

US EPA ARCHIVE DOCUMENT

12/6/88

DATA EVALUATION RECORD

- 1. **CHEMICAL:** Chlorpyrifos Technical
Shaughnessey No. 059101
- 2. **TEST MATERIAL:** Chlorpyrifos Technical; Lot No. 389318
95.9% Active Ingredient
- 3. **STUDY TYPE:** Flow-through Acute Toxicity Test for Freshwater
Invertebrates. Species Tested: Daphnia magna
- 4. **CITATION:** Burgess, David (1988); Acute Flow-through Toxicity
of Chlorpyrifos Technical to Daphnia magna, Report
No. 37190; prepared by Analytical Bio-Chemistry
Laboratories, Inc. Columbia, Missouri; submitted by
Makhteshim-Agan (America) Inc. New York, New York;
Accession No. 408409-02.

5. **REVIEWED BY:**

Kimberly D. Rhodes
Aquatic Toxicologist
Hunter/ESE

Signature: *Kimberly D. Rhodes*
Date:

6. **APPROVED BY:**

Prapimpan Kosalwat, Ph.D.
Staff Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature: *P. Kosalwat*
Date: *11/28/88*

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

Signature: *John Noles*
Date: *12/6/88*

7. **CONCLUSIONS:** This study appears scientifically sound and
fulfills the Guideline requirements for a 48-hour acute flow-
through study of freshwater invertebrates. The 48-hour LC50
based upon nominal concentrations of Chlorpyrifos Technical
to Daphnia magna was 0.10 ug/L, which classifies it as very
highly toxic to D. magna. The NOEC was determined to be
0.024 ug/L after 48 hours.

8. **RECOMMENDATIONS:** N/A

1

9. BACKGROUND:10. DISCUSSION OF INDIVIDUAL TESTS: N/A11. MATERIALS AND METHODS:

A. Test Animals: *Daphnia magna* were obtained from an in-house daphnid culture. The original stock was obtained from the Columbia National Fisheries Research Laboratory (CNFRL) in Columbia, Missouri. Stock cultures were held in a temperature controlled area at $20(\pm 2)^{\circ}\text{C}$. The lighting was 59 ± 2.5 footcandles on a 16-hour daylight photoperiod, with 30 minute dawn and dusk transition periods. During the holding period, the daphnids were fed a suspension of algae (*Selenastrum capricornutum*) supplemented with a suspension of Tetramin, yeast and mixed cereal leaves. Only first-instar daphnids (<24 hours old) were selected for testing.

B. Test System: A half-liter proportional diluter system described by Mount and Brungs, utilizing a Hamilton Micro Lab 420 syringe dispenser, was used for the intermittent introduction of dilution water and Chlorpyrifos into the test chambers. Flow-slitting chambers were utilized to thoroughly mix and divide each test concentration for delivery to the test chambers. To minimize turbulence, the influent water was introduced into the test chambers via 14-gauge hypodermic needles. The proportional diluter system used for the project was set to provide test levels approximately 50 percent dilutions of each other. The system contained seven sets of four replicate one-liter test chambers, designated as control, solvent control, and five Chlorpyrifos test concentrations. One-liter glass beakers with notched drains, which were covered with 50-mesh stainless steel screen to prevent escape of the daphnids, were used as the test chambers. The test chambers were immersed in a temperature-controlled water bath held at $20 \pm 1^{\circ}\text{C}$. The lighting for the test system consisted of fluorescent light bulbs which provided a 50-70 ft.c. intensity. The lighting was on a 16-hour daylight/8-hour dark photoperiod with 30 minute transition periods.

Dilution water for the daphnid test was a blend of reverse osmosis water and ABC well water characterized as having a pH of 7.2 - 7.8, total hardness of 160 - 180 mg/L as CaCO_3 , total alkalinity of 160 - 210 mg/L as CaCO_3 and specific conductance of 220 - 400 umhos/cm.

C. Dosage: 48-hour flow-through acute test.

- D. **Design:** Two static range-finding tests were conducted with Chlorpyrifos. Based on the results of the preliminary testing five concentrations were selected for definitive testing. Forty daphnids were tested per concentration (ten per vessel). A control, solvent control, and nominal Chlorpyrifos Technical concentrations of 0.012, 0.024, 0.05, 0.10, and 0.20 ug/L were tested. The nominal concentrations were not corrected for active ingredient. The concentration of acetone in the solvent control (0.1 mL/L) was equal to that present in the highest concentration of toxicant. All concentrations were observed at 24 and 48 hours for mortality and abnormal effects. The water quality parameters (temperature, dissolved oxygen and pH) were measured in the control, low, middle, and high test levels at 0 and 48 hours of testing. Analytical samples were collected from each test level and the diluter stock at 0 and 48 hours.
- E. **Statistics:** The concentration of toxicant lethal to 50% of the population (LC50's) and 95% confidence intervals was determined at 24- and 48-hour exposure periods by the computer program developed by Stephan et al., 1978.
12. **REPORTED RESULTS:** Accurate mean measured concentrations of the three lowest nominal concentrations (0.012, 0.024, and 0.050 ug/L) were below the detectable validation limit (0.105 ug/L). Mean measured concentrations of 0.10 and 0.20 ug/L nominal concentrations were 0.13 and 0.28 ug/L, respectively. Nominal values were not corrected for sample purity. The 24- and 48-hour LC50 values for Chlorpyrifos were >0.20 and 0.10 (0.09-0.11) ug/L based upon nominal concentrations. The 48-hour no-effect concentration during the test period was observed to be 0.024 ug/L. Table 4 presents the percent mortality and water quality parameters measured during the test (attached). There was no mortality in the control or solvent control during the study. The dissolved oxygen concentrations ranged between 8.0 and 8.3 mg/L (92 to 95% saturation at 20°C) during the test.
13. **STUDY AUTHOR'S CONCLUSIONS/QUALIT &k1HYYY ASSURANCE MEASURES:** The 48-hour LC50 value for Chlorpyrifos Technical was calculated by probit analysis to be 0.10 ug/L with 95 percent confidence limits of 0.09 and 0.11 ug/L based upon nominal concentrations. Nominal concentrations were utilized to calculate the LC50 values because the three lowest test concentrations were below the analytical limit of detection. The NOEC (No-Observed-Effect Concentration) was 0.024 ug/L after 48 hours.

"The study was conducted following the intent of the Good Laboratory Practice Regulations and the final report was reviewed by Analytical Bio-Chemistry Laboratories' Quality Assurance Unit." A Quality Assurance Statement was included in the report.

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:
- o Six-hour temperature measurements were not recorded as required by the SEP for tests conducted in a water bath.
 - o The SEP states that each designated treatment group should be exposed to a concentration of toxicant that is at least 60% of the next highest concentration. Each designated treatment group for the test was only 50% of the next highest concentration.
 - o The lot number of Chlorpyrifos Technical in section III of the report (Lot No. 38918) is not consistent with the lot number in the compendium (Lot No. 389318).
- B. Statistical Analysis: The reviewer used the Toxanal computer program to calculate the LC50 values. These calculations are attached. The probit method provides a 48-hour LC50 value of 0.10 ug/L with a 95 percent confidence interval of 0.09 to 0.12 ug/L which is similar to that reported by the author. The slope of the toxicity curve was estimated to be 4.17.
- C. Discussion/Results: The study results appear to be scientifically valid. The 48-hour LC50 value based upon nominal concentrations was estimated to be 0.10 ug/L. Therefore, Chlorpyrifos Technical is classified as very highly toxic to Daphnia magna.
- D. Adequacy of the Study:
- (1) Classification: Core
 - (2) Rationale: N/A
 - (3) Repairability: N/A

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, 11-17-88.

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL 95% CONFIDENCE LIMITS |
|-------|----------------|-------------|--------------|--------------------------------|
| 0 | 40 | 0 | 0.0 | 0 |
| .1 | 40 | 17 | 42.5 | 0 |
| .15 | 40 | 1 | 2.5 | 0 |
| .004 | 40 | 0 | 0 | 0 |
| .010 | 40 | 0 | 0 | 0 |

BECAUSE THE NUMBER OF ORGANISMS TESTED WAS SO LARGE, THE 95 PERCENT CONFIDENCE INTERVALS CALCULATED FROM THE BINOMIAL PROBABILITY ARE UNRELIABLE. USE THE INTERVALS CALCULATED BY THE OTHER TESTS.

AN APPROXIMATE LOGIT FOR THIS SET OF DATA IS .002112

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD
 PEARSON χ^2 = 10.000 95 PERCENT CONFIDENCE LIMITS
 T = .002107 9.744755E-02 9.426417E-02 .1157825

RESULTS CALCULATED USING THE PROBIT METHOD
 ITERATIONS = 6 N = 1 GOODNESS OF FIT PROBABILITY
 T = 1.098171E-02 1 .5050546

SLOPE = 4.172824
 95 PERCENT CONFIDENCE LIMITS = 3.076858 AND 5.26879

LD50 = 9.955701E-02
 95 PERCENT CONFIDENCE LIMITS = 8.585358E-02 AND .1161879

LD10 = 4.939939E-02
 95 PERCENT CONFIDENCE LIMITS = 3.704477E-02 AND 5.975729E-02

Page 6 is not included in this copy.

Pages _____ through _____ are not included.

The material not included contains the following type of information:

- Identity of product inert ingredients.
 - Identity of product impurities.
 - Description of the product manufacturing process.
 - Description of quality control procedures.
 - Identity of the source of product ingredients.
 - Sales or other commercial/financial information.
 - A draft product label.
 - The product confidential statement of formula.
 - Information about a pending registration action.
 - FIFRA registration data.
 - The document is a duplicate of page(s) _____.
 - The document is not responsive to the request.
-

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.
