7-26-94

DATA EVALUATION RECORD

1. **CHEMICAL:** Acrolein
Shaughnessey No. 000701

2. **TEST MATERIAL:** Acrolein. Nonradiolabeled: Acrolein, inhibited, 94.69%; Lab ID #9309; a clear colorless liquid. Radiolabeled: Acrolein-2,3-^{14}C, Lot #032H9223, 100 mCi, 16 mCi/mmole, radiopurity of 85.2%, liquid.

3. **STUDY TYPE:** 72-3. Marine Shrimp Acute Flow-Through Toxicity Test. Species Tested: Mysid shrimp (*Mysidopsis bahia*).

4. **CITATION:** Bettencourt, M.J. 1994. Acrolein- Acute Toxicity to Mysid Shrimp (*Mysidopsis bahia*) Under Flow-Through Conditions. Report No. 94-1-5148. Prepared by Springborn Laboratories, Inc., Wareham, MA. Submitted by Baker Performance Chemicals Inc. EPA MRID No. 43164301.

5. **REVIEWED BY:**

Joanne S. Edwards, M.S.
Entomologist
Ecological Effects Branch
Environmental Fate and
Effects Division (7507C)

Signature: Joanne S Edwards
Date: 7/24/94

6. **APPROVED BY:**

Leslie W. Touart, Ph.D.
Supervisory Biologist
Ecological Effects Branch
Environmental Fate and
Effects Division (7507C)

Signature: L.W.T.
Date: 7/26/94

7. **CONCLUSIONS:** This study is scientifically sound and satisfies the guideline requirement for a mysid acute toxicity test. The 96-hour LC_{50} in this study was 500 µg ai/l (95% C.I. = 390 - 650 µg ai/l) based on mean measured concentrations, classifies acrolein as highly toxic to mysid shrimp. The NOEC is 36 µg ai/l.

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

9. **BACKGROUND:**

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

11. **MATERIALS AND METHODS:**

A. Test Animals: Mysid shrimp (*Mysidopsis bahia*) were obtained from a commercial supplier in Ft. Collins, CO. The shrimp were cultured in a 500-L fiberglass tank containing filtered natural seawater. The seawater had a salinity of 29 to 32‰ and temperature of 25 ±1°C. The culture water was from the same source as the dilution water used in the definitive test. A photoperiod of 16 hours light/8 hours dark was employed. Lighting was provided by fluorescent bulbs providing an intensity of 80 footcandles. Juvenile mysids ≤24 hours old were collected for the definitive test. The shrimp were fed live brine shrimp (Artemia salina) nauplii twice daily.

B. Test System: The test system consisted of a modified constant flow diluter (40% dilution factor), temperature-controlled water bath and 14 exposure vessels. The vessels were glass aquaria, each measuring 39 X 20 X 25 cm. Each aquarium contained two mysid retention chambers, each housing 5 mysids. The chambers were constructed from glass petri dishes to which Nitex screen collars were attached. Delivery in the system was approx. 6.5 volume replacements per aquarium every 24 hours. The vessels were impartially positioned in a water bath containing circulating water. The temperature was set to maintain 25 ±1°C. The testing area was maintained on a 16-hour daylight photoperiod and sudden transitions between light and dark were avoided. Florescent bulbs were used for lighting. The intensity of the bulbs was 8 to 22 footcandles at the surface of the test solutions. Each test aquarium received 0.05 l of dilution water per minute. Syringe pumps were equipped to deliver calibrated volumes of the stock solution directly into the exposure aquaria. Mixing of the test solutions at the point of entry into the test aquaria was promoted by the action of continuously-flowing water (0.05 l/minute).

The test dilution water was filtered (20 and 5 μm) natural seawater collected from Cape Cod Canal, MA, and stored in an epoxy-lined reservoir prior to use. The salinity of the dilution water was 31-32 ppt and the pH ranged 7.9-8.0.

The solvent control used was acetone. The solvent control solutions contained the maximum amount of acetone present in any test solution (0.50 ml/l).

C. Dosage: Ninety-six-hour flow-through test. Based on preliminary testing, five nominal concentrations (51, 130, 320, 80, and 2000 μg ai/l), a dilution water

control, and a solvent control were chosen for testing.

D. Design: Ten mysids were impartially selected and distributed to each aquaria (5 per retention chamber); two aquaria per group, for a total of 20 shrimp per treatment or control. The maximum biomass loading was 0.00014 g/l.

Observations of mortality, sublethal responses and characteristics of the test solutions were made every 24 hours. Mortality was defined as the absence of mobility and failure to respond to gentle prodding. Mysids were fed live brine shrimp nauplii twice daily. The temperature, salinity, dissolved oxygen concentration (DO), and pH were measured daily in both replicates at each treatment level and the controls. The temperature in one replicate of the dilution water control was continuously monitored using a min/max thermometer.

Samples were taken from each replicate test solution of each treatment level and the controls at 0 and 36 hours for analysis of acrolein using liquid scintillation counting (LSC). Three Quality Control (QC) samples were prepared at each sampling interval. Samples of ^{14}C acrolein diluter stock solution were removed at each sampling interval for analysis of parent acrolein concentration. These samples were analyzed using a high performance liquid chromatographic procedure with a radiometric detector (HPLC-RAM).

E. Statistics: The median lethal concentration (LC_{50}) and associated 95% confidence interval (C.I.) for each 24-hour interval were calculated using a computer program that employed probit, moving average angle analysis, and nonlinear interpolation. If two or more statistical methods produced acceptable results, the method which yielded the smallest confidence interval was selected.

12. REPORTED RESULTS:

Analytical data for water samples are presented in Table 2 (attached). The mean measured concentrations for the test, based on measured ^{14}C acrolein were 36, 110, 230, 630 and 1600 µg/l. The mean measured concentrations were 70 to 81% of the nominal concentrations. The quality control samples had measured concentrations that were consistent with the predetermined recovery range that was established during the method validation/recovery study. These

samples averaged 101.3% of the nominal concentrations.

The responses of the shrimp are given in Table 3 (attached). After 24-hours of exposure, 100% mortality was observed among mysids exposed to the 1600 µg ai/l test concentration, and at termination 30% mortality was observed among mysids exposed to the 630 and 230 µg ai/l test concentrations. No other mortality was observed.

Sublethal effects (loss of equilibrium, erratic swimming and lethargy) was observed among surviving mysids at the 110, 230 and 630 µg ai/l treatment levels. The 96-hour LC_{50}, based on mean measured concentrations, was 500 µg ai/l (95% C.I.= 390-650 µg ai/l) by moving average angle analysis. The NOEC was determined to be 36 µg ai/l.

The results of water quality measurements is provided in Table 1 (attached). Water quality were not affected by the acrolein concentrations tested and were within acceptable ranges for survival of mysid shrimp. Dissolved oxygen ranged from 6.6 to 7.6 mg/l or 94 to 110% of saturation. The pH values ranged from 7.8 to 7.9. The temperature was 24-25°C and the salinity was 31-32 parts per thousand.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** The 96-hour LC_{50} was calculated by moving average angle analysis to be 500 µg ai/l based on mean measured concentrations (95% C.I.= 390-650 µg ai/l). The NOEC was 36 µg ai/l.

A Good Laboratory Practice Compliance Statement was included in the report indicating compliance to with EPA Good Laboratory Practice Standards under the Federal Insecticide, Fungicide, and Rodenticide Act with the following exceptions: routine water and food contaminant screening analyses for pesticides, PCBs and metals were not collected in accordance with GLP procedures. Total organic carbon analyses for filtered seawater utilized standard EPA procedure, but were not collected in accordance with GLP procedures.

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

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

The ASTM criteria for acceptability specifies that the ratio between the highest and lowest measured

concentrations for a single treatment should be ≤1.5. ASTM criteria for acceptability were exceeded for the three lower test concentration levels. However, the measured concentrations for the two highest treatment levels which bracketed the LC_{50} were consistent (calculated ratios of 1.2 and 1.0).

The dilution factor was adjusted from the standard 60% to 40%.

B. **Statistical Analysis:** The reviewer used EPA's Toxanal program to calculate the LC_{50} value and obtained similar results (see attached printout).

C. **Discussion/Results:** This study is classified as core. The 96-hour LC_{50} of 500 µg ai/l (based on mean measured concentrations) classifies acrolein as highly toxic to mysid shrimp. The NOEC is 36 µg ai/l.

LWT 10/12/94

D. **Adequacy of the Study:**

(1) **Classification:** ~~Core~~ SUPPLEMENTAL.

(2) **Rationale:** ~~N/A~~ ANALYTICAL MEASUREMENTS FOR ACROLEIN RESIDUES NOT CORRECTED FOR DEGRADATES.

(3) **Repairability:** ~~N/A~~ REPEAT OF STUDY NOT NECESSARY.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 7/22/94.

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