

US EPA ARCHIVE DOCUMENT

7-3-85

DATA EVALUATION RECORD

1. Chemical: Benefin (EL-110)

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

3. Study Type: Freshwater Fish Acute Toxicity

Species tested: Rainbow trout (Salmo gairdneri)

4. Citation: Koenig, G.R. (1985) The Acute Toxicity of Benefin (EL-110, Compound 54521) to Rainbow trout (Salmo gairdneri) in a Static-Renewal Test System. Study F00185. Prepared by Lilly Research Laboratories, Submitted by Elanco Products Co., Indianapolis, Indiana. Registration No. 1471-148. Acc. #257844. ✓

5. Reviewed by:

Carol M. Natella
Wildlife Biologist
Ecological Effects Branch/HED

Signature: Carol M. Natella
Date: 7-3-85

6. Approved by:

Harry Craven
Supervisory Biologist
Ecological Effects Branch/HED

Signature: Harry Craven
Date: 7/3/85

7. Conclusions:

This study is scientifically sound. With a 96-hour LC₅₀ of 81 ppb, benefin is considered very highly toxic to the cold water fish species, Salmo gairdneri (tested in hard water).

The study fulfills the guidelines requirement for an acute toxicity determination for a cold water fish species.

8. Recommendations: N/A

David

9. Background:

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

10. Discussion of Individual Test: N/A

11. Materials and Methods

A. Test animals:

Rainbow trout (Salmo gairdneri), obtained from Trout Lodge, McMillan, Washington.

Fish had a mean wet weight of 0.525 g and a mean total length of 40.8 mm (loading 0.27 g/l).

B. Test system:

Glass jars completely filled with dilution water (18.9 L) and covered with a sheet of glass. Dilution water was conditioned well water having the following characteristics: total hardness, 136.8 mg/l (as CaCO₃); total alkalinity, 169 mg/l (as CaCO₃); conductivity, 260 μ mhos/cm. Temperature of the test solutions averaged 11.9 °C (range, 11.8 ° to 12.6 °C) during the course of the study.

C. Dose:

Static-renewal test system. Test animals were transferred to freshly prepared test solutions every 24 hours. Preliminary work demonstrated that benefin decreased in test solutions between daily renewals (5 percent without fish and 39 percent if fish were present).

D. Design:

Ten fish per treatment, 6 treatments plus a water control and an acetone control (0.025 ml acetone/l).

E. Statistics:

The log-probit analysis method of Bliss (1938), as adopted by Rosiello et al. (1977), was used to calculate the LC₅₀.

12. Report Results:

Averaged Assayed Concentration (mg/l)	Mortality (%)			
	24-hour	48-hour	72-hour	96-hour
Water Control	0	0	0	0
Acetone Control	0	0	0	0
0.017	0	0	0	0
0.040	0	0	0	0
0.052	0	0	0	10
0.077	10	10	30	30
0.084	10	10	10	80
0.121	0	20	60	80

Averaged analyzed concentrations of benefin in the 24-hour test solutions ranged from 24 percent to 44 percent of the nominal values. (see table 1). Loss of benefin from the exposure solutions was attributed (by the author) to be due to the compound's low water solubility (0.10 mg/l) propensity to adhere to glass surfaces, and uptake by the fish. The average benefin concentrations measured 24 hours after each renewal were used in determining the LC₅₀ and the NOEC.

Concentration-related signs of toxicity such as hypoactivity, impaired swimming, labored respiration, prostration, and death occurred at concentrations > 0.040 mg/l. Sluggish behavior was noted in all of the animals in the 0.040 mg/l treatment.

13. Study Author's Conclusions

96-Hour LC₅₀ (based on average assayed concentrations) = 0.081 mg/l (95% CL 0.070 to 0.094). Slope = 6.728.

14. Reviewer's Discussion and Interpretation of the Study

A. Test Procedures:

The procedures were generally in accordance with protocols recommended by the guidelines. The only departure was in the fact that hard water was used in the test vessels.

B. Statistical Analysis:

Statistical analysis was verified using Stephan's computer program.

C. Discussion/Results:

With a 96-hour LC₅₀ of 81 ppb (0.081 mg/l), benefin is very highly toxic to rainbow trout (in hard water).

D. Adequacy of Study:

1. Classification: Core

2. Rationale: N/A

3. Repairability: N/A

15. Completion of One-Liner

Yes, June 20, 1985

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TABLE 1. ANALYZED CONCENTRATIONS OF BENEFIN IN TEST SOLUTIONS.
 STUDY F00185. (*Random Treat*)

Nominal Concentration (mg/L)	Analyzed Concentration (mg/L)					Average For "Old" Solutions ^c
	Fresh ^a Solution at 0-hr	24 Hr ^b	48 Hr ^b	72 Hr ^b	96 Hr ^b	
Water Control	ND ^d	0.011	ND	ND	ND	
Acetone Control	ND	ND	ND	ND	ND	
0.056	0.016	0.012	0.021	0.018	0.018	0.017 ± 0.004
0.090	0.038	0.029	0.043	0.047	0.044	0.040 ± 0.008
0.140	0.071	0.054	0.053	0.048	0.054	0.052 ± 0.003
0.225	0.071	0.067	0.070	0.090	0.084	0.077 ± 0.011
0.330	0.151	0.068	0.070	0.094	0.106	0.084 ± 0.019
0.500	0.077	0.076	0.150	0.147	0.113	0.121 ± 0.035

^a Samples collected immediately after preparation of the test solutions.

^b Samples collected 24 hr after preparation of the test solutions.

^c Mean ± SD (n=4)

^d ND = None Detected (< 0.0005 mg/L)

NATELLA BENEFIN RAINBOW

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
.121	10	8	80	5.46875
.084	10	8	80	5.46875
.077	10	3	30	17.1875
.052	10	1	10	1.07422
.04	10	0	0	.0976563
.017	10	0	0	.0976563

THE BINOMIAL TEST SHOWS THAT .052 AND +INFINITY CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS .0796698

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
3	.202399	.0757891	.0661527	.0966121

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
5	.24382	1	.37051

SLOPE = 6.70306
 95 PERCENT CONFIDENCE LIMITS = 3.39321 AND 10.0129

LC50 = .0811244
 95 PERCENT CONFIDENCE LIMITS = .0693324 AND .0976353

LC10 = .0524428
 95 PERCENT CONFIDENCE LIMITS = .033996 AND .0628061
