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9/10/91

MRID No. 418872-04

DATA EVALUATION RECORD

1. **CHEMICAL:** Sodium Chlorate.
Shaughnessey No. 073301.

2. **TEST MATERIAL:** Sodium Chlorate; Lot 29-A/PAL A-113; >99% active ingredient; a white powder.

3. **STUDY TYPE:** Freshwater Invertebrate Flow-Through Acute Toxicity Test. Species Tested: Daphnia magna.

4. **CITATION:** Ward, T.J. and R.L. Boeri. 1991. Acute Flow-Through Toxicity of Sodium Chlorate to the Daphnid, Daphnia magna. Envirosystems Study Number 90144-AW. Prepared by EnviroSystems Division, Resource Analysts, Inc., Hampton, NH. Submitted by Sodium Chlorate Reregistration Task Force. EPA MRID No. 418872-04.

5. **REVIEWED BY:**

Louis M. Rifici, M.S.
Associate Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: Louis M Rifici
Date: 9/9/91

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
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Signature: P. Kosalwat
Date: 9/9/91

Henry T. Craven, M.S.
Supervisor, EEB/HED
USEPA

Signature:
Date:

7. **CONCLUSIONS:** This study is scientifically sound but does not meet the guideline requirements for a flow-through acute freshwater invertebrate toxicity study. The concentration of the test material should have been measured to verify the actual test concentrations. Under the conditions of the test, the 48-hour EC_{50} value was >1000 mg/L (based on nominal concentrations). Therefore, sodium chlorate is classified as practically non-toxic to Daphnia magna. The NOEC was determined as 1000 mg/L nominal concentration.

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

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Rev: T. Perry

9. BACKGROUND:

10. DISCUSSION OF INDIVIDUAL TESTS: N/A.

11. MATERIALS AND METHODS:

A. Test Animals: Daphnia magna (<24 hours old) were obtained from in-house cultures. The cultures were maintained in dilution water and were acclimated for more than 14 days. The adult daphnids were fed yeast and trout chow, and/or Selenastrum capricornutum daily.

B. Test System: An intermittent-flow proportional diluter was used. A stock solution was delivered to the diluter and mixed with dilution water using a high-shear pump with a Teflon head. The diluter was calibrated before and after the test. Flow into the test chambers resulted in 8.8 volume replacements per day.

The test chambers were 20-L glass aquaria filled with 15 L of test solution. The test solution depth was approximately 18 cm. The daphnids were confined in cages consisting of glass and Nitex screen. The test aquaria were randomly positioned in a temperature-controlled water bath set to 20 ±1°C. The laboratory environment was maintained on a 16-hour daylight photoperiod with a light intensity of 13 $\mu Es^{-1}m^{-2}$.

Well water with the characteristics listed in Table 1 (attached) was aerated before use as dilution water.

C. Dosage: Forty-eight-hour flow-through test. Based on the results of a preliminary test, five nominal concentrations (150, 240, 380, 600, and 1000 mg/L) and a dilution water control were used.

D. Design: Daphnids were randomly and equally distributed to each aquarium, two aquaria per concentration, for a total of 20 individuals per concentration. The daphnids were not fed during the test.

Observations of mortality and sublethal responses were made every 24 hours. The dissolved oxygen concentration (D.O.), pH, conductivity, and temperature were recorded in each test chamber daily. The temperature of an aquarium was recorded continuously.

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E. Statistics: No statistics were required for this data set.

12. REPORTED RESULTS: No insoluble material was observed at any concentration. "The concentration of sodium chlorate in test media could not be determined because of naturally occurring interference in the dilution water." The concentration of sodium chlorate in the 600,000 mg/L (nominal) stock solution was 690,000 mg/L.

No sublethal effects were noted during the test. Several daphnids died but the mortality followed no pattern (Table 2, attached). The 96-hour LC_{50} value was greater than 1000 mg/L nominal concentration. The no observed effect concentration (NOEC) was 1000 mg/L.

Dissolved oxygen ranged from 8.5 to 9.0 mg/L. The pH values ranged from 7.3 to 7.7 and the conductivity was 620-1500. The temperature was 19.5-20.9°C.

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

The authors made no conclusions.

Quality Assurance and Good Laboratory Practice Regulation 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 was performed in a flow-through system but the concentration of the test material was not verified by analytical measurement. The concentration of the test material must be verified when a flow-though system is used.

No transitional period between light and dark was used in the test.

Observations of the daphnid cultures such as adult mortality, stress, and the presence of ephippia were not given in the report.

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

B. **Statistical Analysis:** No statistics were required for this data set.

C. **Discussion/Results:** This test probably could have been performed in a static system. There is no evidence from the water quality data that lowered D.O. would have been encountered in a static test. In addition, no precipitates were encountered at concentrations as high as 1000 mg/L, so constant renewal of the test solutions was not warranted. It cannot be assumed that the diluter functioned properly during the test. Because a flow-though system was used, measured concentrations are required.

The quality of the water used in this test is questionable. In the three tests using this chemical and fresh water organisms (MRID Nos. 418872-02, 418872-03, and 418872-04), the initial pH, hardness, and conductivity of the test water ranged from 6.8-8.7, 48-180 mg/L as $CaCO_3$, and 490-1500, respectively. The reports state that the water was drawn from a well located at the EnviroSystems laboratory and was aerated and stored in a 500-L polyethylene tank prior to use. The variable water quality for this single source of dilution water is unexplained by the authors and may have implications concerning the proper acclimation of the test organisms and the inability of the laboratory personnel to provide a consistent water supply. The water supply, storage and handling of the water, technical expertise of the technicians, and/or the functioning of the meters should be evaluated as soon as possible.

This study is scientifically sound but does not meet the guideline requirements for a flow-through acute freshwater invertebrate toxicity study. The concentration of the test material should have been measured to verify the actual test concentrations. Under the conditions of the test, the 48-hour EC_{50} value was >1000 mg/L (based on nominal concentrations). Therefore, sodium chlorate is classified as practically non-toxic to Daphnia magna. The NOEC was determined as 1000 mg/L nominal concentration.

D. Adequacy of the Study:

(1) **Classification:** Supplemental.

(2) **Rationale:** The actual concentrations in this flow-through test were not verified analytically.

(3) **Repairability:** No.

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, 08-26-91.

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