mg/m(3)
    a. Carcinogen: Not Listed
E. AIHA WEEL VALUE: Not Listed (AIHA, 1996)

7.2 ENVIRONMENTAL STANDARDS

A. SARA TITLE III
1. EHS (EXTREMELY HAZARDOUS SUBSTANCES) LIST: Not Listed (EPA, 1996f)
2. SECTION 313: Not Listed (EPA, 1996g)
B. CERCLA; HAZARDOUS SUBSTANCES and REPORTABLE QUANTITIES: Listed (EPA, 1996e)
1. Statutory RQ (Reportable Quantity):
    a. 5000 pounds
    b. Codes: Listed
    (1) 1 - Indicates that the statutory source for designation of this hazardous substance under CERCLA is CWA Section 311(b)4.
2. Final RQ (Reportable Quantity):
    a. 5000 pounds (2270 kilograms)
    b. Notes: Not Listed
    c. Final RQ Category: D
C. RCRA HAZARDOUS WASTE NUMBER: Not Listed (EPA, 1996; EPA, 1996a; EPA, 1996b; EPA, 1996c; EPA, 1996d)
D. TSCA INVENTORY: Listed (LOLI, 1996)
E. AIHA ERPG VALUES: Not Listed (AIHA, 1996)
F. DOT List of Marine Pollutants: Not Listed (DOT, 1996a)

7.3 SHIPPING REGULATIONS

7.3.1 SURFACE

A. Table of Hazardous Materials and Special Provisions: Not Listed (DOT, 1996

8.0 HANDLING AND STORAGE

8.1 SUMMARY

A. PROTECTIVE CLOTHING
1. Rubber gloves should be worn for all handling operations (OHM/TADS, 1989).
2. Dust mask, goggles or face shield and rubber gloves should be worn (CHRIS, 1989).

9.0 PERSONAL PROTECTION

9.1 SUMMARY

A. PROTECTIVE CLOTHING - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Wear positive pressure self-contained breathing apparatus (SCBA).
2. Structural firefighters' protective clothing will only provide limited protection.
3. Reference: NAERG, 1996.
B. Rubber gloves should be worn for all handling operations (OHM/TADS, 1989).
C. Dust mask, goggles or face shield, rubber gloves and impervious clothing should be worn (CHRIS, 1989; ITI, 1975).

9.3 RESPIRATORY PROTECTION

A. RESPIRATORY RECOMMENDATIONS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Wear positive pressure self-contained breathing apparatus (SCBA).

1. Wear positive pressure self-contained breathing apparatus (SCBA).
2. Reference: NAERG, 1996.
B. Refer to "Recommendations for respirator selection" in the NIOSH Pocket Guide to Chemical Hazards on TOMES Plus(R) for respirator information.

9.4 PROTECTIVE CLOTHING

A. INTERPRETATION
1. This section consists of a compilation of chemical compatibility recommendations and test data from various reference sources to facilitate protective clothing selection.
2. These recommendations are compiled from published sources and are NOT recommended specifically by Micromedex(R), Inc. No attempt has been made to verify the data presented.
3. There are many critical variables in protective clothing selection that cannot be represented in this summary of the literature. For example, there may be significant differences in the protection offered by the same generic material from one commercial product to another and one lot to another. Refer to "PERSONAL PROTECTIVE EQUIPMENT

- OSHA PUB 3077" INFOTEXT document for general information on protective clothing selection.
4. Therefore, these recommendations should not be used as the sole basis for decisions on choice of protective clothing, but rather should be used as a tool by qualified occupational health and safety professionals or other technically qualified persons in conjunction with a review of all mitigating factors.
5. The presence of a specific product within this section does not in any way constitute an endorsement of said product. Material types have been omitted if no test data or recommendations were found in any of the references consulted.
6. All product recommendations should be confirmed with the specific manufacturer for verification of product performance.
B. BUTYL RUBBER
1. Synonyms: IIR, Butyl
2. General Recommendations:
    a. No recommendation (Forsberg & Mansdorf, 1989)
    b. No recommendation (ACGIH, 1987)
    c. NFPA Summary (Henry, 1989):

    - COMPATIBLE (1980 Coast Guard Study)
3. Specific Products in alpha order:
    a. No specific product recommendations were found for this material (Forsberg & Keith, 1991).
C. POLYCARBONATE
1. Synonyms: PC
2. General Recommendations:
    a. No recommendation (Forsberg & Mansdorf, 1989)
    b. No recommendation (ACGIH, 1987)
    c. NFPA Summary (Henry, 1989):

    - COMPATIBLE (1980 Coast Guard Study)
3. Specific Products in alpha order:
    a. No specific product recommendations were found for this material (Forsberg & Keith, 1991).

10.0 PHYSICAL HAZARDS

10.1 FIRE HAZARD

10.1.1 SUMMARY

A. FIRE OR EXPLOSION HAZARDS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Some may burn but none ignite readily.
2. Some may polymerize explosively when heated or involved in a fire.

3. Containers may explode when heated.
4. Some may be transported hot.
5. Reference: NAERG, 1996.
B. PUBLIC SAFETY, GENERAL - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number: CANADA 1) CANUTEC: 613-996-6666 (Collect calls are accepted.) UNITED STATES 1) CHEMTREC(R): 1-800-424-9300 (Toll-free in the U.S. and Canada); 703-527-3887 for calls originating elsewhere (Collect calls are accepted) OR 2) CHEM-TEL, INC.: 1-800-255-3924 (Toll-free in the U.S. and Canada); 813-979-0626 for calls originating elsewhere (Collect calls are accepted) 3) MILITARY SHIPMENTS: 703-697-0218 - Explosives/ammunition incidents (Collect calls are accepted); 1-800-851-8061 - All other dangerous goods incidents MEXICO 1) SETIQ: 91-800-00-214 in the Mexican Republic; For calls originating in Mexico City and the Metropolitan Area: 575-0838, 575-0842 or 559-1588 For calls originating elsewhere, call: 0-11-52-5-575-0838 or 0-11-52-5-575-0842 2) CECOM: 91-800-00-413 in the Mexican Republic For calls originating in Mexico City and the Metropolitan Area: 550-1496, 550-1552, 550-1485, or 550-4885; FAX 616-5560 Or 616-5561 For calls originating elsewhere, call: 0-11-52-5-550-1496, 0-11-52-5-550-1552, 0-11-52-5-550-1485, or 0-11-52-5-550-4885
2. Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
3. Keep unauthorized personnel away.
4. Stay upwind.
5. Reference: NAERG, 1996.

10.1.6 FIRE CONTROL/EXTINGUISHING AGENTS
A. SMALL FIRES - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Dry chemical, CO2, water spray or regular foam.
2. Reference: NAERG, 1996.
B. LARGE FIRES - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Water spray, fog or regular foam.
2. Move containers from fire area if you can do it without risk.
3. Do not scatter spilled material with high pressure water streams.
4. Dike fire-control water for later disposal.
5. Reference: NAERG, 1996.
C. FIRE INVOLVING TANKS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Cool containers with flooding quantities of water until well after fire is out.
2. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
3. ALWAYS stay away from the ends of tanks.
4. Reference: NAERG, 1996.

10.1.7 COMBUSTION TOXICITY
A. Fire may produce irritating or poisonous gas.

10.2 EXPLOSION HAZARD

A. FIRE OR EXPLOSION HAZARDS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Some may burn but none ignite readily.
2. Some may polymerize explosively when heated or involved in a fire.
3. Containers may explode when heated.
4. Some may be transported hot.
5. Reference: NAERG, 1996.
B. PUBLIC SAFETY, GENERAL - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
2. Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
3. Keep unauthorized personnel away.
4. Stay upwind.
5. Reference: NAERG, 1996.

5. Reference: NAERG, 1996.
C. May explode when hot acidic solutions are stored in a closed vessel.

10.3 DUST/VAPOR HAZARD

A. PUBLIC SAFETY, GENERAL - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
2. Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
3. Keep unauthorized personnel away.
4. Stay upwind.
5. Reference: NAERG, 1996.

10.4 REACTIVITY HAZARD

A. This compound decomposes at 160 degrees C but is stable under ordinary conditions. It is mildly corrosive to metals. It is non- combustible and is a fire retardant. Ammonium sulfamate is stable in air, dilute acid, and dilute alkali (HSDB, 1989).
B. This compound may explode when hot acidic solutions are stored in a closed vessel (HSDB, 1989).
C. It emits toxic fumes of ammonia and oxides of nitrogen and sulfur when heated to decomposition (Sax & Lewis, 1989).
D. Ammonium sulfamate persists in soil for 1 to 3 months (OHM/TADS, 1989).
E. The technical product forms addition products with aldehydes (HSDB, 1989).
F. It dehydrates AMIDES to nitriles (HSDB, 1989).
G. The technical product is readily oxidized by bromine and chlorine (HSDB, 1989).
H. It is corrosive to spraying equipment (HSDB, 1989).

10.5 EVACUATION PROCEDURES

10.5.1 SUMMARY

A. No specific Isolation - Protective Action Distances have been established for this substance.
B. EVACUATION (FIRE) - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
2. Reference: NAERG, 1996.
C. PUBLIC SAFETY, GENERAL - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed in the FIRE HAZARD section of this document.
2. Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
3. Keep unauthorized personnel away.
4. Stay upwind.
5. Reference: NAERG, 1996.

10.6 CONTAINMENT/DISPOSAL GUIDELINES

10.6.1 SUMMARY

A. SPILL OR LEAK, GENERAL - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Do not touch or walk through spilled material.
2. Stop leak if you can do it without risk.
3. Prevent dust cloud.
4. Avoid inhalation of asbestos dust.
5. Reference: NAERG, 1996.
B. Stop leak if no risk is involved.

10.6.2 SMALL LEAK/SPILL

A. SMALL SPILLS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
2. Reference: NAERG, 1996.
B. SMALL DRY SPILLS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
2. Reference: NAERG, 1996.
C. DRY SPILL: Ventilate area of spill. Collect spilled material in the most convenient and safe manner and place in sealed containers for later disposal. Alternatively, material may be transferred slowly into a large container of cold water with stirring and neutralized by addition of either 3 molar hydrochloric acid or 6 molar ammonium hydroxide (HSDB, 1989). Neutralized material may be disposed in the sanitary sewer with adequate dilution (OHM/TADS, 1989; Sittig, 1985).

10.6.3 LARGE LEAK/SPILL
A. LARGE SPILLS - NAERG (SUBSTANCES (LOW TO MODERATE HAZARD)) - GUIDE 171
1. Dike far ahead of liquid spill for later disposal.
2. Cover powder spill with plastic sheet or tarp to minimize spreading.
3. Prevent entry into waterways, sewers, basements or confined areas.
4. Reference: NAERG, 1996.
B. SPILL IN WATER: In the event of a spill in water, add calcium hypochlorite ($Ca(ClO)_2$) to neutralize to pH 7; use mechanical dredges or lifts to remove masses of immobilized pollutants and precipitates (AAR, 1987).
C. BIODEGRADATION: Certain strains of Aureobasidum (pullularia) pullalans, Aphalosporium acremonium, and two unidentified species of Achromobacter and Flavobacterium can use the sodium salt of sulfamic acid as a source of nitrogen. Fungi and bacteria converted sulfamate to sulfate in approximately equimolar proportion to the amount of nitrogen assimilated (HSDB, 1989).
D. BEHAVIOR IN SOIL: Ammonium sulfamate is evidently not retained in soil but moves with soil moisture like chlorate (HSDB, 1989).
E. IN SITU AMELIORATION: Clinoptilolite can absorb ammonium ions. Anion exchangers or organic acid exchangers can adsorb sulfamate (OHM/TADS, 1989).

11.0 ENVIRONMENTAL HAZARD MANAGEMENT

11.1 POLLUTION HAZARD

A. Runoff from fire control or dilution water may cause pollution. Cover solids with plastic to prevent dissolving in rain or fire fighting water.

12.0 PHYSICAL/CHEMICAL PROPERTIES

12.1 MOLECULAR WEIGHT

A. 114.13 (Windholz et al, 1983)

12.2 DESCRIPTION/PHYSICAL STATE

A. Ammonium sulfamate is a colorless, odorless, white crystal (OHM/TADS, 1989).
B. It is a colorless, odorless, non-combustible, hygroscopic crystalline substance. Color may range from white to bright yellow-orange or brownish-gray (HSDB, 1989).

12.3 PH

A. 4.9 (for a 0.2 molar aqueous solution) (Windholz et al, 1983)

12.4 VAPOR PRESSURE

A. approximately 0 mmHg (at 20 degrees C) (CHRIS, 1989)

12.6 DENSITY

A. SOLID: > 1.0 (at 20 degrees C) (OTHER-TP) (CHRIS, 1989) KEY NL-TP: Not Listed, Temperature and Pressure NTP: Normal Temperature and Pressure (25 degrees C; 77 degrees F and 760 mmHg) OTHER-TP: Other, Temperature and Pressure STP: Standard Temperature and Pressure (0 degrees C; 32 degrees F and 760 mmHg)

12.7 FREEZING/MELTING POINT

A. MELTING POINT: 131 degrees C (HSDB, 1989)

12.8 BOILING POINT

A. 160 degrees C (decomposes) (HSDB, 1989)

12.12 SOLUBILITY

A. SOLUBILITY IN WATER
1. highly soluble in water (Windholz et al, 1983)
2. 166.6 g/100 mL (at 10 degrees C) (HSDB, 1989)
3. 216 g/100 mL (at 25 degrees C) (HSDB, 1989)
4. 357 g/100 mL (at 50 degrees C) (HSDB, 1989)
B. SOLUBILITY IN SOLVENTS
1. This compound is soluble in glycerol, glycol, and formamide; it is slightly soluble in ethanol (Windholz et al, 1983).

12.13 REACTIVITY

12.13.2 HAZARDOUS REACTIONS
A. This compound decomposes at 160 degrees C but is stable under ordinary conditions. It is mildly corrosive to metals. It is non- combustible and is a fire retardant. Ammonium sulfamate is stable in air, dilute acid, and dilute alkali (HSDB, 1989).
B. This compound may explode when hot acidic solutions are stored in a closed vessel (HSDB, 1989).
C. It emits toxic fumes of ammonia and oxides of nitrogen and sulfur when heated to decomposition (Sax & Lewis, 1989).
D. Ammonium sulfamate persists in soil for 1 to 3 months (OHM/TADS, 1989).
E. The technical product forms addition products with aldehydes (HSDB, 1989).
F. It dehydrates AMIDES to nitriles (HSDB, 1989).
G. The technical product is readily oxidized by bromine and chlorine (HSDB, 1989).
H. It is corrosive to spraying equipment (HSDB, 1989).

13.0 SAMPLING AND ANALYTICAL METHODS

13.6 OTHER

A. SAMPLING PROCEDURES: Collect on a filter and extract with water (HSDB, 1989).
B. ANALYTICAL METHODS: Ion chromatography has a range of 6.4 to 27.3 mg/m(3) (HSDB, 1989).
1. Ammonium sulfamate residues can be determined in certain fruits by absorption spectrometry at 655 nm (HSDB, 1989).

14.0 REFERENCES

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14.3 CONSULTANTS

A. The above information is generic for the compound. For further product specific information, consult manufacturer. In an emergency, contact CHEMTREC at 1-800-424-9300 or 703-527-3887 if outside the continental U.S.
B. Immediately notify the National Response Center (1-800-424-8802) if a release of a reportable quantity of a hazardous substance to the environment has occurred.
B. Seek professional assistance in the event of a large spill through EPA's Environmental Response Team (ERT). Edison, NJ 24-hour telephone (201)321-6660 (OHM/TADS, 1989)

15.0 AUTHOR INFORMATION

15.1 CONTRIBUTOR(S) TO THIS DOCUMENT

A. Written by: POISINDEX(R) system staff, 05/87
B. Revised by: Betty J Dabney, PhD, 01/90
C. Personal Protection information was reviewed by Barry E North, PhD, MPH, CIH, 06/93
D. In addition to standard revisions of this management, certain portions were updated with recent literature: 02/96
E. Specialty Board: Hazard (DT0487)

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AMMONIUM SULFAMATE

CHRIS - Chemical Hazard Response Information System

OVERVIEW

Material name:

AMMONIUM SULFAMATE
CHRIS Code ASM

Common synonyms:

Ammate
Sulfamic acid, monoammonium salt
Ammonium amidosulfonate
Ammonium amidosulphate
AMS

Characteristics:

Solid White or brownish-gray Odorless
Sinks and mixes with water.

Emergency actions:

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire:

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure:

CALL FOR MEDICAL AID.

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.

IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water pollution:

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

RESPONSE TO DISCHARGE

Disperse and flush

LABEL

Category: None
Class: Not pertinent

CHEMICAL DESIGNATIONS

CG compatibility class: Not listed
Formula: NH(2)SO(3)NH(4)
IMO/UN designation: Not listed
DOT id no.: 9089
CAS registry no.: 7773-06-0

OBSERVABLE CHARACTERISTICS

Physical state: Solid
Color: White or brownish-gray
Odor: None

HEALTH HAZARDS

Personal protective equipment: Dust mask; goggles or face shield; rubber gloves.
Symptoms following exposure: Inhalation causes irritation of nose and throat. Ingestion causes gastrointestinal disturbances. Dust irritates eyes.
Treatment of exposure: INHALATION: remove to fresh air. INGESTION: give large amount of water; get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.
Threshold limit value: 10 mg/m(3)
Short term inhalation limits: Data not available
Toxicity by ingestion: Grade 2; oral rat LD(50) = 1,600 mg/kg
Late toxicity: Data not available
Vapor (gas) irritant characteristics: Data not available
Liquid or solid irritant characteristics: Data not available
Odor threshold: Data not available
IDLH value: 5000 mg/m(3)

FIRE HAZARDS

Flash point: Not flammable

Flash point: Not flammable
Flammable limits in air: Not flammable
Fire extinguishing agents: Not pertinent
Fire extinguishing agents NOT to be used: Not pertinent
Special hazards of combustion products: Toxic oxides of nitrogen may form in fires.
Behavior in fire: Data not available
Ignition temperature: Not pertinent
Electrical hazard: Not pertinent
Burning rate: Not pertinent
Adiabatic flame temperature: Not pertinent
Stoichiometric air to fuel ratio: Not pertinent
Flame temperature: Not pertinent

CHEMICAL REACTIVITY

Reactivity with water: No reaction
Reactivity with common materials: Data not available
Stability during transport: Stable
Neutralizing agents for acids and caustics: Not pertinent
Polymerization: Not pertinent
Inhibitor of polymerization: Not pertinent
Molar ratio (reactant to product): Data not available
Reactivity group: Data not available

WATER POLLUTION

Aquatic toxicity: 259 ppm/24 hr/catfish/LC(50)/fresh water
Waterfowl toxicity: Data not available
Biological oxygen demand (BOD): Data not available
Food chain concentration potential: None

SHIPPING INFORMATION

Grades of purity: Reagent, 99.0%; Commercial, 80%
Storage temperature: Ambient
Inert atmosphere: No requirement
Venting: Open

HAZARD CLASSIFICATIONS

Code of federal regulations: ORM-E

NAS hazard rating for bulk water transportation: Not listed

NFPA hazard classification: Not listed

PHYSICAL AND CHEMICAL PROPERTIES

Physical state at 15 degrees C. and 1 ATM: Solid
Molecular weight: 114.13
Boiling point at 1 ATM: Decomposes above 200 degrees C
Freezing point: 268 degrees F = 131 degrees C = 404 degrees K
Critical temperature: Not pertinent
Critical pressure: Not pertinent
Specific gravity: > 1 at 20 degrees C (solid)

Specific gravity: > 1 at 20 degrees C (solid)
Liquid surface tension: Not pertinent
Liquid water interfacial tension: Not pertinent
Vapor (gas) specific gravity: Not pertinent
Ratio of specific heats of vapor (gas): Not pertinent
Latent heat of vaporization: Not pertinent
Heat of combustion: Not pertinent
Heat of decomposition: Not pertinent
Heat of solution: Data not available
Heat of polymerization: Not pertinent
Heat of fusion: Data not available
Limiting value: Data not available
REID vapor pressure: Data not available

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AMMONIUM SULFAMATE

MEDITEXT(R) - Medical Management

0.0 OVERVIEW

0.1 LIFE SUPPORT

A. This overview assumes that basic life support measures have been instituted.

0.2 CLINICAL EFFECTS

0.2.1 SUMMARY OF EXPOSURE

0.2.1.1 ACUTE EXPOSURE

A. Ammonium sulfamate is of low toxicity. There are no reports of toxic exposures in humans and animal data are limited.

B. GI distress, and respiratory stimulation are possible.

C. The dust may irritate the eyes, nose and throat. Inhaling the dust may cause coughing and breathing difficulty.

0.2.4 HEENT

0.2.4.1 ACUTE EXPOSURE

A. Instillation of 0.5 mL of a 4% solution produced no irritation. The powder may be irritating to the eyes, nose and throat.

0.2.6 RESPIRATORY

0.2.6.1 ACUTE EXPOSURE

A. Ammonium sulfamate may cause respiratory tract irritation.

0.2.8 GASTROINTESTINAL

0.2.8.1 ACUTE EXPOSURE

A. Animal studies indicate ammonium sulfamate may cause GI distress, but data are sketchy.

0.2.14 DERMATOLOGIC

0.2.14.1 ACUTE EXPOSURE

A. Repeated application of a 4% solution to the arm of human volunteers caused no skin irritation.

0.3 MEDICAL SURVEILLANCE/LABORATORY

A. No toxic levels have been established.

0.4 TREATMENT OVERVIEW

0.4.1 SUMMARY EXPOSURE

0.4.1 SUMMARY EXPOSURE

A. This substance has a very low oral or dermal toxicity. There have been no reports of human exposures or symptoms. Sketchy animal studies indicate possible GI and respiratory toxicity.

0.4.2 ORAL EXPOSURE

A. EMESIS: May be indicated in recent substantial ingestion unless the patient is or could rapidly become obtunded, comatose or convulsing. Is most effective if initiated within 30 minutes. (Dose of Ipecac Syrup: ADULT: 30 mL; CHILD 1 to 12 years: 15 mL).

B. ACTIVATED CHARCOAL/CATHARTIC: Administer charcoal slurry, aqueous or mixed with saline cathartic or sorbitol. The FDA suggests 240 mL of diluent/30 g of charcoal. Usual charcoal dose is 30 to 100 grams in adults and 15 to 30 grams in children (1 to 2 g/kg in infants).

1. Administer one dose of a cathartic, mixed with charcoal or given separately. See "Treatment: Prevention of Absorption" in the main document.

0.4.4 EYE EXPOSURE

A. DECONTAMINATION: Exposed eyes should be irrigated with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist, the patient should be seen in a health care facility.

0.4.5 DERMAL EXPOSURE

A. DECONTAMINATION: Wash exposed area extremely thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists.

0.5 RANGE OF TOXICITY

A. The only data available are in animals. Doses lower than 20,000 ppm/kg do not produce symptoms even when repeated. Repeated application of 20 to 50% solutions to the skin of rats produced no ill effects.

1.0 SUBSTANCES INCLUDED/SYNONYMS

1.1 THERAPEUTIC/TOXIC CLASS

A. Ammonium sulfamate is a contact and translocation herbicide, as well as a chemical intermediate and fire retardant. It is of low order toxicity as indicated in animal studies. It may cause gastrointestinal irritation if ingested.

1.2 SPECIFIC SUBSTANCES

Ammonium sulfamate

Amcide

Amicide

AMMAT

Ammate

Ammate X

Ammonium amidosulfonate

Ammonium amidosulphate

Ammoniumsalz der Amidosulfonsaure (German)

Ammonium sulphamate

Ammonium sulphamidate

AMS

Ikumn

Monoammonium sulfamate

Sulfamate

Sulfamate dammonium

Sulfamic acid, monoammonium salt

Sulfaminsaure (German)

Sulphamate

1.3 IDENTIFIERS

1.3.1 CAS REGISTRY NUMBER:

CAS 7773-06-0

1.3.2 NIOSH/RTECS NUMBER:

RTECS/NIOSH WO 6125000

1.3.3 UN/NA NUMBER:

9089 - Ammonium sulphamate

9089 - Ammonium sulfamate

1.3.6 MOLECULAR FORMULA:

H2-N-03-S.H4-N

1.3.7 NAERG GUIDE NUMBER:

171 - SUBSTANCES (LOW TO MODERATE HAZARD)

(UN/NA 9089)

1.6 PREVENTION OF CONTAMINATION

A. PROTECTIVE CLOTHING

1. Rubber gloves should be worn for all handling operations (OHM/TADS, 1989).

2. Dust mask, goggles or face shield and rubber gloves should be worn (CHRIS, 1989).

1.7 USES/FORMS/SOURCES

A. Reagent grade is 99% pure; technical product is at least 97% pure; commercial grade is 80% pure (CHRIS, 1989).

B. As a commercial product weed killer it is available as a brownish-gray, crystalline, hygroscopic material (Budavari, 1989).

C. Ammonium sulfamate is prepared by the chemical reaction of ammonia with sulfamic acid. It is very soluble in water and slightly soluble in ethanol (Budavari, 1989).

D. Ammonium sulfamate is used in various weed killing formulations (Ammate(R), Ikurin(R)). Ammate contains a minumum of 80% ammonium sulfamate (HSDB, 1989).

E. It is also used in formulations as a fire retardant in such products as paper and textiles.

F. Other industrial uses include gilding, generation of nitrous oxide, and electroplating.

G. Ammonium sulfamate is added to cigarette paper to reduce the hazard of tumor formation from tobacco smoke (HSDB, 1989), presumably by controlling the burn rate.

3.0 CLINICAL EFFECTS

3.1 SUMMARY OF EXPOSURE

3.1.1 ACUTE EXPOSURE

A. Ammonium sulfamate is of low toxicity. There are no reports of toxic exposures in humans and animal data are limited.

B. GI distress, and respiratory stimulation are possible.

C. The dust may irritate the eyes, nose and throat. Inhaling the dust may cause coughing and breathing difficulty.

3.4 HEENT

3.4.2 EYES

A. CONJUNCTIVAL IRRITATION -

1. ANIMALS - Ammonium sulfamate instilled in the conjunctival sac of rabbit eyes, 0.5 mL of a 4% solution in water, produced NO irritation (Grant, 1974).

2. HUMAN - The dust may be irritating to the eyes due to mechanical action (CHRIS, 1989).

3.4.4 NOSE

A. NASAL IRRITATION - The dust may be irritating to the nose due to mechanical action (CHRIS, 1989).

3.4.5 THROAT

A. PHARYNGEAL IRRITATION - The dust may be irritating to the throat due to mechanical action (CHRIS, 1989).

3.5 CARDIOVASCULAR

3.5.3 ANIMAL STUDIES

A. LACK OF EFFECT

1. Intravenous injections of 100 mg/kg in rats did not significantly affect circulation (reviewed in Gosselin, 1984).

3.6 RESPIRATORY

3.6.1 ACUTE EFFECTS

A. IRRITATION

1. Breathing of the dust may cause coughing or dyspnea (CHRIS, 1989).

3.6.3 ANIMAL STUDIES

A. HYPERVENTILATION

1. Animals poisoned by IP injection of 0.8 mg/kg developed respiratory stimulation and prostration; 6 of 10 died (Proctor et al, 1988).

B. LACK OF EFFECT

1. Intravenous injections of 100 mg/kg in rats did not significantly affect respiration (reviewed in Gosselin, 1984).

3.8 GASTROINTESTINAL

3.8.3 ANIMAL STUDIES

A. GASTRITIS

1. Animal studies indicate ammonium sulfamate may cause gastrointestinal distress, but data are sketchy (ITI, 1975).

3.14 DERMATOLOGIC

3.14.1 ACUTE EFFECTS

A. LACK OF EFFECT

1. Repeated application of a 4% solution to the arm of human volunteers for 5 days caused no skin irritation (reviewed in Gosselin, 1984).

4.0 MEDICAL SURVEILLANCE/LABORATORY

4.1 MONITORING PARAMETERS/LEVELS

4.1.1 SUMMARY

4.1.1 SUMMARY

A. No toxic levels have been established.

4.1.2 SERUM/BLOOD

A. TOXICITY

1. No toxic levels of ammonium sulfamate have been established.

4.3 METHODS

A. SAMPLING

1. Collect on a filter and extract with water (HSDB, 1989).

B. CHROMATOGRAPHY

1. Ion chromatography has a range of 6.4 to 27.3 mg/m(3) (HSDB, 1989).

C. SPECTROSCOPY/SPECTROMETRY

1. Ammonium sulfamate residues can be determined in certain fruits by absorption spectrometry at 655 nm (HSDB, 1989).

6.0 TREATMENT

6.1 LIFE SUPPORT

A. Support respiratory and cardiovascular function.

6.2 TREATMENT SUMMARY

A. This substance has a very low oral or dermal toxicity. There have been no reports of human exposures or symptoms. Sketchy animal studies indicate possible GI and respiratory toxicity.

6.4 MONITORING

A. No toxic levels have been established.

6.6 DERMAL EXPOSURE

6.6.1 DECONTAMINATION

A. DERMAL DECONTAMINATION

1. Wash exposed area extremely thoroughly with soap and water. A physician may need to examine the area if irritation or pain persists after washing.

6.7 EYE EXPOSURE

6.7.1 DECONTAMINATION

A. Exposed eyes should be irrigated with copious amounts of room temperature water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist after 15 minutes of irrigation, an ophthalmologic

irritation, pain, swelling, lacrimation, or photophobia persist after 15 minutes of irrigation, an ophthalmologic examination should be performed.

6.8 ORAL/PARENTERAL EXPOSURE

6.8.2 PREVENTION OF ABSORPTION

A. EMESIS

1. INDICATIONS/CAUTIONS

a. Measures to decrease absorption may be useful. The decision to induce or not to induce emesis in ingestion is often controversial, is not automatic, and must be carefully considered.

b. Emesis may be indicated in substantial recent ingestions. Contraindications to emesis induction include: signs of oral, pharyngeal, or esophageal irritation; a depressed gag reflex; or central nervous system excitation or depression. If these are present or likely, EMESIS SHOULD NOT BE INDUCED.

c. Emesis is most effective if initiated within 30 minutes of ingestion.

2. DOSE OF IPECAC SYRUP

a. ADULT OR CHILD OVER 90 TO 100 POUNDS (40 to 45 kilograms): 30 milliliters

b. CHILD 1 TO 12 YEARS: 15 milliliters

c. CHILD 6 TO 12 MONTHS (consider administration in a health care facility): 5 to 10 milliliters.

d. FLUIDS: After the dose is given, encourage clear fluids, 6 to 8 ounces in adults and 4 to 6 ounces in a child.

e. REPEAT DOSES: The dose may be repeated once if emesis does not occur within 30 minutes.

3. EMESIS FAILURE

a. If emesis is unsuccessful following 2 doses of ipecac, the decision to lavage or otherwise attempt to decontaminate the gut should be made on an individual basis. Two doses of ipecac pose little inherent toxicity.

4. Refer to the IPECAC/TREATMENT management in POISINDEX or MEDITEXT portion of TOMES or TOMES PLUS for further information on administration and adverse reactions.

B. ACTIVATED CHARCOAL/CATHARTIC

1. CHARCOAL ADMINISTRATION

a. Administer charcoal as slurry; charcoal slurry may be aqueous, or mixture of charcoal with saline cathartic or sorbitol.

2. CHARCOAL DOSE

a. The FDA suggests a minimum of 240 milliliters of diluent per 30 grams charcoal. Optimum dose of charcoal is not established; usual dose is 30 to 100 grams in adults and 15 to 30 grams in children; some suggest using 1 to 2 grams per kilogram as a rough guideline, particularly in infants (FDA, 1985).

3. CHARCOAL ADMINISTRATION/ADVERSE EFFECTS

a. Refer to the ACTIVATED CHARCOAL/TREATMENT management for further information on administration and adverse reactions.

4. CATHARTIC CONTRAINDICATIONS

a. Cathartics should not be used in patients who have an ileus. Saline cathartics should not be used in patients with impaired renal function (Gilman et al, 1990).

5. CATHARTIC ADMINISTRATION/CAUTIONS

a. Administer in a health care facility, especially in children.

b. Monitoring of fluids and electrolytes may be necessary in children.

c. The safety of more than one dose of a cathartic has not been established. Hypermagnesemia has been reported after repeated administration of magnesium containing cathartics in overdose patients with normal renal function (Smilkstein et al, 1988).

d. Repeated cathartic dosing should be done with extreme caution, if at all.

e. Administration of cathartics should be stopped when a charcoal stool appears.

6. CATHARTIC ADMINISTRATION

a. Administer ONE DOSE of a saline cathartic or sorbitol, mixed with charcoal or administered separately.

b. SALINE CATHARTIC/ADULT DOSE: 20 to 30 grams per dose of magnesium sulfate or sodium sulfate, OR magnesium citrate 4 milliliters per kilogram per dose up to 300 milliliters per dose, administered orally (Minocha et al, 1985).

c. SALINE CATHARTIC/PEDIATRIC DOSE: 250 milligrams per kilogram per dose of magnesium or sodium sulfate OR magnesium citrate 4 milliliters per kilogram per dose up to 300 milliliters per dose, administered orally (Minocha et al, 1985).

d. SALINE CATHARTIC ADMINISTRATION/ADVERSE EFFECTS: Refer to the LAXATIVE-SALINE or MAGNESIUM management for further information on administration and adverse effects.

e. SORBITOL/ADULT DOSE: 1 to 2 grams per kilogram per dose to a maximum of 150 grams per dose, administered orally (Minocha et al, 1985).

f. SORBITOL/PEDIATRIC DOSE: 1 to 1.5 grams per kilogram per dose as a 35 percent solution to a maximum of 50 grams per dose, administered orally to children over 1 year of age (Minocha et al, 1985).

g. SORBITOL ADMINISTRATION/ADVERSE EFFECTS: Refer to the SORBITOL management for further information on administration and adverse effects.

6.8.3 TREATMENT

A. SYMPTOMATIC/SUPPORTIVE CARE

1. Since no specific human symptoms have been seen, treatment of exposures is symptomatic and supportive for cardiovascular and respiratory functions.

7.0 RANGE OF TOXICITY

7.1 SUMMARY

A. The only data available are in animals. Doses lower than 20,000 ppm/kg do not produce symptoms even when repeated. Repeated application of 20 to 50% solutions to the skin of rats produced no ill effects.

7.3 MINIMUM LETHAL EXPOSURE

A. The lowest published lethal exposure in rats by the IP route is 800 milligrams/kilogram (RTECS, 1988).

7.4 MAXIMUM TOLERATED EXPOSURE

A. ACUTE TOXICITY

1. Ammonium sulfamate has a low order of toxicity (Windholz et al, 1983).

2. RATS: Doses lower than 20,000 parts per million/kilogram do NOT produce symptoms, even when repeated. Repeated application of 20 to 50% solutions to the skin of rats produced no ill-effects (ACGIH, 1980).

3. RATS: Oral doses as high as 1.6 grams/kilogram were not fatal in rats (HSDB, 1989).

4. RATS: Intravenous injections of 100 mg/kg did not significantly affect respiration or circulation (reviewed in Gosselin, 1984).

B. CHRONIC

1. Oral toxicity is negligible; for example when 10,000 parts per million was fed to rats for 125 days no toxicity was seen. When 20,000 parts per million was fed no histological effects were seen but growth seemed to be inhibited (ACGIH, 1980).

7.6 LD50/LC50

A. References: RTECS, 1988

LD50 - (ORAL) RAT: 1600-3900 mg/kg

LD50 - (ORAL) MOUSE: 3100-5760 mg/kg

LD50 - (ORAL) QUAIL: 3000 mg/kg

8.0 KINETICS

8.1 ABSORPTION

A. SUMMARY

1. Poorly absorbed dermally, may be absorbed via gastrointestinal tract.

10.0 STANDARDS/LABELS

10.1 STANDARDS

10.1.1 WORKPLACE STANDARDS

A. ACGIH-TLV: 10 mg/m(3) TWA; no STEL (ACGIH, 1997)

1. Skin Notation: Not Listed

2. Carcinogen: Not Listed

B. OSHA PEL: Listed (OSHA, 1996a)

The PELs are 8-hour TWAs unless otherwise noted; a (CEILING) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

1. Limit(s) for Air Contaminant (Table Z-1): Listed

a. ppm: Not Listed

b. total dust: 15 mg/m(3) TWA

respirable fraction: 5 mg/m(3) TWA

Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

c. Skin Notation: Not Listed

2. Limit(s) for Air Contaminant (Table Z-2): Not Listed

3. Limit(s) for Air Contaminant (Table Z-3): Not Listed

C. OSHA List of Highly Hazardous Chemicals, Toxics and Reactives: Not Listed (OSHA, 1996)

D. NIOSH VALUES: (NIOSH, 1996)

1. REL: (total) 10 mg/m(3) TWA; (resp) 5 mg/m(3) TWA; no STEL

a. Skin Notation: Not Listed

b. NOTE: A TWA concentration is for up to a 10-hour work-day during a 40-hour workweek. A STEL value is a 15 minute TWA exposure that should not be exceeded at any time during a workday. A Ceiling value should not be exceeded at any time.

2. IDLH VALUE: 1500 mg/m(3)

a. Carcinogen: Not Listed

E. AIHA WEEL VALUE: Not Listed (AIHA, 1996)

10.1.2 ENVIRONMENTAL STANDARDS

A. SARA TITLE III

1. EHS (EXTREMELY HAZARDOUS SUBSTANCES) LIST: Not Listed (EPA, 1996f)

2. SECTION 313: Not Listed (EPA, 1996g)

B. CERCLA; HAZARDOUS SUBSTANCES and REPORTABLE QUANTITIES: Listed (EPA, 1996e)

B. CERCLA; HAZARDOUS SUBSTANCES and REPORTABLE QUANTITIES: Listed (EPA, 1996e)

1. Statutory RQ (Reportable Quantity):

a. 5000 pounds

b. Codes: Listed

(1) 1 - Indicates that the statutory source for designation of this hazardous substance under CERCLA is CWA Section 311(b)4.

2. Final RQ (Reportable Quantity):

a. 5000 pounds (2270 kilograms)

b. Notes: Not Listed

c. Final RQ Category: D

C. RCRA HAZARDOUS WASTE NUMBER: Not Listed (EPA, 1996; EPA, 1996a; EPA, 1996b; EPA, 1996c; EPA, 1996d)

D. TSCA INVENTORY: Listed (LOLI, 1996)

E. AIHA ERPG VALUES: Not Listed (AIHA, 1996)

F. DOT List of Marine Pollutants: Not Listed (DOT, 1996a)

11.0 PHYSICOCHEMICAL

11.1 PHYSICAL PARAMETERS

11.1.1 PHYSICAL CHARACTERISTICS

A. Ammonium sulfamate is a colorless, odorless, white crystal (OHM/TADS, 1989).

B. It is a colorless, odorless, non-combustible, hygroscopic crystalline substance. Color may range from white to bright yellow-orange or brownish-gray (HSDB, 1989).

11.1.2 MOLECULAR WEIGHT

A. 114.13 (Windholz et al, 1983)

11.1.4 DENSITY

A. SOLID: > 1.0 (at 20 degrees C) (OTHER-TP) (CHRIS, 1989) KEY

NL-TP: Not Listed, Temperature and Pressure

NTP: Normal Temperature and Pressure

(25 degrees C; 77 degrees F and 760 mmHg) OTHER-TP: Other, Temperature and Pressure

STP: Standard Temperature and Pressure

(0 degrees C; 32 degrees F and 760 mmHg)

11.2 CHEMICAL PARAMETERS

11.2.1 PH

A. 4.9 (for a 0.2 molar aqueous solution) (Windholz et al, 1983)

11.2.2 REACTIVITY

A. This compound decomposes at 160 degrees C but is stable under ordinary conditions. It is mildly corrosive to metals. It is non- combustible and is a fire retardant. Ammonium sulfamate is stable in air, dilute acid, and dilute alkali (HSDB, 1989).

B. This compound may explode when hot acidic solutions are stored in a closed vessel (HSDB, 1989).

C. It emits toxic fumes of ammonia and oxides of nitrogen and sulfur when heated to decomposition (Sax & Lewis, 1989).

D. Ammonium sulfamate persists in soil for 1 to 3 months (OHM/TADS, 1989).

E. The technical product forms addition products with aldehydes (HSDB, 1989).

F. It dehydrates AMIDES to nitriles (HSDB, 1989).

G. The technical product is readily oxidized by bromine and chlorine (HSDB, 1989).

H. It is corrosive to spraying equipment (HSDB, 1989).

11.2.3 SOLUBILITY

A. SOLUBILITY IN WATER

1. highly soluble in water (Windholz et al, 1983)

2. 166.6 g/100 mL (at 10 degrees C) (HSDB, 1989)

3. 216 g/100 mL (at 25 degrees C) (HSDB, 1989)

4. 357 g/100 mL (at 50 degrees C) (HSDB, 1989)

B. SOLUBILITY IN SOLVENTS

1. This compound is soluble in glycerol, glycol, and formamide; it is slightly soluble in ethanol (Windholz et al, 1983).

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12.3 CONSULTANTS

A. The above information is generic for the compound. For further product specific information, consult manufacturer. In an emergency, contact CHEMTREC at 1-800-424-9300 or 703-527-3887 if outside the continental U.S.

B. Immediately notify the National Response Center (1-800-424-8802) if a release of a reportable quantity of a hazardous substance to the environment has occurred.

B. Seek professional assistance in the event of a large spill through EPA's Environmental Response Team (ERT). Edison, NJ 24-hour telephone (201)321-6660 (OHM/TADS, 1989)

13.0 AUTHOR INFORMATION

13.1 CONTRIBUTOR(S) TO THIS DOCUMENT

A. Written by: David G Spoerke, MS, RPh, 10/85

B. Reviewed by: Barry H Rumack, MD, 10/85

C. Revised by: Betty J Dabney, PhD, 01/90

D. In addition to standard revisions of this management certain portions were updated with recent literature: 09/95; 08/96

E. Specialty Board: Pesticides

Refer to the TOMES EDITORIAL BOARD section for more information.

(TM0487)

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New Jersey Hazardous Substance Fact Sheet

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AMMONIUM SULFAMATE

Common Name: **AMMONIUM SULFAMATE**

CAS Number: 7773-06-0
DOT Number: UN 1651

RTK Substance number: 0114
Date: February 1987 Revision: December 1994

HAZARD SUMMARY

- **Ammonium Sulfamate** can affect you when breathed in.
- Contact can cause skin and eye irritation.
- Breathing **Ammonium Sulfamate** can irritate the nose and throat causing coughing and/or shortness of breath.
- Exposure to very high levels may cause nausea and vomiting.

IDENTIFICATION

Ammonium Sulfamate is a white crystalline (sand-like) solid. It is used to flame-proof textile products and paper, and as a weed killer.

REASON FOR CITATION

- **Ammonium Sulfamate** is on the Hazardous Substance List because it is regulated by OSHA and cited DOT, ACGIH, NIOSH, HHAG and EPA.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is 15 mg/m ^{3} for total dust and 5 mg/m ^{3} for respirable dust averaged over an 8-hour workshift.

ACGIH: The recommended airborne exposure limit is 10 mg/m ^{3} averaged over an 8-hour workshift.

ACGIH: The recommended airborne exposure limit is 10 mg/m ^{3} averaged over an 8-hour workshift.

WAYS OF REDUCING EXPOSURE

- Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- Wear protective work clothing.
- Wash thoroughly immediately after exposure to **Ammonium Sulfamate**.
- Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ammonium Sulfamate** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ammonium Sulfamate**:

- Contact can cause skin and eye irritation.
- Breathing **Ammonium Sulfamate** can irritate the nose and throat causing coughing and/or shortness of breath.
- Exposure to very high levels may cause nausea and vomiting.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ammonium Sulfamate** and can last for months or years:

Cancer Hazard

- According to the information presently available to the New Jersey Department of Health, **Ammonium Sulfamate** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- According to the information presently available to the New Jersey Department of Health, **Ammonium Sulfamate** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

Ammonium Sulfamate has not been tested for other chronic (long-term) health effects.

- **Ammonium Sulfamate** has not been tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- Where possible, automatically transfer **Ammonium Sulfamate** from drums or other storage containers to process containers.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- Workers whose clothing has been contaminated by **Ammonium Sulfamate** should change into clean clothing promptly.
- Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ammonium Sulfamate**.
- Eye wash fountains should be provided in the immediate work area for emergency use.
- If there is the possibility of skin exposure, emergency shower facilities should be provided.
- On skin contact with **Ammonium Sulfamate**, immediately wash or shower to remove the chemical.
- Do not eat, smoke, or drink where **Ammonium Sulfamate** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- Avoid skin contact with **Ammonium Sulfamate**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- For field applications check with your supervisor and your safety equipment supplier regarding the appropriate respiratory equipment.
- Where the potential exists for exposures over 5 mg/m^3, use a MSHA/NIOSH approved full facepiece respirator equipped with particulate (dust/fume/mist) filters. Even greater protection is provided by a powered-air purifying respirator. Particulate filters must be checked every day before work for physical damage, such as rips or tears, and replaced as needed.
- If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Ammonium Sulfamate**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposures exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode.
- Exposure to 5,000 mg/m^3 is immediately dangerous to life and health. If the possibility of exposure above 5,000 mg/m^3 exists, use a MSHA/NIOSH approved self contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that releases energy under certain conditions.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>EMERGENCY INFORMATION<<<<<<<<<

Common Name: **AMMONIUM SULFAMATE**
DOT Number: UN 1651
DOT Emergency Guide code: 31
CAS Number: 7773-06-0

Hazard Rating	NJ DOH	NFPA
FLAMMABILITY	0	Not Rated
REACTIVITY	1	Not Rated
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

- **Ammonium Sulfamate** may burn, but does not readily ignite.
- Use dry chemical, CO_2, or foam extinguishers.
- POISONOUS GASES ARE PRODUCED IN FIRE, including Nitrogen Oxides, Sulfur Oxides, and Ammonia.
- If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Ammonium Sulfamate** is spilled, take the following steps:

- Restrict persons not wearing protective equipment from area of spill until clean-up is complete.
- Collect powdered material in the most convenient and safe manner and deposit in sealed containers. Ventilate and wash area after clean-up is complete.

- Ventilate and wash area after clean-up is complete.
- It may be necessary to contain and dispose of **Ammonium Sulfamate** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172
Other:

HANDLING AND STORAGE

- Prior to working with **Ammonium Sulfamate** you should be trained on its proper handling and storage.
- **Ammonium Sulfamate** can react explosively when HEATED or by mixing with HOT ACID.
- **Ammonium Sulfamate** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HOT WATER.
- Store in tightly closed containers in a cool, well-ventilated area away from area.

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253
Other:

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

- Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing

- Remove the person from exposure.
- Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 0 mm Hg at 68 °F (20 °C)
Water Solubility: Soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Sulfamic Acid, Monoammonium Salt

Other Names:
Ammonium Amidosulphate; Amicide

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

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Ammonium sulfamate

NIOSH Pocket Guide

1.0 CHEMICAL NAME, STRUCTURE/FORMULA, CAS AND RTECS NOS., AND DOT ID AND GUIDE NOS.

Chemical Name: Ammonium sulfamate
Formula: $NH_4OSO_2NH_2$
Structure/Formula: $NH_4OSO_2NH_2$
CAS Number: 7773-06-0
RTECS Number: WO6125000
DOT ID and NAERG Guide Numbers: 9089 171

2.0 SYNONYMS, TRADENAMES AND CONVERSION FACTORS

Synonyms/Tradenames: Ammate herbicide; Ammonium amidosulfonate; AMS; Monoammonium salt of sulfamic acid; Sulfamate

3.0 EXPOSURE LIMITS (TWA UNLESS NOTED OTHERWISE)

NIOSH Recommended Exposure Limits (RELs): Time-weighted average (TWA) 10 mg/m ^{3} (total particulate) Time-weighted average (TWA) 5 mg/m ^{3} (respirable fraction)
OSHA Permissible Exposure Limits (PELs): (Vacated OSHA PELs are listed in Appendix G) Time-weighted average (TWA) 15 mg/m ^{3} (total particulate) Time-weighted average (TWA) 5 mg/m ^{3} (respirable fraction)

4.0 IDLH

1500 mg/m ^{3}

5.0 PHYSICAL DESCRIPTION

Colorless to white crystalline, odorless solid.
Notes: [herbicide]

6.0 CHEMICAL AND PHYSICAL PROPERTIES

Molecular Weight: 114.1
Boiling Point: 320°F (Decomposes)
Solubility in Water: 200%
Flash Point: NA
Ionization Potential: Unknown
Specific Gravity: 1.77
Flammability Class: Noncombustible Solid
Vapor Pressure: 0 mmHg (approx)
Freezing Point: 268°F
Upper Explosive Limit in air (% by volume): NA
Lower Explosive Limit in air (% by volume): NA

7.0 INCOMPATIBILITIES AND REACTIVITIES

Acids, hot water
Notes: [Elevated temperatures cause a highly exothermic reaction with water.]

8.0 MEASUREMENT METHOD (SEE TABLE 1)

Particulate filter; Water; Ion chromatography; II(5) [#S348]

9.0 PERSONAL PROTECTION AND SANITATION (SEE TABLE 3)

Skin: No recommendation is made specifying the need for personal protective equipment for the body.
Eyes: No recommendation is made specifying the need for eye protection.
Wash Skin: No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).
Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.
Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

10.0 RECOMMENDATIONS FOR RESPIRATOR SELECTION (SEE TABLE 4)

NIOSH

50 mg/m^3: Any dust and mist respirator.(Assigned Protection Factor = 5)

100 mg/m^3: Any dust and mist respirator except single-use and quarter-mask respirators.(Assigned Protection Factor = 10)/Any supplied-air respirator.(Assigned Protection Factor = 10)

250 mg/m^3: Any supplied-air respirator operated in a continuous-flow mode.(Assigned Protection Factor = 25)/Any powered, air-purifying respirator with a dust and mist filter.(Assigned Protection Factor = 25)

500 mg/m^3: Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode.(Assigned Protection Factor = 50)/Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.(Assigned Protection Factor = 50)/Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter.(Assigned Protection Factor = 50)/Any self-contained breathing apparatus with a full facepiece.(Assigned Protection Factor = 50)/Any supplied-air respirator with a full facepiece.(Assigned Protection Factor = 50)

1500 mg/m^3: Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.(Assigned Protection Factor = 2000)

Emergency or planned entry into unknown concentrations or IDLH conditions: Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode(Assigned Protection Factor = 10000)/Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.(Assigned Protection Factor = 10000)

Escape: Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter.(Assigned Protection Factor = 50)/Any appropriate escape-type, self-contained breathing apparatus.

11.0 HEALTH HAZARDS

Exposure Routes: Inhalation, Skin and/or eye contact

Exposure Routes: Inhalation, Skin and/or eye contact
Exposure Symptoms (See Table 5): Irritation eyes, nose, throat; cough, Dyspnea (breathing difficulty)
Eye (See Table 6): If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.
Skin (See Table 6): If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.
Breath (See Table 6): If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.
Swallow (See Table 6): If this chemical has been swallowed, get medical attention immediately.
Target Organs (See Table 5): Eyes, Respiratory System

AMMONIUM SULFAMATE

OHM/TADS - Oil and Hazardous Materials/Technical Assistance Data System

SUBSTANCES INCLUDED

Material name: AMMONIUM SULFAMATE
Note: Listed in CERCLA ("Superfund" Act)
Synonyms: AMMATE AMICIDE AMS AMMONIUM AMIDO-SULFATE
CAS number: 7773-06-0
Chemical formula: NH4NH2SO3
SIC CODE: 2879
Tradename(s): AMMATE (DU PONT)
Production sites: DU PONT, E CHICAGO, IN; LINDEN NJ.
Species in mixture: 99% PURE, 1% AMMONIUM SULFATE.

COMMON USES

HERBICIDE; FLAMEPROOFING; AGENT FOR TEXTILES AND SOME PAPERS; WEED AND BRUSH KILLER; ELECTROPLATING; GENERATION OF NITROUS OXIDE.

TRANSPORT/STORAGE/HANDLING

Transport:
Rail(%): 17.0
Barge(%): .8
Truck(%): 80.2
Storage:
Containers: BAGS, CARLOTS, TRUCKLOADS.
General storage procedures: KEEP IN WELL VENTILATED AREA.
Handling:
General handling procedures: WEAR RUBBER GLOVES FOR ALL HANDLING.

LABORATORY

Field detection limits (ppm): .2, SP. EL., (BNW 100193)
Laboratory detection limits (ppm): .01, SP. EL., (BNW 100193)

PHYSICOCHEMICAL PARAMETERS

Physical parameters:

Location/state of material: WHITE CRYSTALLINE SALT OR YELLOW SOLID. WILL DISSOLVE.
Color in water: COLORLESS
Melting point (degrees C): 131
Boiling point (degrees C): 160
Boiling characteristics: DECOMPOSES

Chemical parameters:

Solubility (ppm 25 degrees C): 1000000
Reactivity:
Synergistic materials: CALCIUM, MAGNESIUM AND POTASSIUM IONS CAN BE SYNERGISTIC TO AMMONIUM IONS NEAR TOXIC LEVELS,.

AMMONIUM IONS NEAR TOXIC LEVELS,.

Antagonistic materials: SODIUM IS ANTAGONISTIC TO AMMONIUM IONS AT TOXIC LEVELS.

Water chemistry: HYDROLYZES AT ELEVATED TEMPERATURES. SEE AMMONIA FILE FOR SOLUTION CHEMISTRY.

FIRE/EXPLOSION/CORROSION HAZARDS

Fire hazard:

Flammability: SLIGHT

Standard codes: EPA 311; NFPA-1,1,5; KEEP CLOSED AND PROTECTED FROM MOISTURE; SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST.

Toxic combustion products: OXIDES OF SULFUR.

Extinguishing methods: SELF-CONTAINED BREATHING APPARATUS, RUBBER GLOVES, HATS, SUITS AND BOOTS MUST BE WORN. HIGHLY TOXIC FUMES ARE IMMINENT.

Personnel protection: SELF-CONTAINED BREATHING APPARATUS MUST BE WORN. RUBBER GLOVES, HATS, SUITS AND BOOTS MUST BE WORN.

Explosion hazard:

Explosiveness: SLIGHT REACTIVE ONLY UNDER EXTREME CONDITIONS.

Corrosion hazard:

Corrosiveness: MILDLY CORROSIVE TO CARBON STEEL, COPPER, BRASS, BRONZE, IRON.

ENVIRONMENTAL HAZARDS

Pollution hazard:

Water pollution:

Persistency: HYDROLYZES FAIRLY RAPIDLY AT ELEVATED TEMPERATURES. PERSISTED IN SOIL 1-3 MONTHS.

Water uses threatened: IRRIGATION

Industrial fouling potential: INDUSTRIAL USE LEVEL RECREATION 1 PPM NH3-N.

Food chain:

Potential for accumulation: NEGATIVE

Food chain concentration: NEGATIVE

Aquatic toxicity:

Freshwater toxicity text (Conc. in ppm):

Conc.	Expos (Hr)	Specie	Effect	Test Environment
259	24	CATFISH	50% KILL	
1100	24	HARLEQUIN FISH	LC50	STATIC AND CONTINUOUS FLOW, HARD
206	48	CATFISH	50% KILL	
700	24	HARLEQUIN FISH	LC50	STATIC AND CONTINUOUS FLOW, SOFT
203	96	CATFISH	50% KILL	
3200	24	HARLEQUIN FISH	LC50	STATIC AND CONTINUOUS FLOW, PH 5.7
76 LB/ACRE	-	ALLIGATOR WEED	1% CONTROL	-

RE			L	
510	24	HARLEQUIN FISH	LC50	STATIC AND CONTINUOUS FLOW PH 7.1
120 LB/AC	-	CATTAIL	80% CONTROL	-
RE			L	
55	24	HARLEQUIN FISH	LC50	STATIC AND CONTINUOUS FLOW PH I
1250	24	HARLEQUIN FISH	LC50	

Toxicity to animals:

Animal toxicity text (Value in mg of material/kg body wt):

Value	Time	Species	Param.	Route
3900		RAT	LD50	ORL

Toxicity to plants:

Species threatened: AQUATIC PLANTS.

RANGE OF TOXICITY

Inhalation limit: 10

Inhalation limit text: MG/M3

Direct contact: NONE NOTED IN TESTS WITH RATS.

General sensation: NO ODOR, 10% SOLUTION - PH 5.1

Direct human ingestion (mg/kgwt): 2000

HUMAN HEALTH HAZARDS

Acute hazard level: HIGH SOLUBILITY INDICATES LETHAL DOSE WILL RAPIDLY BE ATTAINED IN AREA OF SPILL.

Public health hazard: HIGH TOXICITY INDICATES HIGH HEALTH HAZARD. APPROXIMATE LETHALL DOSE TO 150 LB MAN - 1 CUPFUL ; IN DISASTER SITUATIONS, FIRE AND HEAT THREATEN TO RELEASE TOXIC FUMES.

Action levels: EVACUATE AREA. ENTER FROM UPWIND SIDE. NOTIFY LOCAL AIR AUTHORITY AND NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION.

CLEANUP PROCEDURES

In situ amelioration: CLINOPTILOLITE CAN BE USED TO PICK UP AMMONIUM IONS. SULFAMATE CAN BE PICKED UP ON ANION EXCHANGERS OR ORGANIC ACID EXCHANGERS. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

Beach/shore restoration: SALT CAN BE WASHED OUT OF SAND. EXCHANGED SALT ON ZEOLITES MAY HAVE TO BE WASHED WITH SALINE SOLUTION. TIDE WILL CLEAN COASTAL BEACHES. RAISING TEMPERATURE TO 160 DEGREES CENTIGRADE WILL DECOMPOSE THE SULFAMATE.

Countermeasure material availability: EXCHANGERS MAY BE AVAILABLE FROM WATER SOFTENER SUPPLY OUTFITS.

Disposal method(s): HYDROLYZES IN ACID DECOMPOSES AT 160 DEGREES CELSIUS. SLOWLY AGITATE INTO COLD WATER, NEUTRALIZE, AND FLUSH TO SEWAGE TREATMENT PLANT.

Disposal notification(s): CONTACT LOCAL SEWAGE MAINTENANCE PERSONNEL.

DATA ADEQUACY EVALUATION

MODERATE

MODERATE

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*****************************************************************************
* User name:   slm8 (113)                    Queue:  FNIO-SDT-TAFT/PQ-EID-B36    *
* File name:                                 Server: PS-EID-B36-HP5              *
* Directory:                                                                     *
* Description:  Sulfamic acid, monoammonium sa                                   *
*              May 20, 1998                          3:07pm                     *
*****************************************************************************
*                                                                               *
*                                  ll          888                              *
*                                   l         8   8                             *
*                           ssss    l   mm m  8   8                             *
*                          s        l   m m m  888                              *
*                           sss     l   m m m 8   8                             *
*                              s    l   m   m 8   8                             *
*                          ssss    lll  m   m  888                              *
*                                                                               *
*                                                                               *
*                                                                               *
*****************************************************************************
*                                                                               *
*         PPPP   QQQ        EEEEE  III  DDDD        BBBB  33333   66            *
*         P   P Q   Q       E       I   D   D       B   B    3   6              *
*         P   P Q   Q       E       I   D   D       B   B   3   6               *
*         PPPP  Q   Q ----- EEEE    I   D   D ----- BBBB     3  6666            *
*         P     Q Q Q       E       I   D   D       B   B     3 6   6           *
*         P     Q  Q        E       I   D   D       B   B 3   3 6   6           *
*         P      QQ Q       EEEEE  III  DDDD        BBBB   333   666            *
*                                                                               *
*                                                                               *
*                                                                               *
*****************************************************************************
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Sulfamic acid, monoammonium salt

RTECS - Registry of Toxic Effects of Chemical Substances

1.0 SUBSTANCE IDENTIFICATION

RTECS Number: WO6125000
Chemical Name: Sulfamic acid, monoammonium salt
CAS Number: 7773-06-0
Molecular Formula: H3-N-O3-S.H3-N
Molecular Weight: 114.14
Wiswesser Notation: ZSWQ &ZH
Substance Investigated as: Agricultural Chemical
Last Revision Date: 1997

2.0 SYNONYM(S)/TRADENAME(S)

1 Amicide
2 Ammat
3 Ammate
4 Ammate X
5 Ammonium amidosulfonate
6 Ammonium amidosulphate
7 Ammonium sulfamate (ACGIH:OSHA)
8 Ammonium sulphamate Ammonium sulphamidate
9 Ammoniumsalz der amidosulfonsaure (German)
10 AMS
11 Feliderm K
12 Fyran 200 K
13 Fyran J 3
14 Ikurin
15 Monoammonium sulfamate
16 Sulfaminsaure (German)

3.0 HEALTH HAZARD DATA

ACUTE TOXICITY

LDLO/LCLO - LOWEST PUBLISHED LETHAL DOSE/CONC

Rat

LDLo - ROUTE: Intraperitoneal; **DOSE:** 800 mg/kg *CODEN: JIHTAB Bibliographic Data: Journal of Industrial Hygiene and Toxicology. (Cambridge, MA) V.18-31, 1936-49. For publisher information, see AEHLAU. CODEN Reference: 25:26,1943*
TOXIC EFFECTS:
Behavioral - Somnolence (general depressed activity)
Lung, Thorax, or Respiration - Respiratory stimulation

LD50/LC50 - LETHAL DOSE/CONC 50% KILL

Rat

LD50 - ROUTE: Oral; **DOSE:** 2 gm/kg *CODEN: AMIHAB Bibliographic Data: AMA*

LD50 - **ROUTE:** Oral; **DOSE:** 2 gm/kg *CODEN: AMIHAB Bibliographic Data: AMA Archives of Industrial Health. (Chicago, IL) V.11-21, 1955-60. For publisher information, see AEHLAU. CODEN Reference: 14:178,1956*

Mouse

LD50 - **ROUTE:** Oral; **DOSE:** 3100 mg/kg *CODEN: GTPZAB Bibliographic Data: Gigiena Truda i Professional'nye Zabolevaniya. Labor Hygiene and Occupational Diseases. (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) V.1-36, 1957-1992. For publisher information, see MTPEEI CODEN Reference: 7(5):56,1963*
TOXIC EFFECTS:
Behavioral - General anesthetic
Behavioral - Convulsions or effect on seizure threshold
Lung, Thorax, or Respiration - Dyspnea

OTHER LD/LC - OTHER LETHAL DOSE/CONC

Mouse

LD - **ROUTE:** Intraperitoneal; **DOSE:** >500 mg/kg *CODEN: CBCCT* Bibliographic Data: "Summary Tables of Biological Tests," National Research Council Chemical-Biological Coordination Center. (National Academy of Science Library, 2101 Constitution Ave., NW, Washington, DC 20418) CODEN Reference: 4:316,1952*

OTHER MULTIPLE DOSE TOXICITY DATA

Rat

ROUTE: Oral; **DOSE:** 39 gm/kg/90D intermittent *CODEN: TXCYAC Bibliographic Data: Toxicology. (Elsevier Scientific Pub. Ireland, Ltd., POB 85, Limerick, Ireland) V.1- 1973- CODEN Reference: 13:45,1979*
TOXIC EFFECTS:
Nutritional and Gross Metabolic - Weight loss or decreased weight gain

4.0 STANDARDS AND REGULATIONS

1 EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION *CODEN: FEREAC Bibliographic Data: Federal Register. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) V.1- 1936- CODEN Reference: 54:7740,1989*
2 MSHA STANDARD-air:TWA 10 mg/m3 *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: 3:12,1971*
3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
4 OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV
5 OEL-AUSTRALIA:TWA 10 mg/m3 JAN 1993
6 OEL-AUSTRIA:TWA 15 mg/m3 JAN 1993
7 OEL-BELGIUM:TWA 10 mg/m3 JAN 1993
8 OEL-DENMARK:TWA 10 mg/m3 JAN 1993
9 OEL-FINLAND:TWA 10 mg/m3;STEL 20 mg/m3 JAN 1993
10 OEL-FRANCE:TWA 10 mg/m3 JAN 1993
11 OEL-GERMANY:TWA 15 mg/m3 (total dust) JAN 1993
12 OEL-RUSSIA:STEL 10 mg/m3 JAN 1993
13 OEL-SWITZERLAND:TWA 10 mg/m3 JAN 1993
14 OEL-THE NETHERLANDS:TWA 10 mg/m3 JAN 1993
15 OEL-THE PHILIPPINES:TWA 15 mg/m3 JAN 1993
16 OEL-TURKEY:TWA 15 mg/m3 JAN 1993
17 OEL-UNITED KINGDOM:TWA 10 mg/m3;STEL 20 mg/m3 JAN 1993
18 OSHA PEL (Construc):8H TWA 15 mg/m3, total dust *CODEN: CFRGBR Bibliographic Data:*

18
Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1926.55,1994

19 OSHA PEL (Construc):8H TWA 5 mg/m3, respirable fraction *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1926.55,1994*

20 OSHA PEL (Fed Cont):8H TWA 15 mg/m3 *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 41:50-204.50,1994*

21 OSHA PEL (Gen Indu):8H TWA 15 mg/m3, total dust *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1910.1000,1994*

22 OSHA PEL (Gen Indu):8H TWA 5 mg/m3, respirable fraction *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1910.1000,1994*

23 OSHA PEL (Shipyard):8H TWA 15 mg/m3, total dust *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1915.1000,1993*

24 OSHA PEL (Shipyard):8H TWA 5 mg/m3, respirable fraction *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1915.1000,1993*

5.0 NIOSH DOCUMENTS

1 NIOSH REL TO AMMONIUM SULFAMATE, respirable dust-air:10H TWA 5 mg/m3

2 NIOSH REL TO AMMONIUM SULFAMATE, total dust-air:10H TWA 10 mg/m3

3 National Occupational Exposure Survey 1983: Hazard Code 06190; Number of Industries 7; Total Number of Facilities 288; Number of Occupations 14; Total Number of Employees 9676; Total Number of Female Employees 4583

4 National Occupational Hazard Survey 1974: Hazard Code 06190; Number of Industries 5; Total Number of Facilities 232; Number of Occupations 7; Total Number of Employees 2131

6.0 REVIEWS

ACGIH TLV-TWA 10 mg/m3 *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: TLV/BEI,1996*

7.0 STATUS IN U.S.

1 EPA TSCA Section 8(b) CHEMICAL INVENTORY

2 On EPA IRIS database

TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE

HSDB - Hazardous Substances Data Bank

0.0 ADMINISTRATIVE INFORMATION

Hazardous Substances Data Bank Number: 4364
Last Revision Date: 970820
Review Date: Reviewed by SRP on 3/17/89
Update History:

1 Complete Update on 08/20/97, 3 fields added/edited/deleted.
2 Field Update on 05/01/97, 2 fields added/edited/deleted.
3 Complete Update on 01/28/97, 1 field added/edited/deleted.
4 Complete Update on 05/13/96, 1 field added/edited/deleted.
5 Complete Update on 01/28/96, 1 field added/edited/deleted.
6 Complete Update on 01/03/95, 1 field added/edited/deleted.
7 Complete Update on 03/25/94, 1 field added/edited/deleted.
8 Field update on 01/02/93, 1 field added/edited/deleted.
9 Field update on 03/06/90, 1 field added/edited/deleted.
10 Complete Update on 07/28/89, 42 fields added/edited/deleted.
11 Complete Update on 01/12/85

1.0 SUBSTANCE IDENTIFICATION

Name of Substance: TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE
CAS Registry Number: 13674-87-8
Synonyms:

1 Emulsion 212 [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
2 FYROL FR 2 [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
3 Phosphoric acid tris(1,3-dichloro-2-propyl)ester [Peer Reviewed] *The Merck Index. 10th ed Rahway, New Jersey: Merck Co., Inc., 1983. 617*
4 TCPP [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
5 TDCPP [Peer Reviewed] *U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS fi*
6 Tris(1,3-dichloroisopropyl)phosphate [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
7 Tris(2-chloro-1-(chloromethyl)ethyl)phosphate [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
8 1,3-DICHLORO-2-PROPANOL PHOSPHATE (3:1) [Peer Reviewed]
9 2-PROPANOL, 1,3-DICHLORO-, PHOSPHATE (3:1) [Peer Reviewed]
10 Fosforan Troj-(1,3-dwuchloroizopropylowy) (Polish) [Peer Reviewed]
11 PF 38 [Peer Reviewed]
12 PF 38/3 [Peer Reviewed]
13 TDCP [Peer Reviewed]
14 TRIS(1-CHLOROMETHYL-2-CHLOROETHYL)PHOSPHATE [Peer Reviewed]
15 TRIS-(1,3-DICHLORO-2-PROPYL)-PHOSPHATE [Peer Reviewed]

Molecular Formula: C9-H15-Cl6-O4-P [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New*

Molecular Formula: C9-H15-Cl6-O4-P [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
Wiswesser Line Notation: G1Y1GOPO&OY1G1GOY1G1G [Peer Reviewed] *U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry ofToxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS fi*
RTECS Number: NIOSH/UB1473000

2.0 MANUFACTURING/USE INFORMATION

Methods of Manufacturing:

... From epichlorohydrin and phosphorus oxychloride and contains 49 wt % chlorine and 7.2 wt % phosphorus. The resultant dichloropropyl groups are mainly 1,3-dichloro-2-propyl groups. [Peer Reviewed] *Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984.,p. 10(80) 402*

Other Manufacturing Information:

FYROL /IS/ TRADEMARK FOR SERIES OF PHOSPHATE FLAME RETARDANT PLASTICIZERS. /FYROL/ [Peer Reviewed] *Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand Reinhold Co., 1977. 403*

Major Uses:

1 Flame retardant formerly used in children's sleepwear; once considered as a potential replacement for tris(2,3-dibromo-1-propyl) phosphate. [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
2 Tris(1,3-dichloro-2-propyl)phosphate is used as flame retardant in a wide variety of commercial items such as polyurethane and polyisocyanurate foams, flexible urethane foams, automotive seating, styrene-butadiene rubber and acrylic latexes for textile backcoating and binding of nonwoven fabrics. [Peer Reviewed] *Weil ED; Kirk-Othmer Encycl Chem Tech 3rd ed 10: 396-419 (1980)*

3.0 CHEMICAL AND PHYSICAL PROPERTIES

Color/Form: Viscous liquid [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
Boiling Point: 236-237 deg C at 5 mm Hg [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
Molecular Weight: 430.88 [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
Octanol/Water Partition Coefficient: log Kow= 3.76 [Peer Reviewed] *Sasaki K et al; Bull Environ Contam Toxicol 27: 775-82 (1981)*
Solubilities:

1 100 ppm in water (approx) [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
2 Water solubility= 7 mg/l [Peer Reviewed] *Hollifield HC; Bull Environ Contam Toxicol 23: 579-86 (1979)*

Spectral Properties: Index of refraction: 1.5022 at 20 deg C [Peer Reviewed] *The Merck Index. 10th ed. Rahway, New Jersey: Merck Co., Inc., 1983. 617*
Vapor Pressure: 0.01 mm Hg at 30 deg C [Peer Reviewed] *Lande SS et al; Investigation of Selected Potential Environmental Contaminants: Haloakyl Phosphates EPA-560/2-76-0007 NTIS# BP257910 (1976)*
Other Chemical/Physical Properties:

Other Chemical/Physical Properties:

1 The rate constant for the vapor-phase reaction of tris(1,3-dichloro-2-propyl)phosphate with photochemically produced hydroxyl radicals has been estimated to be 38.1X10-12 cu cm/molecule-sec at 25 deg C. [Peer Reviewed] *Atkinson R; J Inter Chem Kinet 19: 799-828 (1987)*

2 The Henry's Law Constant for tris(1,3-dichloro-2-propyl)phosphate can be estimated to be 8.1X10-4 atm-cu m/mole. [Peer Reviewed] *Lyman WJ et al; Handbook of Chemical Property Estimation Methods NY: McGraw-Hill p. 15-15 to 15-29 (1982)*

4.0 SAFETY AND HANDLING

FIRE FIGHTING INFORMATION

Toxic Combustion Products:

When heated to decomposition, it emits toxic fumes of Cl- and POx. [Peer Reviewed] *Sax, N.I. Dangerous Properties of Industrial Materials. 6th ed. New York, NY: Van Nostrand Reinhold, 1984. 2691*

HAZARDOUS REACTIONS

Decomposition:

When heated to decomposition, it emits toxic fumes of /hydrogen chloride and phosphorus oxides/. [Peer Reviewed] *Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996. 1713*

WARNING PROPERTIES

Skin, Eye and Respiratory Irritations:

... Fyrol FR-2 can be irritating to the skin and the eyes ... . [Peer Reviewed] *USEPA; Subst Risk Notice, 8EHQ-1280-0401 S (8/13/81)*

PREVENTIVE MEASURES

Protective Equipment and Clothing:

Some data suggesting breakthrough times /for butyl rubber and nitrile rubber/ of approximately an hour or more. /Organo-phosphorus cmpd/ [Peer Reviewed] *ACGIH; Guidelines Select of Chem Protect Clothing Volume #1 Field Guide p.79 (1983)*

Other Preventative Measures:

1 SRP: Contact lenses should not be worn when working with this chemical. [Peer Reviewed]

2 SRP: The scientific literature for the use of contact lenses inindustry is conflicting. The benefit or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not bewom. In any event, the usual eye protection equipment should

contact lenses should not bewom. In any event, the usual eye protection equipment should be worn even when contact lenses are in place. [Peer Reviewed]

OTHER SAFETY AND HANDLING

Disposal Methods:

SRP: At the time of review, criteria for land treatment or burial (sanitary landfill) disposal practices are subject to significant revision. Prior to implementing land disposal of waste residue (including waste sludge), consult with environmental regulatory agencies for guidance on acceptable disposal practices. [Peer Reviewed]

5.0 TOXICITY/BIOMEDICAL EFFECTS

TOXICITY EXCERPTS

Non-Human Toxicity Excerpts:

1 AFTER 20 LAUNDERINGS, 37% OF FLAME RETARDANT WAS LOST FROM POLYESTER SLEEPWEAR. FYROL FR-2 RELEASED FROM UNLAUNDERED SLEEPWEAR TO WATER AT 30 PPM CAUSED DEATH TO GOLDFISH WITHIN 3 HR. IT REMAINED STABLE IN WATER FOR 24 HR. [Peer Reviewed] *AHRENS VD ET AL; BULL ENVIRON CONTAM TOXICOL 21 (3): 409 (1979)*

2 AN IN VIVO SYSTEM FOR DETECTION OF SISTER CHROMATID EXCHANGES (SCE) IN PRENATAL PERIOD WAS PERFECTED & APPLIED TO PROBLEM OF SCREENING ENVIRONMENTAL CHEM FOR POTENTIAL MUTAGENICITY. THIS SCREENING SYSTEM USES 3 TO 4 DAY CHICK EMBRYO IN OVO AS TEST MATERIAL. THE 6 TO 7 DAY EMBRYO IS ALSO INCL TO GAIN INFORMATION ON MUTAGENICITY AS A FUNCTION OF DEVELOPMENTAL STAGE. SISTER CHROMATID EXCHANGES & BREAKAGE ARE STUDIED IN CELLS OBTAINED FROM LIMB BUDS, ALLANTOIC SAC, & BLOOD. CHICK EMBRYO CYTOGENETIC TEST (CECT) WAS EVALUATED FOR ITS SENSITIVITY & ACCURACY FOR DETECTING MUTAGENS AS WELL AS ECONOMY & APPLICATION AS A SCREEN FOR CHEM OF VARIOUS KINDS INCL WATER INSOL AGENTS. FYROL FR-2 WAS NEG IN CHICK EMBRYO CYTOGENETIC TEST AND FAILED TO INCR RATE OF SISTER CHROMATID EXCHANGE OR BREAKAGE. [Peer Reviewed] *BLOOM SE; CYTOGENET ASSAYS ENVIRON MUTAGENS: 137 (1982)*

3 IN PRESENCE OF PHENOBARBITAL-INDUCED LIVER HOMOGENATES, TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE WAS MUTAGENIC TO SALMONELLA TYPHIMURIUM (TA100); ITS MAJOR METABOLITE, BIS(1,3-DICHLORO-2-PROPYL)PHOSPHATE, & MINOR METABOLITE, 1,3-DICHLORO-2-PROPYL PHOSPHATE, WERE NONMUTAGENIC. ANOTHER METABOLITE, 1,3-DICHLORO-2-PROPANOL, WAS MUTAGENIC IN THE SAME SYSTEM WITHOUT LIVER HOMOGENATE ACTIVATION. [Peer Reviewed] *LYNN RK ET AL; DRUG METAB DISPOS 9 (5): 434 (1981)*

4 TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE WAS GIVEN ORALLY TO RATS AT DAILY DOSES OF 25, 50, 100, & 400 MG/KG FOR 7-15 DAYS OF GESTATION, & ITS TERATOGENIC EFFECTS EXAMINED IN FETUS & OFFSPRING. THERE WERE NO TERATOGENIC EFFECTS OBSERVED UNDER THESE CONDITIONS, THOUGH AT 400 MG/KG IT ELICITED MATERNAL & TOXIC EFFECTS. [Peer Reviewed] *TANAKA S ET AL; SEI SHIKENSHO HOKOKU (99): 50 (1981)*

5 THE ORAL LD50 VALUES OF TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE (PF 38) DETERMINED IN RATS AFTER ADMIN OF SMALL DOSES FOR 120 HR & LARGER DOSES FOR 48 HR, WERE 1.85 & 4.5 G/KG, RESPECTIVELY. PF 38 SHOWED NO IRRITANT ACTION ON RABBIT SKIN & EYES & NO SENSITIZING ACTION IN GUINEA

IRRITANT ACTION ON RABBIT SKIN & EYES & NO SENSITIZING ACTION IN GUINEA PIGS. THE MOST SEVERE PATHOLOGICAL CHANGES AFTER ORAL TREATMENT OF RATS OCCURRED IN KIDNEYS, WHERE FATTY DEGENERATION & NECROSIS WERE OBSERVED. [Peer Reviewed] *PIOTROWSKI JK ET AL; BROMATOL CHEM TOKSYKOL 9 (2): 141 (1976)*

6 TRIS(1,3-DICHLORO-2-PROPYL)PHOSPHATE SHOWED WEAK POS OR VARIABLE RESULTS IN TESTS FOR CHROMOSOME EFFECTS AND IN TESTS WITH BACTERIA. [Peer Reviewed] *BRUSICK D ET AL; J ENVIRON PATHOL TOXICOL 3 (1-2): 207 (1979)*

7 Tris(1,3-dichloro-2-propyl) phosphate showed positive results for mutagenicity in Salmonella typhimurium assays (multiple tests: all positive). [Peer Reviewed] *NTP; Fiscal Year 1987 Annual Plan p.72 (1987) NTP-87-001*

8 Fyrol FR-2 was administered in the /diet of rats/ at dose levels of 0, 5, 20, and 80 mg/kg/day. ... Neoplastic changes were observed microscopically in the liver of the test animals and ... incidence of hepatocellular carcinomas was statistically significant at the 80 mg/kg dose but not at the lower doses. ... Benign testicular interstitial cell tumors ... /were/ observed microscopically. [Peer Reviewed] *USEPA; Subst Risk Notice, 8EHQ-1280-0401 S (8/13/81)*

9 Fyrol FR-2 posseses weak (but significant) mutagenic activity when tested in Ames/Salmonella bacterial assay in the presence of phenobarbital induced mouse liver and rat liver enzyme preparation, polychlorinated biphenyl induced mouse liver enzyme preparation, and phenobarbital induced hamster liver enzyme preparation. ... /Evidence/ also indicates that Fyrol FR-2 can induce both sister chromatid exchanges and chromosomal aberrations in vitro (mouse L5178Y cells). [Peer Reviewed] *USEPA; Subst Risk Notice, 8EHQ-1280-0401 S (8/13/81)*

10 SEVERAL FLAME RETARDANTS SUCH AS FYROL FR-2 WERE TOXIC TO GOLDFISH WITH SLUGGISH & DISORIENTED SWIMMING PRIOR TO DEATH. [Peer Reviewed] *ELDEFRAWI ET AL; BULL ENVIRON CONTAM TOXICOL 17 (6): 720-6 (1977)*

TOXICITY VALUES

TSCA Test Submissions:

In a fertility study, male rabbits (10/group, strain not specified) were exposed orally by gavage to tris(1,3-dichloroisopropyl) phosphate at dose levels of 0, 2, 20 or 200 mg/kg/day daily for 12 weeks. The males were then mated with female rats. Significant differences were observed between treated and control male animals in the following: increased absolute kidney weight and relative liver weight (high-dose group). No significant differences were observed between treated and control male animals in the following: mating behavior, male fertility or sperm quantity and quality, body weight, clinical signs, blood chemistry, hematology values, and gross or microscopic examination of tissues. *Confidential; Fyrol FR-2 (Tris(1,3-dichloroisopropyl) phosphate) Fertility Study in Male Rabbits. (1983), EPA Document No. FYI-OTS-0183-0228, Fiche No. OTS00000228S-0*

PHARMACOKINETICS

Absorption, Distribution and Excretion:

1 (14)C-LABELED FYROL FR 2 WAS READILY ABSORBED FROM SKIN & GI TRACT OF RATS & RAPIDLY DISTRIBUTED THROUGHOUT BODY. ROUTE OF ADMIN HAD LITTLE EFFECT ON DISTRIBUTION. ABSORPTION & DISTRIBUTION WERE UNAFFECTED OVER DOSE RANGE OF 2 ORDERS OF MAGNITUDE. [Peer Reviewed] *NOMEIR AA ET AL; TOXICOL APPL PHARMACOL 57 (3): 401 (1981)*

2 SIX HR AFTER ADMIN (94.4 UMOL/KG, IV) OF U-(14)C-LABELED TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE, THERE WERE VARYING AMT IN LIVER, KIDNEY, MUSCLE, NUCLEIC ACIDS, & PROTEIN ISOLATED FROM EACH TISSUE. HIGHEST CONCN IN LIVER. IN EACH TISSUE, HIGHEST CONCN OF BOUND RADIOACTIVITY WAS IN LOW MOL WT RNA, WITH DECR CONCN IN PROTEIN, RRNA,

RADIOACTIVITY WAS IN LOW MOL WT RNA, WITH DECR CONCN IN PROTEIN, RRNA, & DNA. [Peer Reviewed] *MORALES NM, MATTHEWS HB; BULL ENVIRON CONTAM TOXICOL 25 (1): 34 (1980)*

3 FIVE DAYS AFTER IV ADMIN OF (14)C-TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE (TDCP) TO SPRAGUE DAWLEY RATS, 92% OF ADMIN RADIOLABEL WAS EXCRETED; 54% IN URINE, 16% IN FECES, & 22% IN EXPIRED AIR; 4% WAS RECOVERED IN THE BODY. LESS THAN 0.1% OF ADMIN DOSE WAS RECOVERED AS TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE IN EXCRETA. TDCP WAS ELIMINATED PRIMARILY BY RAPID METABOLISM WHEREAS THE SLOWLY METABOLIZED BIS(1,3-DICHLORO-2-PROPYL)PHOSPHATE WAS ELIMINATED BY EXCRETION. MAJOR PORTION OF RADIOLABEL EXCRETED IN BILE UNDERWENT ENTEROHEPATIC RECIRCULATION. [Peer Reviewed] *LYNN RK ET AL; DRUG METB DISPOS 9 (5): 434 (1981)*

4 IN CONTINUOUS FLOW TEST SYSTEM TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE WAS TAKEN UP RAPIDLY BY KILLIFISH REACHING MAX ON 1ST DAY & LEVELS WERE MAINTAINED UNTIL LAST DAY OF EXPOSURE. ELIMINATION WAS VERY FAST. [Peer Reviewed] *SASAKI K ET AL; BULL ENVIRON CONTAM TOXICOL 28 (6): 752 (1982)*

5 NEGATIVE CHEMICAL IONIZATION SCREENING EVIDENCE SUGGESTS THAT THIS FLAME RETARDANT OR ITS ISOMER, TRIS(2,3-DICHLORO-1-PROPYL)PHOSPHATE, OR BOTH, ARE ABSORBED INTO THE BODY FROM FORMULATIONS IN WHICH THEY ARE USED AS FLAME RETARDANTS. [Peer Reviewed] *HUDEC T ET AL; SCIENCE 211 (4485): 951 (1981)*

6 ... Capable of being absorbed both from the GI tract and from the skin. ... [Peer Reviewed] *USEPA; Subst Risk Notice, 8EHQ-1280-0401 S (8/13/81)*

Metabolism/Metabolites:

1 FIVE DAYS AFTER IV ADMIN OF (14)C-TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE TO SPRAGUE DAWLEY RATS, 22% WAS EXCRETED IN EXPIRED AIR AS (14)CO2. MAJOR URINARY, FECAL, & BILIARY METABOLITE WAS BIS(1,3-DICHLORO-2-PROPYL)PHOSPHATE. OTHER METAB INCL THE MONO ESTER, 1,3-DICHLORO-2-PROPYL PHOSPHATE, & 1,3-DICHLORO-2-PROPANOL. [Peer Reviewed] *LYNN RK ET AL; DRUG METAB DISPOS 9 (5): 434 (1981)*

2 Tris(1,3-dichloro-2-propyl)phosphate (Tris-CP) was metabolized to products which were mutagenic for Salmonella typhimurium TA100 in the presence of liver microsomes from phenobarbital (PB) pretreated rats and reduced nicotinamide adenine dinucleotide. ... [Peer Reviewed] *Soderlund EJ et al; Acta Pharmacol Toxicol 56 (1): 20-9 (1985)*

7.0 ENVIRONMENTAL FATE/EXPOSURE POTENTIAL

SUMMARY

Environmental Fate/Exposure Summary:

Tris(1,3-dichloro-2-propyl)phosphate may be released into the environment via effluents at production sites of a wide variety of products in which it may be added as a flame retardant. Tris(1,3-dichloro-2-propyl)phosphate is expected to be mobile in soil and susceptible to leaching. Sufficient data are not available to predict the significance of biodegradation or hydrolysis in water or soil. The volatilization of tris(1,3-dichloro-2-propyl)phosphate from environmental waters would be expected to be significant. The bioconcentration of tris(1,3-dichloro-2-propyl)phosphate within aquatic systems does not appear to be environmentallyimportant.

Tris(1,3-dichloro-2-propyl)phosphate may undergo some adsorption to clays and humic materials, thereby partitioning from the water column to sediments and suspended material. Volatilization of tris(1,3-dichloro-2-propyl)phosphate from environmental waters would be expected to be important with estimated half-lives from a model river and pond of 8.4 hr and 23.7 days respectively. If

with estimated half-lives from a model river and pond of 8.4 hr and 23.7 days respectively. If released to the atmosphere tris(1,3-dichloro-2-propyl)phosphate is expected to exist in the vapor phase and can be degraded rapidly in an average ambient atmosphere by reaction with photochemically produced hydroxyl radicals at an estimated half-life rate of 10.1 hr. Occupational exposure may be possible through inhalation of vapor and dermal contact at sites of its commercial manufacture and use as a flame retardant. (SRC) [Peer Reviewed]

POLLUTION SOURCES

Artificial Sources:

Tris(1,3-dichloro-2-propyl)phosphate is used as flame retardant in a wide variety of commercial items such as polyurethane and polyisocyanurate foams, flexible urethane foams, automotive seating, styrene-butadiene rubber and acrylic latexes for textile backcoating and binding of nonwoven fabrics(1). Therefore, tris(1,3-dichloro-2-propyl)phosphate may be released into the environment via effluents at production sites of a wide variety of products as well as from disposal of flame retardant products(SRC). [Peer Reviewed] *(1) Weil ED; Kirk-Othmer Encycl Chem Tech 3rd ed. 10: 396-419 (1980)*

ENVIRONMENTAL FATE

1 TERRESTRIAL FATE: Tris(1,3-dichloro-2-propyl)phosphate is expected to maintain a medium to low mobility in soil. Sufficient data are not available to predict the significance of biodegradation in soil. (SRC) [Peer Reviewed]

2 AQUATIC FATE: Tris(1,3-dichloro-2-propyl)phosphate may be stable to chemical degradation in waters having neutral pH; however, decomposition of tris(1,3-dichloro-2-propyl)phosphate may occur in acidic or alkaline waters. Sufficient data are not available to predict the significance of biodegradation or hydrolysis in water. The volatilization half-life from a model river has been estimated to be 8.4 hr(SRC). The volatilization half-life from an environmental pond has been estimated to be 23.7 days(2,SRC). Bioconcentration does not appear to be environmentally important. Based upon estimated Koc values, tris(1,3-dichloro-2-propyl)phosphate may undergo some adsorption to clays and humic materials, thereby partitioning from the water column to sediments and suspended material(SRC). [Peer Reviewed] *(1) Lyman WJ et al; Handbook of Chemical Property Estimation Methods NY: McGraw-Hill p. 15-15 to 15-29 (1982) (2) USEPA; EXAMS II Computer Simulation (1987)*

3 ATMOSPHERIC FATE: Tris(1,3-dichloro-2-propyl)phosphate is expected to exist almost entirely in the vapor-phase in the ambient atmosphere and degrade rapidly in an average ambient atmosphere by reaction with photochemically produced hydroxyl radicals at an estimated half-life rate of 10.1 hr(1). [Peer Reviewed] *(1) Atkinson R; J Inter Chem Kinet 19: 799-828 (1987)*

ENVIRONMENTAL TRANSFORMATIONS

Biodegradation:

No data regarding the biodegradation of tris(1,3-dichloro-2-propyl)phosphate in either soil or aquatic systems was available. In general, the biodegradability of haloalkyl phosphates is not well understood. [Peer Reviewed] *(1) Lande SS et al; Investigation of Selected Potential Environmental Contaminants: Haloakyl Phosphates USEPA-560/2-76-0007. NTIS PB257910 (1976) (2) Ishikawa S et al; Suishitsu Odaku Kenkyu 8: 799-807 (1985B)*

Abiotic Degradation:

1 Based upon a vapor pressure of 0.01 mm Hg at 30 deg C(2), tris(1,3-dichloro-2-propyl)phosphate is expected to exist almost entirely in the vapor-phase in the ambient atmosphere(3). The rate constant for the vapor-phase reaction of tris(1,3-dichloro-2-propyl)phosphate with photochemically produced hydroxyl radicals has been estimated to be 38.1X10-12 cu cm/molecule-sec at 25 deg C which corresponds to an atmospheric half-life of about 10.1 hr at an atmospheric concn of 5X10+5 hydroxyl radicals per cu cm(1). Tris(haloalkyl)phosphates are generally stable to hydrolysis at neutral pH and undergo moderate hydrolysis in acidic or basic solutions(2). Data from the manufacturers suggest that tris(1,3-dichloro-2-propyl)phosphate will be resistant to hydrolysis in most environmental waters(2). [Peer Reviewed] *(1) Atkinson R; J Inter Chem Kinet 19: 799-828 (1987) (2) Lande SS et al; Investigation of Selected Potential Environmental Contaminants: Haloakyl Phosphates USEPA-560/2-76-0007. NTIS PB257910 (1976) (3) Eisenreich SJ et al; Environ Sci Technol 15: 30-8*

2 TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE WAS SUBJECTED TO THERMAL OXIDATIVE DEGRADATION IN AIR @ 370 DEG C, HYDROGEN HALIDES & HALOGENATED C2- & C3-SPECIES RESULTED, ACROLEIN PRESENTED THE MAJOR TOXIC HAZARD. [Peer Reviewed] *PACIOREK KJ L ET AL; AM IND HYG ASSOC J 39 (8): 633 (1978)*

ENVIRONMENTAL TRANSPORT

Bioconcentration:

Bioconcentration were factors of 113 and 77 was determined for tris(1,3-dichloro-2-propyl)phosphate using killifish (Oryzias latipes) exposed to the chemical in static water for 24 and 96 hr(1). BCF's of 5 and 3 were obtained for goldfish (Carassius auratus) under identical conditions(1). Whereas BCF's of 32 and 49 were determined using killifish (Oryzias latipes) exposed to 0.3 ppm of tris(1,3-dichloro-2-propyl)phosphate for 4 days and 0.08 ppm for 32 days, respectively, in a continuous flow water system(2). None of these bioconcentration factors suggest tris(1,3-dichloro-2-propyl)phosphate will significantly bioconcentrate in aquatic systems(SRC). [Peer Reviewed] *(1) Sasaki K et al; Bull Environ Contam Toxicol 27: 775-82 (1981) (2) Sasaki K et al; Bull Environ Contam Toxicol 28: 752-9 (1982)*

Soil Adsorption/Mobility:

Based upon a water solubility of 7 mg/l(1) and a measured log Kow of 3.76(2), the Koc for tris(1,3-dichloro-2-propyl)phosphate can be estimated to range from 347 to 1,497 from various regression-derived equations(3). These Koc values indicate medium to low soil mobility(4). [Peer Reviewed] *(1) Hollifield, HC; Bull Environ Contam Toxicol 23: 579-86 (1979) (2) Sasaki K et al; Bull Environ Contam Toxicol 27: 775-82 (1981) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods NY: McGraw-Hill p. 4-9 (1982) (4) Swann RL et al; Res*

Volatilization from Soil/Water:

Based upon a water solubility of 7 mg/l(1) and a vapor pressure of 0.01 mm Hg at 30 deg C(2), the Henry's Law Constant for tris(1,3-dichloro-2-propyl)phosphate can be estimated to be 8.1X10-4 atm-cu m/mole(3). This value of Henry's Law Constant indicates volatilization is not rapid but may be significant from environmental waters(3). The volatilization half-life from a model river (30 deg C) 1 meter deep flowing 1 m/sec with a wind speed of 3 m/sec) has been estimated to be 8.4 hr(3). The volatilization half-life from an environmental pond has been estimated to be 23.7 days(4). [Peer Reviewed] *(1) Hollifield, HC; Bull Environ Contam Toxicol 23: 579-86 (1979) (2) Lande SS et al; Investigation of Selected Potential Environmental Contaminants: Haloakyl Phosphates USEPA-560/2-76-0007. NTIS BP257910 (1976) (3) Lyman WJ et al; Handbook of Chemical P*

USEPA-560/2-76-0007. NTIS BP257910 (1976) (3) Lyman WJ et al; Handbook of Chemical P

ENVIRONMENTAL CONCENTRATIONS

Water Concentrations:

DRINKING WATER: In a 1980 analysis of drinking water supplies from 12 Great Lakes municipalities in Canada, tris(1,3-dichloro-2-propyl)phosphate was detected in every water supply at concentrations ranging from 0.4 to 15.7 ng/l during the mo of Jan and from 0.1 to 4.6 ng/l for Aug(1). A 1978 analysis of the water from six eastern Ontario municipal water treatment plants showed drinking water concentrations of tris(1,3-dichloro-2-propyl)phosphate between 0.2 and 1.8 ng/l(2). Tris(1,3-dichloro-2-propyl)phosphate was detected at levels between 0.3 and 23.0 ng/l for 14 of 29 municipal water supplies representing the major urban centers across Canada(3). The mean concentration of tris(1,3-dichloro-2-propyl)phosphate of water supplies among drainage basins ranged from 0.0 ng/l at the Pacific Sea Board to 3.1 ng/l for the St. Lawrence River(3). Whereas the average level according to source measured 3.7, 0.3, and 0.0 ng/l for rivers, lakes, and wells, respectively(3). [Peer Reviewed] *(1) Williams DT et al; Chemosphere 11: 263-76 (1982) (2) LeBell GL et al; J Assoc Off Anal Chem 64: 991-8 (1981) (3) Williams DT, LeBell GL; Bull Environ Contam Toxicol 27: 450-7 (1981)*

HUMAN EXPOSURE

Probable Routes of Human Exposure:

1 Occupational exposure to tris(1,3-dichloro-2-propyl)phosphate may occur through dermal contact or inhalation at sites where thecompound is produced or used. (SRC) [Peer Reviewed]

2 NIOSH (NOHS Survey 1972-1974) has statistically estimated that 3,158 workers are potentially exposed to tris(1,3-dichloro-2-propyl)phosphate in the USA(1). [Peer Reviewed] *(1) NIOSH; National Occupational Hazard Survey (NOHS) (1974)*

9.0 MONITORING AND ANALYSIS METHODS

Sampling Procedures:

If phosphorus forms are to be differentiated, filter sample immediately after collection. Preserve by freezing at or below -10 deg C. Add 40 mg mercury chloride/l to the samples. ... Do not add either acid or chloroform as a preservative when phosphorus forms are to be determined. /Phosphorus forms/ [Peer Reviewed] *Franson MA (Ed); Standard Methods for the Examination of Water and Wastewater 16th edition p.441 (1985)*

Analytical Laboratory Methods:

1 A FABRIC SAMPLE FROM CHILDREN'S PAJAMAS WAS EXTRACTED IN ACETONE & RESULTING EXTRACTS ANALYZED BY NUCLEAR MAGNETIC RESONANCE (NMR). [Peer Reviewed] *GOLD MD ET AL; SCIENCE 200: 785 (1978)*

2 FOOD SAMPLES (MEATS, DAIRY PRODUCTS, FRUITS, & ROOT VEGETABLES) WERE ANLAYZED FOR VARIOUS PHOSPHATE RESIDUES INCL TRIS(1,3-DICHLORO-2-PROPYL) PHOSPHATE BY GAS CHROMATOGRAPHY EQUIPPED WITH FLAME PHOTOMETRIC OR NITROGEN/PHOSPHORUS DETECTORS. [Peer Reviewed] *DAFT JL; BULL ENVIRON CONTAM TOXICOL 29 (2): 221 (1982)*

3 The sample is collected and extracted. A 1 ml aliquot of the decant from the first or second 10 ml portion is placed in a beaker. A 5 ml volume of concentrated nitric acid is added and the mixture evaporated to 1 ml in a fume hood. A 2 ml volume of water is added and the mixture transferred to a test tube. A 1 ml volume of 1 M ammonium nitrate and 2 ml of 0.5 M

mixture transferred to a test tube. A 1 ml volume of 1 M ammonium nitrate and 2 ml of 0.5 M ammonium molybdate are added. The solution is heated to boiling and the formation of a yellow precipitate of ammonium phosphomolybdate indicates phosphate. /Phosphate/ [Peer Reviewed] *Welcher FJ, Hahn RB; Semimicro Qual Anal, 458 pp (1955) as cited in Environment Canada; Tech Info for Problem Spills: Phosphoric acid (Draft) p.82 (1981)*

4 A range of 1 to 20 mg/l (ppm) of phosphoric acid as phosphate may be determined colorimetrically. A 35 ml aliquot or less of sample is placed in a 50 ml volumetric flask. A 10 ml volume of vanadate-molybdate reagent is added and the volume taken to mark with distilled water. The treated sample is left to develop for 10 min, then the absorbance determined at 400 nm using a suitable spectrophotometer with matched 1 cm cells. A blank determination must also be made. The phosphate is determined using a calibration curve. /Phosphate/ [Peer Reviewed] *AWWA; Standard Methods for the Examination of Water and Wastewater, 15 ed (1981) as cited in Environment Canada; Tech Info for Problem Spills: Phoshoric acid (Draft) p.83 (1981)*

5 Principle: A water sample is injected into a stream of carbonate-bicarbonate eluant and passed through a series of ion exchangers. The anions of interest are separated on the basis of their relative affinities for a low capacity, strongly basic anion exchanger (guard and separator column). The separated anions are directed into a strongly acidic cation exchanger (suppressor column) where they are converted to their highly conductive acid form are measured by conductivity. They are identified on the basis of retention time as compared to standards. Quantitation is by measurement of peak area or peak height. Generally, minimum detectable concentrations are in the range of 0.05 mg/l for fluoride and 0.1 mg/l for bromide, chloride, nitrate, nitrite, phosphate(-3), and sulfate(-2) ions with a 100 ml sample loop and a 10 ohms full-scale setting on the conductivity detector. /Phosphate/ [Peer Reviewed] *Franson MA (Ed); Standard Methods for the Examination of Water and Wastewater 16th edition p.483-4 (1985)*

6 Ammonium molybdate and potassium antimonyl tartrate react in acid medium with orthophosphate to form phosphomolybdic acid that is reduced to ... molybdenum blue by ascorbic acid. Minimum detectable concn: 10 ug phosphorus/l. Interference: Arsenates. /Phosphorus/ [Peer Reviewed] *Franson MA (Ed); Standard Methods for the Examination of Water and Wastewater 16th edition p.448 (1985)*

10.0 ADDITIONAL REFERENCES

Special Reports:

Holleman JW; Health Effects of Haloalkyl Phosphate Flame Retardants and Potential Metabolic Products 40pp (1984) REPORT# ISS DOE/NBM-4006848. Tris(1,3-dichloro-2-propyl)phosphate and related compounds ... is reported.

2-Propanol, 1,3-dichloro-, phosphate (3:1)

RTECS - Registry of Toxic Effects of Chemical Substances

1.0 SUBSTANCE IDENTIFICATION

RTECS Number: UB1473000
Chemical Name: 2-Propanol, 1,3-dichloro-, phosphate (3:1)
CAS Number: 13674-87-8
Molecular Formula: C9-H15-Cl6-O4-P
Molecular Weight: 430.91
Wiswesser Notation: G1Y1GOPO&OY1G1GOY1G1G
Substance Investigated as: Tumorigen, Mutagen, Reproductive Effector
Last Revision Date: 1997

2.0 SYNONYM(S)/TRADENAME(S)

1 1,3-Dichloro-2-propanol phosphate (3:1)
2 CRP
3 CRP (fireproofing agent)
4 Emulsion 212
5 Fosforan troj-(1,3-dwuchloroizopropylowy) (Polish)
6 Fyrol FR 2
7 PF 38
8 Phosphoric acid, tris(1,3-dichloro-2-propyl) ester
9 TDCPP
10 Tri(beta,beta'-dichloroisopropyl)phosphate
11 Tris(1,3-dichloroisopropyl)phosphate
12 Tris(1-chloromethyl-2-chloroethyl)phosphate
13 Tris-(1,3-dichloro-2-propyl)-phosphate

3.0 HEALTH HAZARD DATA

ACUTE TOXICITY

LD50/LC50 - LETHAL DOSE/CONC 50% KILL

Rat

LD50 - ROUTE: Oral; **DOSE:** 1850 mg/kg *CODEN: BCTKAG Bibliographic Data: Bromatologia i Chemia Toksykologiczna. (Ars Polona, POB 1001, 00-068 Warsaw 1, Poland) V.4- 1971- CODEN Reference: 9:141,1976*

Mouse

LD50 - ROUTE: Oral; **DOSE:** 2250 mg/kg *CODEN: ESKHA5 Bibliographic Data: Eisei Shikenjo Hokoku. Bulletin of the Institute of Hygienic Sciences. (Kokuritsu Eisei Shikenjo Kagaku, 18-1 Bushitsu Johobu, Setagaya-ku, Tokyo 158, Japan) V.1- 1886- CODEN Reference: (107),36,1989*

TOXIC EFFECTS:
Sense Organs and Special Senses (Nose, Eye, Ear, and Taste) - Other
Behavioral - Tremor
Behavioral - Convulsions or effect on seizure threshold

Rabbit

LD50 - ROUTE: Skin; **DOSE:** >23700 mg/kg *CODEN: EPASR* Bibliographic Data*

LD50 - ROUTE: Skin; **DOSE:** >23700 mg/kg *CODEN: EPASR* Bibliographic Data: United States Environmental Protection Agency, Office of Pesticides and Toxic Substances. (U.S. Environmental Protection Agency, 401 M St., SW, Washington, DC 20460) History unknown. CODEN Reference: 8EHQ-1280-0401S*
TOXIC EFFECTS:
Behavioral - Irritability
Gastrointestinal - Hypermotility, diarrhea
Biochemical - True cholinesterase

REPRODUCTIVE EFFECTS

Rat

ROUTE: Oral; **DOSE:** 3600 mg/kg; **DURATION:** female 7-15D of pregnancy *CODEN: JTSCDR Bibliographic Data: Journal of Toxicological Sciences. (Japanese Soc. of Toxicological Sciences, 4th Floor, Gakkai Center Bldg., 4-16, Yayoi 2-chome, Bunkyo-ku, Tokyo 113, Japan) V.1- 1976- CODEN Reference: 8:339,1983*
TOXIC EFFECTS:
Effects on Embryo or Fetus - Fetal death
ROUTE: Oral; **DOSE:** 3600 mg/kg; **DURATION:** female 7-15D of pregnancy *CODEN: ESKHA5 Bibliographic Data: Eisei Shikenjo Hokoku. Bulletin of the Institute of Hygienic Sciences. (Kokuritsu Eisei Shikenjo Kagaku, 18-1 Bushitsu Johobu, Setagaya-ku, Tokyo 158, Japan) V.1- 1886- CODEN Reference: (99),50,1981*
TOXIC EFFECTS:
Effects on Fertility - Litter size (e.g., # fetuses per litter, measured before birth)
Effects on Embryo or Fetus - Fetal death

GENETIC EFFECTS

MUTATIONS IN MICROORGANISMS

Bacteria - S Typhimurium

DOSE: 100 ug/plate (-S9) *CODEN: SCIEAS Bibliographic Data: Science. (American Assoc. for the Advancement of Science, 1333 H St., NW, Washington, DC 20005) V.1- 1895- CODEN Reference: 200:785,1978*
DOSE: 100 umol/plate (+S9) *CODEN: MUREAV Bibliographic Data: Mutation Research. (Elsevier Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1964- CODEN Reference: 66:373,1979*

MORPHOLOGICAL TRANSFORMATION

Hamster

CELL TYPE: embryo; **DOSE:** 20 umol/L *CODEN: APTOA6 Bibliographic Data: Acta Pharmacologica et Toxicologica. (Copenhagen, Denmark) V.1-59, 1945-86. For publisher information, see PHTOEH CODEN Reference: 56:20,1985*

TUMORIGENIC EFFECTS

Rat

ROUTE: Oral; **DOSE:** 58400 mg/kg/2Y continuous *CODEN: EPASR* Bibliographic Data: United States Environmental Protection Agency, Office of Pesticides and Toxic Substances. (U.S. Environmental Protection Agency, 401 M St., SW, Washington, DC 20460) History unknown. CODEN Reference: 8EHQ-1280-0401S*
TOXIC EFFECTS:
Tumorigenic - Carcinogenic by RTECS criteria
Liver - Tumors

Liver - Tumors

OTHER MULTIPLE DOSE TOXICITY DATA

Mouse

ROUTE: Oral; **DOSE:** 15561 mg/kg/13W continuous *CODEN: ESKHA5 Bibliographic Data: Eisei Shikenjo Hokoku. Bulletin of the Institute of Hygienic Sciences. (Kokuritsu Eisei Shikenjo Kagaku, 18-1 Bushitsu Johobu, Setagaya-ku, Tokyo 158, Japan) V.1-1886- CODEN Reference: (107),36,1989*
TOXIC EFFECTS:
Gastrointestinal - Tumors
Kidney, Ureter, and Bladder - Tumors
Blood - Pigmented or nucleated red blood cells

Rabbit

ROUTE: Oral; **DOSE:** 16800 mg/kg/12W intermittent *CODEN: TOXID9 Bibliographic Data: Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- CODEN Reference: 3:22,1983*
TOXIC EFFECTS:
Liver - Changes in liver weight
Kidney, Ureter, and Bladder - Changes in bladder weight

6.0 REVIEWS

TOXICOLOGY REVIEW *CODEN: CTOXAO Bibliographic Data: Clinical Toxicology. (New York, NY) V.1-18, 1968-81. For publisher information, see JTCTDW. CODEN Reference: 17:101,1980*

7.0 STATUS IN U.S.

1 EPA GENETOX PROGRAM 1988, Inconclusive: Histidine reversion-Ames test
2 EPA TSCA Section 8(b) CHEMICAL INVENTORY
3 EPA TSCA Section 8(d) unpublished health/safety studies
4 EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, SEPTEMBER 1997

1-Propanol, 2-chloro-, phosphate (3:1)

RTECS - Registry of Toxic Effects of Chemical Substances

1.0 SUBSTANCE IDENTIFICATION

RTECS Number: UA9456500
Chemical Name: 1-Propanol, 2-chloro-, phosphate (3:1)
CAS Number: 6145-73-9
Molecular Formula: C19-H18-Cl3-O4-P
Molecular Weight: 447.69
Last Revision Date: 1997

2.0 SYNONYM(S)/TRADENAME(S)

1 2-Chloro-1-propanol phosphate (3:1)
2 Antiblaze 80
3 AP 33
4 Fyrol PCF
5 Tris(2-chloropropyl) phosphate
6 Tris(beta-chloropropyl) phosphate

3.0 HEALTH HAZARD DATA

ACUTE TOXICITY

LDLO/LCLO - LOWEST PUBLISHED LETHAL DOSE/CONC

Rat

LCLo - ROUTE: Inhalation; **DOSE:** 5 gm/m3/4H *CODEN: NTIS** Bibliographic Data: National Technical Information Service. (Springfield, VA 22161) Formerly U.S. Clearinghouse for Scientific & Technical Information. CODEN Reference: OTS0517715*
TOXIC EFFECTS:
Sense Organs and Special Senses (Nose, Eye, Ear, and Taste) - Lacrimation
Behavioral - Somnolence (general depressed activity)
Nutritional and Gross Metabolic - Weight loss or decreased weight gain

LD50/LC50 - LETHAL DOSE/CONC 50% KILL

Rat

LD50 - ROUTE: Oral; **DOSE:** 1017 mg/kg *CODEN: NTIS** Bibliographic Data: National Technical Information Service. (Springfield, VA 22161) Formerly U.S. Clearinghouse for Scientific & Technical Information. CODEN Reference: OTS0517716*
TOXIC EFFECTS:
Behavioral - Convulsions or effect on seizure threshold
Behavioral - Irritability
Gastrointestinal - Hypermotility, diarrhea

Rabbit

LD50 - ROUTE: Skin; **DOSE:** 2 gm/kg *CODEN: NTIS** Bibliographic Data: National Technical Information Service. (Springfield, VA 22161) Formerly U.S. Clearinghouse for Scientific & Technical Information. CODEN Reference: OTS0517715*
TOXIC EFFECTS:

TOXIC EFFECTS:
Behavioral - Food intake (animal)
Skin and Appendages - Dermatitis, other

OTHER MULTIPLE DOSE TOXICITY DATA

Rat

ROUTE: Oral; **DOSE:** 108 gm/kg/90D continuous *CODEN: TOXID9 Bibliographic Data: Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1-1981- CODEN Reference: 3:124,1983*
TOXIC EFFECTS:
Kidney, Ureter, and Bladder - Changes in bladder weight
Nutritional and Gross Metabolic - Weight loss or decreased weight gain

7.0 STATUS IN U.S.

1 EPA TSCA Section 8(b) CHEMICAL INVENTORY
2 EPA TSCA Section 8(d) unpublished health/safety studies
3 EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, SEPTEMBER 1997

Phosphoric acid, triphenyl ester

RTECS - Registry of Toxic Effects of Chemical Substances

1.0 SUBSTANCE IDENTIFICATION

RTECS Number: TC8400000
Chemical Name: Phosphoric acid, triphenyl ester
CAS Number: 115-86-6
Molecular Formula: C18-H15-O4-P
Molecular Weight: 326.30
Wiswesser Notation: ROPO&OR&OR
Last Revision Date: 1997

2.0 SYNONYM(S)/TRADENAME(S)

1 Celluflex TPP
2 Disflamoll TP
3 Phosflex TPP
4 TPP
5 Trifenylfosfat (Czech)
6 Triphenyl phosphate (ACGIH:OSHA)

3.0 HEALTH HAZARD DATA

ACUTE TOXICITY

LDLO/LCLO - LOWEST PUBLISHED LETHAL DOSE/CONC

Rabbit

LDLo - ROUTE: Oral; **DOSE:** 3 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

LDLo - ROUTE: Subcutaneous; **DOSE:** 1 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

Cat

LDLo - ROUTE: Oral; **DOSE:** 2 gm/kg *CODEN: ARZNAD Bibliographic Data: Arzneimittel-Forschung. Drug Research. (Editio Cantor Verlag, Postfach 1255, W-7960 Aulendorf, Fed. Rep. Ger.) V.1- 1951- CODEN Reference: 7:585,1957*

TOXIC EFFECTS:
Behavioral - Altered sleep time (including change in righting reflex)
Behavioral - Tremor
Behavioral - Muscle weakness

LDLo - ROUTE: Subcutaneous; **DOSE:** 300 mg/kg *CODEN: NIHBAZ Bibliographic Data: National Institutes of Health, Bulletin. (Bethesda, MD) CODEN Reference: 160:1,1932*

TOXIC EFFECTS:
Peripheral Nerve and Sensation - Flaccid paralysis without anesthesia (usually neuromuscular blockage)
Behavioral - Tremor
Behavioral - Muscle weakness

Behavioral - Muscle weakness

Monkey

LDLo - ROUTE: Subcutaneous; **DOSE:** 500 mg/kg *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: 4:420,1980*

LD50/LC50 - LETHAL DOSE/CONC 50% KILL

Rat

LD50 - ROUTE: Oral; **DOSE:** 3500 mg/kg *CODEN: ARZNAD Bibliographic Data: Arzneimittel-Forschung. Drug Research. (Editio Cantor Verlag, Postfach 1255, W-7960 Aulendorf, Fed. Rep. Ger.) V.1- 1951- CODEN Reference: 7:585,1957*

TOXIC EFFECTS:

Behavioral - Tremor

Behavioral - Ataxia

Gastrointestinal - Hypermotility, diarrhea

Mouse

LD50 - ROUTE: Intraperitoneal; **DOSE:** 1273 mg/kg *CODEN: ABCHA6 Bibliographic Data: Agricultural and Biological Chemistry. (Maruzen Co. Ltd., POB 5050, Tokyo International, Tokyo 100-31, Japan) V.25- 1961- CODEN Reference: 31:1288,1967*

LD50 - ROUTE: Oral; **DOSE:** 1320 mg/kg *CODEN: GISAAA Bibliographic Data: Gigiena i Sanitariya. For English translation, see HYSAAV. (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) V.1- 1936- CODEN Reference: 39(8):98,1974*

TOXIC EFFECTS:

Sense Organs and Special Senses (Nose, Eye, Ear, and Taste) - Other changes

Behavioral - Somnolence (general depressed activity)

Behavioral - Change in motor activity (specific assay)

Rabbit

LD50 - ROUTE: Skin; **DOSE:** >7900 mg/kg *CODEN: TXAPA9 Bibliographic Data: Toxicology and Applied Pharmacology. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1- 1959- CODEN Reference: 41:291,1977*

Guinea Pig

LD50 - ROUTE: Skin; **DOSE:** >4 gm/kg *CODEN: KODAK* Bibliographic Data: Kodak Company Reports. (343 State St., Rochester, NY 14650) CODEN Reference: 21MAY1971*

Mammal - Unspecified Species

LC50 - ROUTE: Inhalation; **DOSE:** 4200 mg/m3 *CODEN: GISAAA Bibliographic Data: Gigiena i Sanitariya. For English translation, see HYSAAV. (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) V.1- 1936- CODEN Reference: 39(8):98,1974*

TOXIC EFFECTS:

Sense Organs and Special Senses (Nose, Eye, Ear, and Taste) - Other changes

Behavioral - Somnolence (general depressed activity)

Behavioral - Change in motor activity (specific assay)

OTHER LD/LC - OTHER LETHAL DOSE/CONC

Rat

LD - ROUTE: Intraperitoneal; **DOSE:** >5 gm/kg *CODEN: NTIS** Bibliographic Data: National Technical Information Service. (Springfield, VA 22161) Formerly U.S. Clearinghouse for Scientific & Technical Information. CODEN Reference: OTS0535042*

TOXIC EFFECTS:

Gastrointestinal - Other changes

Skin and Appendages - Hair

LD - ROUTE: Subcutaneous; **DOSE:** >3 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW,*

Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960

Mouse

LD - ROUTE: Subcutaneous; **DOSE:** >3 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

Rabbit

LD - ROUTE: Intramuscular; **DOSE:** >1 gm/kg *CODEN: NIHBAZ Bibliographic Data: National Institutes of Health, Bulletin. (Bethesda, MD) CODEN Reference: 160:1,1932*

Guinea Pig

LD - ROUTE: Oral; **DOSE:** >4 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

LD - ROUTE: Subcutaneous; **DOSE:** >3 gm/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

Cat

LD - ROUTE: Intraperitoneal; **DOSE:** >400 mg/kg *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

TOXIC EFFECTS:

Peripheral Nerve and Sensation - Spastic paralysis with or without sensory change

Behavioral - Somnolence (general depressed activity)

Behavioral - Muscle weakness

OTHER MULTIPLE DOSE TOXICITY DATA

Rat

ROUTE: Oral; **DOSE:** 59353 mg/kg/35D continuous *CODEN: AEHLAU Bibliographic Data: Archives of Environmental Health. (Heldref Pub., 4000 Albemarle St., NW, Washington, DC 20016) V.1- 1960- CODEN Reference: 1:33,1960*

TOXIC EFFECTS:

Liver - Changes in liver weight

ROUTE: Oral; **DOSE:** 65 gm/kg/65D continuous *CODEN: ARZNAD Bibliographic Data: Arzneimittel-Forschung. Drug Research. (Editio Cantor Verlag, Postfach 1255, W-7960 Aulendorf, Fed. Rep. Ger.) V.1- 1951- CODEN Reference: 7:585,1957*

TOXIC EFFECTS:

Spinal Cord - Other degenerative changes

Peripheral Nerve and Sensation - Sensory syndrome diagnostic of central lesion

Nutritional and Gross Metabolic - Weight loss or decreased weight gain

Cat

ROUTE: Oral; **DOSE:** 600 mg/kg/10D intermittent *CODEN: ARZNAD Bibliographic Data: Arzneimittel-Forschung. Drug Research. (Editio Cantor Verlag, Postfach 1255, W-7960 Aulendorf, Fed. Rep. Ger.) V.1- 1951- CODEN Reference: 7:585,1957*

TOXIC EFFECTS:

Behavioral - Tremor

Nutritional and Gross Metabolic - Other changes

4.0 STANDARDS AND REGULATIONS

1 MSHA STANDARD-air:TWA 3 mg/m3 *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: 3:272,1971*

2 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV

2 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
3 OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV
4 OEL-AUSTRALIA:TWA 3 mg/m3 JAN 1993
5 OEL-BELGIUM:TWA 3 mg/m3 JAN 1993
6 OEL-DENMARK:TWA 3 mg/m3 JAN 1993
7 OEL-FINLAND:TWA 3 mg/m3;STEL 6 mg/m3;Skin JAN 1993
8 OEL-FRANCE:TWA 3 mg/m3 JAN 1993
9 OEL-RUSSIA:STEL 1 mg/m3 JAN 1993
10 OEL-SWITZERLAND:TWA 3 mg/m3 JAN 1993
11 OEL-THE NETHERLANDS:TWA 3 mg/m3 JAN 1993
12 OEL-UNITED KINGDOM:TWA 3 mg/m3;STEL 6 mg/m3 JAN 1993
13 OSHA PEL (Construc):8H TWA 3 mg/m3 *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1926.55,1994*
14 OSHA PEL (Fed Cont):8H TWA 3 mg/m3 *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 41:50-204.50,1994*
15 OSHA PEL (Gen Indu):8H TWA 3 mg/m3 *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1910.1000,1994*
16 OSHA PEL (Shipyard):8H TWA 3 mg/m3 *CODEN: CFRGBR Bibliographic Data: Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) CODEN Reference: 29:1915.1000,1993*

5.0 NIOSH DOCUMENTS

1 NIOSH REL TO TRIPHENYL PHOSPHATE-air:10H TWA 3 mg/m3
2 National Occupational Exposure Survey 1983: Hazard Code 74635; Number of Industries 51; Total Number of Facilities 2869; Number of Occupations 54; Total Number of Employees 91754; Total Number of Female Employees 22800
3 National Occupational Hazard Survey 1974: Hazard Code 74635; Number of Industries 11; Total Number of Facilities 341; Number of Occupations 30; Total Number of Employees 7631

6.0 REVIEWS

1 ACGIH TLV-Not classifiable as a human carcinogen *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: TLV/BEI,1996*
2 ACGIH TLV-TWA 3 mg/m3 *CODEN: DTLVS* Bibliographic Data: The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 CODEN Reference: TLV/BEI,1996*
3 TOXICOLOGY REVIEW *CODEN: CRTXB2 Bibliographic Data: CRC Critical Reviews in Toxicology. (CRC Press, Inc., 2000 Corporate Blvd., NW, Boca Raton, FL 33431) V.1- 1971- CODEN Reference: 3:289,1975*

7.0 STATUS IN U.S.

1 EPA TSCA 8(a) PRELIMINARY ASSESSMENT INFORMATION, FINAL RULE FEREAC 47,26992,82
2 EPA TSCA Section 8(b) CHEMICAL INVENTORY
3 EPA TSCA Section 8(d) unpublished health/safety studies
4 EPA TSCA Section 8(e) Risk Notification, 8EHQ-0892-9169;8EHQ-0892-8839
5 EPA TSCA Section 8(e) Risk Notification, 8EHQ-0892-9290

5 EPA TSCA Section 8(e) Risk Notification, 8EHQ-0892-9290
6 EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, SEPTEMBER 1997
7 NIOSH Analytical Method, 1994: Triphenyl phosphate, 5038