9/17/92

DATA EVALUATION RECORD

1. Chemical: Benefin (EL-110)

2. Test Material: Technical, 97.3% (Lot 231EF4)

3. Study Type: Aquatic Invertebrate Acute Toxicity

   Species tested: Daphnia magna

4. Citation: Koenig, G.R. (1985) The Acute Toxicity of Benefin (EL-110, compound 54521) to Daphnia magna in a Static-Renewal Test System. Study C00185. Prepared by Lilly Research Laboratories, submitted by Elanco Product Co., Indianapolis, Indiana. Registration No. 1471-148. Acc. No. 257844.

5. Reviewed by:

   Carol M. Natella
   Wildlife Biologist
   Ecological Effects Branch
   Hazard Evaluation Division

   Signature: Carol M. Natella

   Date: 7-3-85

6. Approved by:

   Harry Craven
   Supervisory Biologist
   Ecological Effects Branch
   Hazard Evaluation Division

   Signature: [signature]

   Date: 7/3/85

7. Conclusions:

   This study is scientifically sound. With a 48-hour LC_{50} of greater than 0.1 ml/l (maximum solubility in water), benefin can be considered no more than highly toxic to Daphnia magna (tested in hard water).

   The study fulfills the guidelines requirement for an acute toxicity determination for a freshwater aquatic invertebrate (for the present use patterns and at the present rates of application).

8. Recommendations: N/A

Study does not satisfy the Guideline requirement [illegible] CM 11/2/88

9/17/92

Also see memo of 9/16/92 for MRID D171483

9. Background:

Requested, EEB Review January 25, 1984, (EUP, lawns and golf-courses).

10. Discussion of Individual Test: N/A

11. Materials and Methods:

A. Test animals:

First-instar Daphnia magna obtained from the brood stock maintained at Lilly Environmental Toxicology Laboratory.

B. Test system:

250-ml borosilicate glass beakers containing 200 ml of test solution. Dilution water was conditioned well water having the following characteristics: total hardness, 183 mg/l (as $CaCO_3$); total alkalinity, 183 mg/l (as $CaCO_3$); and conductivity, 300 μS/cm. Temperature of the test solutions averaged 20.4 $\pm$ 0.4 °C during the course of the study.

C. Dose:

Static-renewal test system. Test animals were transferred to freshly prepared test solutions after 24 hours. To determine if undissolved compound contributed to toxicity, organisms were exposed to unfiltered as well as to filtered test solutions at all treatment levels (except controls).

D. Design:

Ten Daphnia per container; 3 replicates. Three treatments plus a water control and an acetone control (0.500 ml/l) were used.

E. Statistics:

Dunnett's t-test was used to compare the analyzed benefin concentration in filtered test solutions.

12. Reported Results:

For dose/mortality data, see attachment (table 3).

"Unfiltered solutions: At the beginning of each 24-hour renewal period, benefin concentration in the unfiltered solutions were well above the water solubility of 0.1 mg/l. This presumably resulted from the presence of undissolved benefin in the water samples submitted for analysis...the substantial reductions in benefin concentrations(i.e., after 24 hours; see table 2) resulted primarily from setting of undissolved chemical and not through loss of compound from the exposure chambers (e.g., volatilization)..."

"Filtered solutions: In contrast to the analytical results for unfiltered test solutions, benefin concentrations in filtered samples were at or near the water solubility (0.1 mg/l) and remained relatively stable during each 24-hour renewal period."

"Toxicity of Benefin (table 3): Daphnids exposed to nominal benefin concentrations $\leq$ 50 mg/L in both unfiltered and filtered test solutions were not affected and appeared normal throughout the study. At the 100 mg/L treatment, the frequencies of immobilization after 48 hr exposure were 63 percent in unfiltered solutions and 57 percent in filtered solutions. Organisms that survived the 100 mg/L treatments showed no hypoactivity or other signs of sublethal toxicity. Since the mean concentrations in all filtered solutions were at or near the water solubility of the test compound, it is doubtful that organisms in any test solution were exposed to dissolved benefin concentrations above 0.1 mg/L."

"Although the analytical data indicated that there were no significant differences in the dissolved benefin concentrations at 25, 50, and 100 mg/L, approximately 60 percent immobilization was observed at the 100 mg/L while no effects occurred at 25 and 50 mg/L. Because there was no apparent relationship between the concentration of benefin and immobilization of the daphnids, it is doubtful that the observed toxicity was caused by benefin."

13. Study Author's Conclusions

"Based on results from the present study with Daphnia magna, the acute no-observed-effect concentration (NOEC) of benefin was 0.1 mg/L, which is the water solubility of the test compound. The 48-hour EC_{50} of benefin was > 0.1 mg/L. Using nominal concentrations, the NOEC and 48-hour EC_{50} of benefin were 50 mg/L and > 50 < 100 mg/L, respectively."

14. Reviewers' Discussion and Interpretation of the Study

A. Test Procedures:

The procedures were in accordance with protocols recommended by the guidelines. A potential problem, however, lies in the fact that all the test material did not go into solution. The maximum amount of solvent allowed (acetone, 0.500 ml/l) was used to prepare test solutions, even so, the assayed benefin concentrations in the filtered test solutions were at or near the water solubility of benefin (0.1 mg/l).

The reviewer is in agreement with the study author that since no organism in any test solution was exposed to dissolved benefin concentrations higher than 0.1 ml/l, the mortality observed at the highest test concentration (100 mg/l nominal) was probably not toxicant related.

B. Statistical Analysis:

Because mortality was not toxicant related, no statistical analyses were performed.

C. Discussion/Results:

With a 48-hour LC_{50} of > 0.1 ml/l, benefin is no more than highly toxic to Daphnia magna.

D. Adequacy of Study:

1. Classification: Core (at the present use rates of c. 1.5 to 3.0 lbs ai/acre.

2. Rationale: Although this study does not establish a definite LC_{50} value, the study is adequate to support the present use patterns at the presently registered rates.

3. Repairability: N/A

15. Completion of One-Liner

Yes, June 26, 1985

TABLE 2. ANALYZED CONCENTRATIONS OF BENEFIN IN TEST SOLUTIONS. STUDY C00185. (*Daphnia magna*)

Nominal Benefin Concentration (mg/L)	0 to 24 hr		24 to 48 hr		Mean ± SD (n=4)
	New[a]	Old[b]	New	Old	
Unfiltered Solutions					
0.0 (Water Control)	ND	ND	ND	ND	ND
0.0 (Acetone Control)	0.008	ND	0.011	ND	0.005 ± 0.006
25	6.6	0.17	8.6	0.27	3.9 ± 4.3
50	8.8	0.30	9.4	0.36	4.7 ± 5.1
100	25.0	0.29	3.2	0.23	7.2 ± 12.0
Filtered Solutions					
25	0.06	0.12	0.12	0.14	0.11 ± 0.03
50	0.09	0.08	0.11	0.10	0.10 ± 0.01
100	0.05	0.04	0.11	0.09	0.07 ± 0.03

[a]Refers to samples collected immediately after the treatment stock solutions were prepared.

[b]Refers to samples collected 24 hr after the test solutions were placed in the exposure chambers.

[c]ND = None Detected (<0.0005 mg/L).

TABLE 3. CUMULATIVE IMMOBILIZATION OF DAPHNIA MAGNA EXPOSED FOR 48 HOURS TO BENEFIN. STUDY C00185.

Nominal Benefin Concentration (mg/L)	Analyzed Benefin Concentration[a] (mg/L)	Cumulative Immobilization (%)	
		24 hr	48 hr
Unfiltered Solutions			
0.0 (Water Control)	ND	0	0
0.0 (Acetone Control)	0.005 ±0.006	0	0
25	3.9 ± 4.3	0	0
50	4.7 ± 5.1	0	0
100	7.2 ± 12.0	0	63
Filtered Solutions			
25	0.11 ± 0.03	0	0
50	0.10 ± 0.01	0	0
100	0.07 ± 0.03	13	57

[a]Mean ± SD (n=4)