(9-2-92)

MRID No. 419406-05

DATA EVALUATION RECORD

1. **CHEMICAL:** MSMA.
Shaughnessey No. 013803.

2. **TEST MATERIAL:** MSMA (Monosodium methanearsonate) 51% Aqueous Solution; CH_4O_3NaAs; Notebook (Lot) No. 20338-98-14; CAS No. 2163-80-6; 51% active ingredient; a clear liquid.

3. **STUDY TYPE:** Freshwater Invertebrate Static Acute Toxicity Test. Species Tested: *Daphnia pulex*.

4. **CITATION:** Hughes, J.S. and M.M. Alexander. 1991. The Toxicity of MSMA 51% Aqueous Solution to *Daphnia pulex*. Study No. B648-03-7. Prepared by Malcolm Pirnie, Inc., Tarrytown, NY. Submitted by MAA Research Task Force Three, c/o Luxembourg Industries (Pamol), Ltd., Tel Aviv, Israel. EPA MRID No. 419406-05.

5. **REVIEWED BY:**

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7. **CONCLUSIONS:** This study is scientifically sound and meets the guideline requirements for a static-acute toxicity test using a freshwater invertebrate. The 48-hour LC_{50} of 77.5 mg/l (based on mean measured concentrations) classifies MSMA as slightly toxic to *Daphnia pulex*. No sublethal effects were noted by the authors. The no observed effect concentration (NOEC) can be estimated as 12.3 mg/l, based on the lack of mortality.

8. **RECOMMENDATIONS:** N/A.

6 hrs

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9. **BACKGROUND:**

10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

11. **MATERIALS AND METHODS:**

A. **Test Animals:** *Daphnia pulex* (<24 hours old) were obtained from in-house cultures maintained under the test conditions. Filtered pond water (White Pond, Stormville, NY), a temperature of 20°C, and a photoperiod of 16-hours light/8-hours dark were used. The cultures were fed an algal suspension (*Selenastrum capricornutum* and *Ankistrodesmus falcatus*).

B. **Test System:** Vessels used in the test were 100-ml glass beakers containing 50 ml of culture water (control) or test solution. The beakers were covered with plexiglass. The photoperiod during the test was the same as that in culturing with a light intensity of 50-100 ft-candles. The vessels were held in a temperature controlled incubator at 20 ±2°C.

The filtered pond water used in culturing was used as test dilution water. The water quality of the dilution water, measured at the beginning of the test, is presented in Table 2 (attached).

C. **Dosage:** Forty-eight-hour static test. Based on a preliminary test, five nominal concentrations (6.25, 12.5, 25, 50, and 100 mg a.i./l) and a dilution water control were used. A working stock solution was prepared by diluting the test material in ASTM Type I water. Appropriate volumes of stock were mixed with dilution water to give the desired concentrations.

D. **Design:** Four beakers were used for each concentration and five daphnids were used per beaker. One beaker containing no daphnids (blank) was maintained for each concentration and the control. Each beaker was observed once every 24 hours for mortality. The temperature, dissolved oxygen concentration, and pH were measured in the blank at 24 hours and in one replicate of each test concentration at the end of the test. The daphnids were not fed during the test.

MSMA 51% Aqueous Solution concentrations were measured by gas chromatography from samples taken at test initiation and termination. The samples were collected

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in glass bottles, frozen, and shipped on ice via overnight delivery to PTRL East, Inc., Richmond, KY.

E. **Statistics:** The 48-hour median lethal concentration (LC_{50}) and associated 95% confidence interval (C.I.) were calculated using a computer program developed by the Connecticut Department of Environmental Protection.

12. **REPORTED RESULTS:** The mean measured concentrations were 5.5, 12.3, 29.4, 61.4, and 146.0 mg/l or 88-146% of nominal (Table 3, attached). Measured concentrations of the two lowest test levels were fairly consistent between sampling times. At the highest three levels, measured concentrations decreased by as much as 32% between the two sampling times.

The responses of *Daphnia pulex* are given in Table 4 (attached). The 48-hour LC_{50} was determined as 82.8 mg/l (95% C.I. = 60.0-114.3 mg/l) using the Spearman-Karber method.

Dissolved oxygen ranged from 102 to 107% and 91 to 93% of saturation at test initiation and termination, respectively. The pH values ranged from 6.96 to 8.10. The temperature was 19.4-21.0°C.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**

The authors presented no conclusions.

Quality Assurance Inspection and Good Laboratory Practice Statements were included in the report, indicating that the study was conducted in accordance with FIFRA Good Laboratory Practice Standards set forth in 40 CFR Part 160.

14. **REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:**

A. **Test Procedure:** The test procedures were generally in accordance with protocols recommended by the guidelines, but deviated from the SEP as follows:

The test material was an aqueous solution of the active ingredient (51%). The test should have been performed using the technical material.

Each nominal concentration was 50% of the next highest concentration. The SEP recommends that each test concentration be at least 60% of the next highest concentration.

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No observations of sublethal effects, if any, were made during the test. A no observed effect concentration (NOEC) based on sublethal effects was not determined.

Oxygen saturation was greater than 100% (the recommended range is 60%-100% at initiation) in all solutions at test initiation (102%-107%).

The test temperature was not monitored continuously as recommended.

The hardness of the dilution water (28 mg/l as $CaCO_3$) was lower than recommended (40-200 mg/l as $CaCO_3$).

The length of time between solution preparation and test initiation was not given and the method used to transfer daphnids to the test solutions was not included in the report.

Fifteen to 30 minute dawn and dusk simulations are recommended in the SEP. The simulation periods were not used in the test.

First instar *Daphnia pulex* used in tests should be from the fourth or later broods of a given parent. The author did not indicate which brood was the source of the test animals.

B. **Statistical Analysis:** The reviewer used EPA's Toxanal program to calculate the 48-hour LC_{50} value as 77.5 mg/l (95% C.I. = 58.0-112.8 mg/l) using probit analysis and mean measured concentrations (see attached printout). The slope of the dose-response curve was 2.7.

C. **Discussion/Results:** The concentration of the test material decreased during the exposure in four of the five levels. It is possible that the test material was unstable in the test system. The test material is an aqueous solution, so it is unlikely that the active ingredient degraded rapidly. In addition, the three highest test levels experienced the greatest decreases in concentration. Since the analytical samples were packaged and shipped to another laboratory, the observed concentration decreases are probably the result of handling. The reviewer will accept the mean measured concentrations as good approximations of the actual test concentrations.

This study is scientifically sound and meets the guideline requirements for a static-acute toxicity test using a freshwater invertebrate. The 48-hour LC_{50} of 77.5 mg/l (based on mean measured concentrations) classifies MSMA as slightly toxic to *Daphnia pulex*. No sublethal effects were noted by the authors. The no observed effect concentration (NOEC) can be estimated as 12.3 mg/l, based on the lack of mortality.

D. **Adequacy of the Study:**

(1) Classification: Core for the formulation.

(2) Rationale: N/A.

(3) Repairability: N/A.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 09-17-91.