DP Barcode : D191189
PC Code No : 006315
EEB Out : 9/27/93

To:
Product Manager Barbara Briscoe, PM 51

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # : 6315-6836

Chemical Name : 5,5-Dimenthylhydantoin

Type Product : Microbiocide

Product Name : Hydrantoin

Company Name : Lonza Inc.
Purpose : Review study
Action Code : _____ Date Due : _____
Reviewer : J. Sylvester Date In EEB: _____

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)			72-2(A)			72-7(A)		
71-1(B)			72-2(B)			72-7(B)		
71-2(A)			72-3(A)			122-1(A)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A)		
71-4(B)			72-3(E)			123-1(B)		
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)	427217-02	Y	124-1		
72-1(A)			72-4(B)	427217-01	N	124-2		
72-1(B)			72-5			141-1		
72-1(C)			72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur

DP BARCODE: D191189 REREG CASE # 305

CASE: 800364 DATA PACKAGE RECORD DATE: 05/11/9
SUBMISSION: S440576 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 627 GENERIC DATA SUBMISSION
CHEMICALS: 006315 1-Bromo-3-chloro-5,5-dimethylhydantoin 100.00

ID#: 006315-006836
COMPANY: 006836 LONZA INC
PRODUCT MANAGER: 51 BARBARA BRISCOE 703-308-8177 ROOM: CS1 3H3
PM TEAM REVIEWER: TOM MYERS 703-308-8074 ROOM: CS1 4N1
RECEIVED DATE: 05/11/93 DUE OUT DATE: 08/09/93

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 191189 EXPEDITE: N DATE SENT: 05/11/93 DATE RET.: / /
CHEMICAL: 006315 1-Bromo-3-chloro-5,5-dimethylhydantoin
DP TYPE: 999 Miscellaneous Data Package
ADMIN DUE DATE: 08/09/93 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	5/13/93	/ /
BRAN: EEB	5/13/93	/ /
SECT:	/ /	/ /
REVR :	/ /	/ /
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

Please review the following ecological effects studies for the hydantoins (6315, 6317, 28501 and 128826).

Gdln 72-4(a) Early Life Stage - Fish MRID 42721702
Gdln 72-4(b) Life Cycle Tox. - Daphnia MRID 42721701

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 27 1993

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Review of Data for Hydantoin Submitted by Lonza Inc. (Shaughnessy # 006315)

FROM: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

TO: Barbara Briscoe, PM 51
Special Review and Reregistration Division (H7508W)

The Ecological Effects Branch has completed its review of the studies submitted by Lonza Inc. for Hydantoin. The following is a brief summary of the data reviewed.

1. **Citation:** Zelinka, E.A., C.M. Holmes, and J.P. Swigert. 1993. A Flow-through Life-Cycle Toxicity Test with 5,5-Dimethylhydantoin in the Cladoceran (Daphnia magna). Project No. 289A-110. Prepared by Wildlife International Ltd., Easton, MD. Submitted by Lonza Inc., Fair Lawn, NJ. EPA MRID No. 427217-01.

Conclusions: This study is not scientifically sound. The study design is not clearly described and does not appear to be scientifically valid. The design of this test appears to be based on the ASTM static-renewal protocol and the design suggested in the SEP for static-renewal tests. However, each test beaker was not physically separated. As the test solution could flow between beakers at each test concentration, these beakers were not true replicates. In addition, it is likely that a mercury spill in replicate B of the 116 ppm test concentration resulted in significant mortality and an erroneous conclusion of an LOEC (based on reduced survival) of 116 ppm. The MATC was >70.9 ppm DMH mean measured concentration.

2. **Citation:** Holmes, C.M. and J.P. Swgert. 1993. An Early Life-Stage Toxicity Test with 5,5-Dimethyhydantoin in the Fathead Minnow (Pimephales promelas). Project No. 289A-111. Prepared by Wildlife International Ltd., Easton, MD. Submitted by Lonza Inc., Fair Lawn, NJ. EPA MRID No. 427217-02

Conclusions: This study is scientifically sound and meets the guideline requirements for an early life-stage toxicity test using fathead minnows. The MATC for 5,5-dimethylhydantoin was >14 and <29 ppm mean measured concentration (geometric mean MATC = 20 ppm), based on the most sensitive biological parameter, dry weight.

For additional information, please contact Joseph Sylvester, EEB at 305-7463.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 7 1993

CERTIFIED MAIL - P 040 186 621

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Mr. Joseph R. Robinson
Lonza Inc.
Corporate Headquarters
17-17 Route 208
Fair Lawn, NJ 07410

SUBJECT: Review of ecological effects studies with the chemical bromo-3-chloro-5,5,dimethylhydantoin.

Dear Mr. Robinson:

The Agency has completed the review of the early life stage fish toxicity test, 72-4(a) and the life cycle toxicity test with Daphnia magna, 72-4(b) for the chemical bromo-3-chloro 5,5, dimethylhydantoin (Chemical No. 6315, Case 3055) and has reached the following decision.

Gdln 72-4(a) Early Life Stage Toxicity - Fish MRID 42721702

This study is scientifically sound and meets the guideline requirements for an early life stage toxicity test using fathead minnows. The maximum acceptable toxicant concentration (MATC) for 5,5-dimethylhydantoin was >14 and <29 ppm mean measured concentration (geometric mean MATC = 20 ppm), based on the most sensitive biological parameter, dry weight. A copy of the DER is enclosed.

Gdln 72-4(b) Life Cycle Invertebrate Test - Daphnia MRID 42721701

This study is unacceptable and needs to be repeated. The study design is not clearly described and does not appear to be scientifically valid. The design of this test appears to be based on the ASTM static-renewal protocol and the design suggested in the SEP for static-renewal tests. However, each test beaker was not physically separated. As the test solution could flow between beakers at each test concentration, these beakers were not true replicates. In addition, it is likely that a mercury spill in replicate B of the 116 ppm test concentration resulted in significant mortality and an erroneous conclusion of an LOEC (based on reduced survival) of 116 ppm. A copy of the DER is enclosed. A new study is required and needs to be submitted by October 30, 1994.

5

If you have any questions regarding this letter, please contact Tom Myers in the Accelerated Reregistration Branch at (703) 308-8074.

Sincerely yours,

Jay Ellenberger, Chief
Accelerated Reregistration Branch
Special Review and
Reregistration Division

Enclosures:

cc: Ruth Douglas, PM-32
Joseph Sylvester, EEB

6

DATA EVALUATION RECORD

1. **CHEMICAL:** Hydantoin.
Shaughnessey No. 006315.

2. **TEST MATERIAL:** 1) Nonradiolabeled Dantoin DMH; TRCS No. 20209; Lot No. N0432543; >99.9% active ingredient. 2) Radiolabeled 5,5-Dimethylhydantoin [2-^{14}C]; Lot No. 911108; 64.7 µCi/ml; 15 mCi/mmol specific activity; 98.34% radiochemical purity.

3. **STUDY TYPE:** 72-4. Daphnid Flow-Through Life-Cycle Chronic Toxicity Test. Species Tested: *Daphnia magna*.

4. **CITATION:** Zelinka, E.A., C.M. Holmes, and J.P. Swigert. 1993. A Flow-Through Life-Cycle Toxicity Test with 5,5-Dimethylhydantoin in the Cladoceran (*Daphnia magna*). Project No. 289A-110. Prepared by Wildlife International Ltd., Easton, MD. Submitted by Lonza Inc., Fair Lawn, NJ. EPA MRID No. 427217-01.

5. **REVIEWED BY:**

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

Signature: P. Kosalwat for LMR / J. Sylvester
Date: 6/22/93 9/17/93

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: P. Kosalwat
Date: 6/22/93

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

Signature: Anne Stavola 9/17/93
Date:

INVALID

7. **CONCLUSIONS:** This study is not scientifically sound. The study design is not clearly described and does not appear to be scientifically valid. In addition, it is likely that a mercury spill in replicate B of the 116 ppm test concentration resulted in significant mortality and an erroneous conclusion of an LOEC (based on reduced survival) of 116 ppm. The MATC was >70.9 ppm DMH mean measured concentration.

8. RECOMMENDATIONS: N/A.

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 maintained in the test dilution water and at test temperature. The cultures were fed *Selenastrum capricornutum* and a yeast, Cerophyll®, and trout chow mixture. The progeny of three or more adults were used to initiate the test.

B. Test System: A continuous-flow diluter was used. A stock solution was prepared for each of the five test concentrations. A stock solution was prepared for each of the five test concentrations. The primary stock (100 mg/ml) was prepared by dissolving nonradiolabeled DMH in reverse-osmosis water. Aliquots of this stock were diluted in reverse-osmosis water to prepare the four additional stock solutions. Dispensing stock solutions were prepared by spiking the nonradiolabeled stock solutions with a radiolabeled stock (0.55 mg/ml ^{14}C-DMH). Each dispensing solution had an approximate radioactive concentration of 2.5×10^4 dpm/ml. The radiolabeled stock and the dispensing stocks were stored at -14°C until needed.

A peristaltic pump delivered the test stocks to the diluter mixing chambers. The flow of test solution from the mixing/splitting chambers into the test chambers provided 14 volume additions per day. The diluter was allowed to run for approximately 43 hours prior to test initiation.

The test compartments were 300-ml glass beakers (6.5-cm diameter and 12-cm high). Two circular openings on opposite sides of the beakers, covered with Nitex® screen to contain the daphnids, allowed test solution to flow into and out of the beakers. The beakers were suspended in Teflon®-lined 8-l chambers filled with 6.5 l of test solution. The chambers were indiscriminately positioned in a temperature-controlled water bath designed to maintain 20 ±1°C. The test area was illuminated at an intensity of 431 lux using fluorescent tubes and a 16-hour light/8-hour dark

photoperiod. Thirty-minute dawn and dusk simulations were employed.

The dilution water was filtered, aerated well water. Average water quality during the 4-week period immediately preceding the test was a hardness of 140-160 mg/l as $CaCO_3$, an alkalinity of 190-192 mg/l as $CaCO_3$, a pH of 7.8-8.2, and a conductivity of 330-340 µmhos/cm.

C. Dosage: Twenty-one-day, flow-through, life-cycle toxicity test. Five nominal concentrations (15.6, 25.9, 43.2, 72.0, and 120 ppm DMH) and a dilution water control were selected for the test.

D. Design: Individual neonate daphnids were placed in seven replicate test beakers per treatment to assess survival, reproduction, and growth, and groups of five daphnids were placed in each of three beakers per treatment to assess survival. Five beakers were placed in each of two replicate test chambers. The daphnids were fed the same diet used in culturing three times daily during the test and once on the last day of the test.

Survival and counts of offspring produced (except in the beakers containing 5 adult daphnids) were recorded three times per week (Monday, Wednesday, and Friday) and at test termination. Beginning on day 9, after each observation the adult was transferred to a clean test beaker and the neonates discarded. Any sublethal effects were noted. The lengths and dry weights of surviving first generation daphnids were determined at the end of the test.

The temperature in each replicate of each concentration was measured at the beginning of the test and weekly thereafter. The temperature of one control replicate was also monitored continuously using a data logging device. The dissolved oxygen concentration (DO) and pH were measured in alternate replicates of each treatment and control group daily during the first week of the test and weekly thereafter. Hardness, alkalinity, and conductivity in alternate replicates of the control were determined at test initiation and then weekly until the end of the test.

Water samples from each test chamber were taken prior to test initiation and on days 0, 7, 14, and 21 for

determination of the concentration of DMH by liquid scintillation counting (LSC). Aliquots of dispensing stock solutions and aquarium water were collected at test initiation and termination and shipped to BTC where they were analyzed for DMH concentration using high pressure liquid chromatography. The concentration of radioactivity in the water samples was converted to mg DMH equivalents/l of water and expressed as ppm.

E. Statistics: Survival data were analyzed using the Mann-Whitney test. Reproduction and growth data were checked for homogeneity of variance and normality using Bartlett's test and the chi-square test, respectively, and transformed (inverse square root) if necessary. The responses of the exposed daphnids were compared to those of the control daphnids using Bonferroni's test.

12. REPORTED RESULTS: The mean measured concentrations were 15.7, 25.3, 42.2, 70.9, and 116 ppm (Table 1, attached). Measured values of the test material in the control were less than the limit of quantitation.

"Mercury was spilled from a broken thermometer into Replicate B test chamber and one test compartment of the 120 ppm DMH (nominal) test chamber on Day 5 of the exposure period. The test chamber was drained, cleaned with acetone, and relined with a Teflon® bag after the mercury was contained. All daphnia in this replicate were transferred to clean test compartments containing test solution from the 120 ppm DMH, Replicate A, test chamber. The 120 ppm DMH test water was directed to the Replicate B test chamber until the chamber was full and then split between the two replicate test chambers as usual."

One daphnid in the 42.2 ppm DMH treatment group appeared lethargic on day 20. Two daphnids in the 116 ppm DMH treatment group appeared lethargic on day 8. All other surviving daphnids were normal throughout the test. Mortality in the four lowest treatment groups was similar to that of the control group and was not considered to be treatment related (Table 2, attached). Mortality in the 116 ppm group (55%) was significantly higher than control mortality.

The number of days until first brood production (11 days) was the same for all treatments (Table 3, attached). Neonate production obtained in all treatment groups was not statistically different from that obtained in the control group.

The length and weight of surviving daphnids exposed to DMH were not significantly different from those of the control daphnids (Table 4, attached).

The DO ranged from 7.8 to 8.7 mg/l during the test. The pH was 7.8-8.1. The results of continuous temperature monitoring established the temperature range during the test as 19.7-20.5°C. The hardness, alkalinity, and conductivity of the control solution were 132-136 mg/l as $CaCO_3$, 182-184 mg/l as $CaCO_3$, and 330-335 µmhos/cm, respectively.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** Based on reduced survival at 116 ppm DMH mean measured concentration, the maximum acceptable toxicant concentration (MATC) was estimated to be >70.9 and <116 ppm DMH (geometric mean MATC = 90.7 ppm DMH).

Quality Assurance and good laboratory practice statements were included in the report indicating adherence to USEPA GLP Regulations (40 CFR Part 160). The dates and types of quality assurance audits were also presented.

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

A. **Test Procedure:** Since there is no SEP for a daphnid chronic flow-through test at the present time, the test procedures were evaluated based on general guidance from the SEP for chronic static-renewal tests using daphnids and ASTM protocols. Significant weaknesses of the test are listed below:

The test report did not specifically state whether the daphnids were randomly distributed to the test chambers. Random or impartial distribution is required.

The distribution of the exposure compartments (i.e., beakers with two screened holes on the sides) was not clearly described in the report. Seven beakers contained a single daphnid each while three beakers contained 5 daphnids each. The authors only stated that five beakers were contained in each replicate chamber but did not state how the beakers were distributed between the two chambers (e.g., all beakers with 5 daphnids and two beakers with 1 daphnid in one chamber, while the other chamber contained five beakers with 1 daphnid each, etc.).

11

The physical characteristics of the test material (i.e., color, physical state) were not stated in the report.

The number of volume replacements used during the test (14/day) was much greater than recommended (4-6/day).

Only the conductivity, hardness, and alkalinity of the dilution water control were measured weekly. ASTM states that these parameters must be measured in the control, low, medium, and high concentrations weekly.

B. Statistical Analysis: Survival of daphnids was analyzed using Fisher's Exact test (Toxstat Version 3.3). The raw data did not differentiate between replicates; the survival was given only as total survival out of 22 daphnids. The computer program would not accept more than 20 test organisms per concentration so the reviewer adjusted the survival mathematically to reflect 20 test organisms. The reviewer's analysis was the same as the authors' (see attached printout 1). Survival data from the two systems (beakers with 1 daphnid and beakers with 5 daphnids) should have been reported and analyzed separately.

The number of young produced per reproductive day, total number of young per surviving adult, length, and dry weight were analyzed using one-way analysis of variance and Bonferroni's test. None of these parameters was significantly affected by exposure to the test material (see attached printouts 1-4).

C. Discussion/Results: The proposed chronic, flow-through protocol (ASTM, 1992) recommends four replicates per concentration, with each replicate containing 10 daphnids. < The design of this test appears to be based on the ASTM static-renewal protocol and the design suggested in the SEP for static-renewal tests. However, each test beaker was not physically separated. > Five beakers were placed in a replicate chamber. Since the beakers had two screened holes on the sides, the test solution could flow from one beaker to another. The authors statistically treated the seven beakers containing a single daphnid as if they were true replicates. These beakers were not true replicates.

The authors reported that mercury from a broken thermometer contaminated replicate B of the 116 ppm DMH test concentration on Day 5 of the exposure period. It

appears that some mercury also contaminated one of the test beakers containing daphnids in the replicate. The test chamber was drained, cleaned with acetone, and relined with a Teflon® bag after the mercury was contained. All daphnids in this replicate were transferred to clean beakers containing test solution from replicate A, and flow to replicate B was reinitiated.

The test material had no effect on daphnid reproduction or growth during the test. Mortality was first observed during the study on day 8, when 27% of the daphnids in the 116 ppm concentration were observed dead. Mortality in this concentration was 55% by test termination. The authors did not report the mortality in each replicate, so the reviewer does not know how much mortality occurred in replicate B of the 116 ppm concentration during the test. Mortality in the control and the four lowest test concentrations ranged from 5 to 14%.

This test should have been terminated after the mercury spill and restarted. Since the spill was early in the test, the cost to the laboratory of restarting the test would have been minimal. It is likely that the mortality observed in the highest test concentration is the result of the stress created by the spill. Although the end result of the spill is a conservative NOEC of 70.9 ppm, this number does not reflect the NOEC of 5,5-dimethylhydantoin.

This study is not scientifically sound. The study design was not clearly described. The test procedures reported did not appear to be scientifically valid. Also, it is likely that the mercury spill in replicate B of the 116 ppm (mean measured concentration) resulted in significant mortality in this concentration and an erroneous conclusion of an LOEC (based on reduced survival) of 116 ppm. If the study is repeated, either the SEP's static renewal procedures (use of 10 physically separated beakers) or ASTM's flow-through test procedures (use of 4 replicates/concentration and 10 daphnids/replicate) should be followed. The MATC was >70.9 ppm DMH mean measured concentration.

D. **Adequacy of the Study:**

(1) **Classification:** Invalid.

(2) **Rationale:** 1) The study design is not scientifically sound. 2) The contamination of replicate B of the 116 ppm test level with mercury from a broken thermometer occurred on test day 5.

(3) **Repairability:** No.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 06-17-93.

RIN # 3113-00

EPA - Data Evaluation Records (DERs)

Page_____ is not included in this copy.

Pages 15 through 22 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.

427217-01, dimethylhydantoin, survival

SUMMARY OF FISHERS EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	20	2	
1	15.7 ppm	20	1	
2	25.3 ppm	20	3	
3	42.2 ppm	20	3	
4	70.9 ppm	20	2	
5	116 ppm	20	13	*

427217-01, dimethylhydantoin, young/reproductive day
File: a:42721701.dt1 Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
Data PASS normality test at P=0.01 level. Continue analysis.

Bartletts test for homogeneity of variance
Data PASS homogeneity test at 0.01 level. Continue analysis.

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1.507	0.301	3.342
Within (Error)	34	3.065	0.090	
Total	39	4.572		

Critical F value = 2.53 (0.05,5,30)
Since F > Critical F REJECT Ho:All groups equal

BONFERRONI T-TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	negative contrl	0.424	5.017		
2	15.7 ppm	1.002	10.400	-3.602	
3	25.3	0.887	7.957	-2.885	
4	42.2	0.868	7.771	-2.766	
5	70.9	0.955	9.357	-3.304	
6	116	0.794	6.680	-2.100	

Bonferroni T table value = 2.44 (1 Tailed Value, P=0.05, df=34,5)

427217-01, dimethylhydantoin, young/surviving adult
File: a:42721701.dt2 Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
Data PASS normality test at P=0.01 level. Continue analysis.

Bartletts test for homogeneity of variance
Data PASS homogeneity test at 0.01 level. Continue analysis.

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	7576.314	1515.263	2.039
Within (Error)	29	21550.429	743.118	
Total	34	29126.743		

Critical F value = 2.55 (0.05,5,29)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

BONFERRONI T-TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	negative contrl	68.600	68.600		
2	15.7 ppm	104.000	104.000	-2.218	
3	25.3	79.571	79.571	-0.687	
4	42.2	84.800	84.800	-0.940	
5	70.9	93.571	93.571	-1.564	
6	116	57.500	57.500	0.607	

Bonferroni T table value = 2.46 (1 Tailed Value, P=0.05, df=29,5)

427217-01, dimethylhydantoin, length (mm)
File: a:42721701.dt3 Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
Data PASS normality test at P=0.01 level. Continue analysis.

Bartletts test for homogeneity of variance
Data PASS homogeneity test at 0.01 level. Continue analysis.

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.756	0.151	1.305
Within (Error)	29	3.360	0.116	
Total	34	4.115		

Critical F value = 2.55 (0.05,5,29)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

BONFERRONI T-TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	negative contrl	4.030	4.030		
2	15.7 ppm	4.300	4.300	-1.355	
3	25.3	4.121	4.121	-0.459	
4	42.2	4.360	4.360	-1.533	
5	70.9	4.386	4.386	-1.785	
6	116	4.012	4.012	0.077	

Bonferroni T table value = 2.46 (1 Tailed Value, P=0.05, df=29,5)

427217-01, dimethylhydantoin, dry weight (mg)
File: a:42721701.dt4 Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
Data PASS normality test at P=0.01 level. Continue analysis.

Bartletts test for homogeneity of variance
Data PASS homogeneity test at 0.01 level. Continue analysis.

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.196	0.039	0.725
Within (Error)	29	1.570	0.054	
Total	34	1.766		

Critical F value = 2.55 (0.05,5,29)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

BONFERRONI T-TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	negative contrl	0.550	0.550		
2	15.7 ppm	0.759	0.759	-1.531	
3	25.3	0.616	0.616	-0.482	
4	42.2	0.650	0.650	-0.680	
5	70.9	0.694	0.694	-1.059	
6	116	0.548	0.548	0.016	

Bonferroni T table value = 2.46 (1 Tailed Value, P=0.05, df=29,5)

2e

TITLE: 427217-01, dimethylhydantoin, dry weight (mg)
FILE: a:42721701.dt4
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	negative contrl	1	0.7700	0.7700
1	negative contrl	2	0.2100	0.2100
1	negative contrl	3	0.1900	0.1900
1	negative contrl	4	0.8800	0.8800
1	negative contrl	5	0.7000	0.7000
2	15.7 ppm	1	0.7000	0.7000
2	15.7 ppm	2	0.3400	0.3400
2	15.7 ppm	3	0.9700	0.9700
2	15.7 ppm	4	0.8900	0.8900
2	15.7 ppm	5	0.6700	0.6700
2	15.7 ppm	6	0.9200	0.9200
2	15.7 ppm	7	0.8200	0.8200
3	25.3	1	0.3900	0.3900
3	25.3	2	0.8400	0.8400
3	25.3	3	0.4400	0.4400
3	25.3	4	0.7200	0.7200
3	25.3	5	0.5900	0.5900
3	25.3	6	0.6900	0.6900
3	25.3	7	0.6400	0.6400
4	42.2	1	0.8800	0.8800
4	42.2	2	0.9400	0.9400
4	42.2	3	0.3000	0.3000
4	42.2	4	0.7500	0.7500
4	42.2	5	0.3800	0.3800
5	70.9	1	0.9200	0.9200
5	70.9	2	0.4300	0.4300
5	70.9	3	0.9300	0.9300
5	70.9	4	0.7100	0.7100
5	70.9	5	0.5200	0.5200
5	70.9	6	0.5600	0.5600
5	70.9	7	0.7900	0.7900
6	116	1	0.4600	0.4600
6	116	2	0.4500	0.4500
6	116	3	0.8700	0.8700
6	116	4	0.4100	0.4100

TITLE: 427217-01, dimethylhydantoin, young/reproductive day
FILE: a:42721701.dt1
TRANSFORM: LOG BASE 10(Y) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	negative contrl	1	10.1000	1.0043
1	negative contrl	2	0.6000	-0.2218
1	negative contrl	3	0.2200	-0.6576
1	negative contrl	4	2.4000	0.3802
1	negative contrl	5	4.1000	0.6128
1	negative contrl	6	11.5000	1.0607
1	negative contrl	7	6.2000	0.7924
2	15.7 ppm	1	10.9000	1.0374
2	15.7 ppm	2	5.9000	0.7709
2	15.7 ppm	3	13.1000	1.1173
2	15.7 ppm	4	8.7000	0.9395
2	15.7 ppm	5	8.9000	0.9494
2	15.7 ppm	6	13.4000	1.1271
2	15.7 ppm	7	11.9000	1.0755
3	25.3	1	5.6000	0.7482
3	25.3	2	6.7000	0.8261
3	25.3	3	6.9000	0.8388
3	25.3	4	8.7000	0.9395
3	25.3	5	6.2000	0.7924
3	25.3	6	10.9000	1.0374

3	25.3	7	10.7000	1.0294
4	42.2	1	11.3000	1.0531
4	42.2	2	9.0000	0.9542
4	42.2	3	4.9000	0.6902
4	42.2	4	7.1000	0.8513
4	42.2	5	6.8000	0.8325
4	42.2	6	10.6000	1.0253
4	42.2	7	4.7000	0.6721
5	70.9	1	11.1000	1.0453
5	70.9	2	6.5000	0.8129
5	70.9	3	12.8000	1.1072
5	70.9	4	11.1000	1.0453
5	70.9	5	8.0000	0.9031
5	70.9	6	5.7000	0.7559
5	70.9	7	10.3000	1.0128
6	116	1	3.3000	0.5185
6	116	2	10.5000	1.0212
6	116	3	7.3000	0.8633
6	116	4	7.2000	0.8573
6	116	5	5.1000	0.7076

TITLE: 427217-01, dimethylhydantoin, young/surviving adult
FILE: a:42721701.dt2
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	negative contrl	1	101.0000	101.0000
1	negative contrl	2	24.0000	24.0000
1	negative contrl	3	41.0000	41.0000
1	negative contrl	4	115.0000	115.0000
1	negative contrl	5	62.0000	62.0000
2	15.7 ppm	1	109.0000	109.0000
2	15.7 ppm	2	59.0000	59.0000
2	15.7 ppm	3	131.0000	131.0000
2	15.7 ppm	4	87.0000	87.0000
2	15.7 ppm	5	89.0000	89.0000
2	15.7 ppm	6	134.0000	134.0000
2	15.7 ppm	7	119.0000	119.0000
3	25.3	1	56.0000	56.0000
3	25.3	2	67.0000	67.0000
3	25.3	3	69.0000	69.0000
3	25.3	4	87.0000	87.0000
3	25.3	5	62.0000	62.0000
3	25.3	6	109.0000	109.0000
3	25.3	7	107.0000	107.0000
4	42.2	1	113.0000	113.0000
4	42.2	2	90.0000	90.0000
4	42.2	3	68.0000	68.0000
4	42.2	4	106.0000	106.0000
4	42.2	5	47.0000	47.0000
5	70.9	1	111.0000	111.0000
5	70.9	2	65.0000	65.0000
5	70.9	3	128.0000	128.0000
5	70.9	4	111.0000	111.0000
5	70.9	5	80.0000	80.0000
5	70.9	6	57.0000	57.0000
5	70.9	7	103.0000	103.0000
6	116	1	33.0000	33.0000
6	116	2	74.0000	74.0000
6	116	3	72.0000	72.0000
6	116	4	51.0000	51.0000

TITLE: 427217-01, dimethylhydantoin, length (mm)
FILE: a:42721701.dt3
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	negative contrl	1	4.5000	4.5000
1	negative contrl	2	3.3500	3.3500
1	negative contrl	3	3.7000	3.7000
1	negative contrl	4	4.6000	4.6000
1	negative contrl	5	4.0000	4.0000
2	15.7 ppm	1	4.4000	4.4000
2	15.7 ppm	2	4.0000	4.0000
2	15.7 ppm	3	4.5000	4.5000
2	15.7 ppm	4	4.6000	4.6000
2	15.7 ppm	5	4.1000	4.1000
2	15.7 ppm	6	3.8500	3.8500
2	15.7 ppm	7	4.6500	4.6500
3	25.3	1	3.8500	3.8500
3	25.3	2	4.4000	4.4000
3	25.3	3	4.0500	4.0500
3	25.3	4	4.3000	4.3000
3	25.3	5	3.8000	3.8000
3	25.3	6	4.3000	4.3000
3	25.3	7	4.1500	4.1500
4	42.2	1	4.5000	4.5000
4	42.2	2	4.8000	4.8000
4	42.2	3	4.0500	4.0500
4	42.2	4	4.5000	4.5000
4	42.2	5	3.9500	3.9500
5	70.9	1	4.7500	4.7500
5	70.9	2	4.2000	4.2000
5	70.9	3	4.7500	4.7500
5	70.9	4	4.5000	4.5000
5	70.9	5	4.0000	4.0000
5	70.9	6	3.9000	3.9000
5	70.9	7	4.6000	4.6000
6	116	1	3.8500	3.8500
6	116	2	4.1000	4.1000
6	116	3	4.2000	4.2000
6	116	4	3.9000	3.9000

Ecological Effects Branch One-Liner Data Entry Form

Chemical Hydantoin Shaughnessy No. 006315 Pesticide Use _____

INVERTEBRATE ACUTE TOXICITY	% AI	EC_{50} (95%CL) SLOPE	HRS/ TYPE	NOEC	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1.								
2.								
3.								
4.								
5.								
6.								
7.								

CHRONIC TOX.	% AI	MATC * ~~LC_{50}~~	DAYS	AFFECTED PARA.	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1. Daphnia magna	99.9	>70.9 ppm	21	Survival	1993/1993	427217-01 Invalid	WIL	LMR
2.								
3.								

COMMENTS: * mean measured concentration

70

DATA EVALUATION RECORD

1. **CHEMICAL:** Hydantoin.
Shaughnessey No. 006315.

2. **TEST MATERIAL:** 1) Nonradiolabeled Dantoin DMH; TRCS No. 20209; Lot No. N0432543; >99.9% active ingredient. 2) Radiolabeled 5,5-Dimethylhydantoin [2-^{14}C]; Lot No. 911108; 64.7 µCi/ml; 15 mCi/mmol specific activity; 98.34% radiochemical purity.

3. **STUDY TYPE:** 72-4. Freshwater Fish, Early Life-Stage, Toxicity Test. Species Tested: Fathead Minnow (*Pimephales promelas*).

4. **CITATION:** Holmes, C.M. and J.P. Swigert. 1993. An Early Life-Stage Toxicity Test with 5,5-Dimethylhydantoin in the Fathead Minnow (*Pimephales promelas*). Project No. 289A-111. Prepared by Wildlife International Ltd., Easton, MD. Submitted by Lonza Inc., Fair Lawn, NJ. EPA MRID No. 427217-02.

5. **REVIEWED BY:**

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

Signature: P. Kosalwat for LHR J. Sylvester
Date: 6/22/93 9/17/93

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: P. Kosalwat
Date: 6/22/93

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

Signature:
Date:

7. **CONCLUSIONS:** This study is scientifically sound and meets the guideline requirements for an early life-stage toxicity test using fathead minnows. The MATC for 5,5-dimethylhydantoin was >14 and <29 ppm mean measured concentration (geometric mean MATC = 20 ppm), based on the most sensitive biological parameter, dry weight.

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

9. BACKGROUND:

10. DISCUSSION OF INDIVIDUAL TESTS: N/A.

11. MATERIALS AND METHODS:

A. Test Animals: Fertilized fathead minnow (*Pimephales promelas*) embryos were obtained from in-house cultures. Embryos (from a minimum of three spawns) were removed from the spawning substrates and microscopically examined to select healthy specimens in approximately the same stage of development. The embryos were 4.5 to 22 hours old at test initiation.

B. Test System: A continuous-flow diluter with a 50% dilution factor was used. A stock solution was prepared for each of the five test concentrations. The primary stock (100 mg/ml) was prepared by dissolving nonradiolabeled DMH in reverse-osmosis water. Aliquots of this stock were diluted in reverse-osmosis water to prepare the four additional stock solutions. Dispensing stock solutions were prepared by spiking the nonradiolabeled stock solutions with a radiolabeled stock (0.55 mg/ml ^{14}C-DMH). Each dispensing solution had an approximate radioactive concentration of 2.5 x 10^4 dpm/ml. The radiolabeled stock and the dispensing stocks were stored at -14°C until needed.

The stocks were injected into the diluter mixing chambers. The flow of test solution from the mixing/splitting chambers into the test chambers provided 12 volume additions per day. The diluter was allowed to run for approximately 43 hours prior to test initiation and was visually checked twice daily.

The test chambers were 9-l glass aquaria, each containing 7.5 l of test solution at a depth of approximately 16.8 cm. The test chambers were indiscriminately positioned in a temperature-controlled environmental chamber (25 ±1°C) and illuminated (280 lux) with fluorescent tubes on a 16-hour light photoperiod. Thirty-minute dawn and dusk simulations were provided.

The egg incubation cups were glass cylinders (50-mm diameter) with nylon screen bottoms. The cups were suspended in the water column of each chamber. Renewal of the solution in the egg cups was ensured by using a rocker-arm apparatus to oscillate (2 rpm) the cups.

The dilution water was filtered, aerated, medium-hard well water. Average water quality during the three-week period immediately preceding the test was a hardness of 144-148 mg/l as $CaCO_3$, an alkalinity of 186-190 mg/l as $CaCO_3$, a pH of 7.9-8.1, and a conductivity of 320-410 μmhos/cm.

C. Dosage: Thirty-three-day (28-days post-hatch), flow-through test. Based on the results of acute toxicity testing, five nominal concentrations (7.5, 15, 30, 60, and 120 ppm DMH) and a dilution water control were used.

D. Design: Twenty newly-fertilized embryos were impartially distributed (in groups of two or three) to each of two incubation cups per replicate (40 embryos per replicate and 80 embryos per treatment).

Eighteen and 24 hours after test initiation, dead embryos and embryos with fungus were counted and removed from the cups. "Dead eggs and eggs with fungus removed during the first 24 hours of the test were considered to represent natural mortality (D.A. Benoit, personal communication), and all eggs that remained were considered viable." Dead embryos and fungused embryos were removed twice daily until hatching began. Hatching success was calculated as the percentage of viable embryos that hatched successfully during the first five days of the study. After hatching, the larvae were counted and released into their respective chambers. Observations of mortality, appearance, and sublethal effects were made daily. At termination, the wet weight, dry weight, and total length of the surviving fish were determined.

Newly-hatched larvae were fed live brine shrimp nauplii 3 times per day during the first 7 days post-hatch. On days 8 through 25 post-hatch, the fish were fed live brine shrimp nauplii three times daily on weekdays and at least twice daily on weekends. The quantity of food used was adjusted weekly to account for mortality. The fish were not fed during the last 48 hours of the test. The biomass loading rate was determined at test termination to be 0.025 g/l/day or 0.30 g/l at any given time.

The hardness, alkalinity, and conductivity of the negative control water was measured weekly and at the beginning and end of the test. The pH was measured in

one replicate of each treatment and control group at test initiation and weekly thereafter. The dissolved oxygen concentration in alternating replicates of each test level was measured daily during the first 7 days of the test and weekly thereafter. The temperature in both replicates of each test level was measured at the beginning and weekly during the test. The temperature of a dilution water control replicate was also monitored continuously using an electronic recorder.

Samples of the test solutions were taken on test days -1, 0, 7, 14, 21, 28, and 33 for determination of the concentration of DMH by liquid scintillation counting (LSC). Aliquots of dispensing stock solutions and aquaria water were collected at test initiation and termination and shipped to BTC where they were analyzed for DMH concentration. The concentration of radioactivity in the water samples was converted to mg DMH equivalents/l of water and expressed as ppm.

E. **Statistics:** Hatching success, larval survival, fish length, and fish weight (wet and dry) data were analyzed statistically. Hatching success (the percentage of viable eggs that hatched successfully during the first 5 days of the study) and survival data (the number of larvae alive on day 28 post-hatch divided by the number of larvae successfully hatched minus any incidental mortalities) were arcsine square-root transformed before the analysis.

The survival data met the assumptions of normality (chi-square test) and homogeneity of variance (Bartlett's test) and were analyzed using analysis of variance (ANOVA) and Dunnett's test. Hatching success data failed the homogeneity test and were analyzed using a non-parametric test (Kruskal-Wallis test). The length and weight data did not meet the assumptions underlying parametric statistical testing and were therefore analyzed using the Mann-Whitney test.

12. **REPORTED RESULTS:** The mean measured concentrations for the 33-day test were 6.8, 14, 29, 55, and 116 ppm DMH (Table 1, attached). "Measured values for all samples from the negative control were less than the limit of quantitation. DMH was shown to be stable in the dispensing stock solutions and test water throughout the test as measured concentrations of DMH verified nominal concentrations of DMH prior to the start of the test and at the end of the test."

All embryos hatched within a two day period at all test concentrations. There were no treatment-related effects upon mean hatching success at any of the test concentrations (Table 2, attached). There were no treatment-related effects upon survival of fathead minnow larvae at any test concentration (Table 3, attached).

Mean total length and mean wet weight were not significantly affected by exposure to any concentration of DMH (Table 4, attached). Fish dry weights were significantly decreased in the 29, 55, and 116 ppm treatment groups when compared to the control group and appeared to be treatment related.

During the test, dissolved oxygen concentration and pH ranged from 7.0 to 8.3 mg/l (>60% of saturation at 25°C) and 7.6 to 7.9, respectively. The temperature range during the test was 24.6 to 25.0°C. The dilution water had a hardness of 140-144 mg/l as $CaCO_3$, an alkalinity of 182-190 mg/l as $CaCO_3$, and a conductivity of 350-360 µmhos/cm.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** Based on significantly reduced larval dry weight, the maximum acceptable toxicant concentration (MATC) for fathead minnows was >14 ppm and <29 ppm. The geometric mean MATC was 20 ppm.

Quality Assurance and good laboratory practices statements were included in the report, indicating that the study was conducted in accordance with USEPA Good Laboratory Practice Standards set forth in 40 CFR Part 160. Characterization of the test substance was the responsibility of the sponsor.

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

A. **Test Procedure:** The test procedures were generally in accordance with protocols recommended by the SEP or ASTM (1992), except for the following:

The physical characteristics of the test material (i.e., color, physical state) were not stated in the report.

No chemical characterization of the brine shrimp cysts used as food was included in the report.

B. **Statistical Analysis:** Percentage hatch and survival data were clearly unaffected by exposure to DMH (Tables 2 and 3, attached) and were therefore not analyzed statistically.

35

The length, wet weight and dry weight raw data were analyzed using two-way ANOVA and Bonferroni's test (Systat 5.0). Dry weight in the 55 and 116 ppm test levels was significantly lower than control wet weight (printout 4, attached). Wet weight and length of fish was not significantly effected by exposure to DMH (printouts 2 and 6, respectively, attached). The authors' statistical analysis resulted in a more conservative NOEC and LOEC (14 and 29 ppm, respectively) which are accepted by the reviewer.

C. **Discussion/Results:** This study is scientifically sound and meets the guideline requirements for an early life-stage toxicity test using fathead minnows. The MATC for 5,5-dimethylhydantoin was >14 and <29 ppm mean measured concentration (geometric mean MATC = 20 ppm), based on the most sensitive biological parameter, dry weight.

D. **Adequacy of the Study:**

(1) **Classification:** Core.

(2) **Rationale:** N/A.

(3) **Repairability:** N/A.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 06-15-93.

RINA 3113-00

EPA Data Evaluation Records (DERs)

Page_____ is not included in this copy.

Pages 37 through 40 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.

5,5-dimethylhydantoin: early life-stage test with the fathead minnow

TRT 1 = dilution water control

TRT 2 = 6.8 ppm

TRT 3 = 14 ppm

TRT 4 = 29 ppm

TRT 5 = 55 ppm

TRT 6 = 116 ppm

ANOVA on wet weights

LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT
1.000 2.000 3.000 4.000 5.000 6.000
REP
1.000 2.000

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	3822.881	5	764.576	1.850	0.102
REP	59.211	1	59.211	0.143	0.705
TRT*REP	1471.952	5	294.390	0.712	0.614
ERROR	162799.588	394	413.197		

LEAST SQUARES MEANS.

			MEAN	SD	(N)
TRT	=	1.000	66.529	19.078	68
TRT	=	2.000	67.764	26.273	65
TRT	=	3.000	72.420	18.279	63
TRT	=	4.000	65.697	25.642	69
TRT	=	5.000	62.027	15.210	70
TRT	=	6.000	65.523	14.333	71
TRT	=	1.000			
REP	=	1.000	64.674	16.214	34
TRT	=	1.000			
REP	=	2.000	68.385	21.656	34
TRT	=	2.000			
REP	=	1.000	69.044	23.186	32
TRT	=	2.000			
REP	=	2.000	66.485	29.264	33
TRT	=	3.000			
REP	=	1.000	70.974	11.872	31
TRT	=	3.000			
REP	=	2.000	73.866	22.969	32
TRT	=	4.000			
REP	=	1.000	67.470	24.216	33
TRT	=	4.000			
REP	=	2.000	63.925	27.113	36

TRT	=	5.000			
REP	=	1.000	63.223	10.677	35
TRT	=	5.000			
REP	=	2.000	60.831	18.777	35
TRT	=	6.000			
REP	=	1.000	62.283	15.492	36
TRT	=	6.000			
REP	=	2.000	68.763	12.408	35

Post-hoc pairwise comparison of wet weight/Bonferroni.

COL/ ROW	TRT
1	1.000
2	2.000
3	3.000
4	4.000
5	5.000
6	6.000

USING LEAST SQUARES MEANS.

POST HOC TEST OF WET

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.000				
2	1.235	0.000			
3	5.890	4.656	0.000		
4	-0.832	-2.067	-6.723	0.000	
5	-4.502	-5.737	-10.393	-3.670	0.000
6	-1.006	-2.241	-6.897	-0.174	3.496

	6
6	0.000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.000				
2	1.000	1.000			
3	1.000	1.000	1.000		
4	1.000	1.000	0.879	1.000	
5	1.000	1.000	0.052	1.000	1.000
6	1.000	1.000	0.760	1.000	1.000

	6
6	1.000

ANOVA on dry weight
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.000	2.000	3.000	4.000	5.000	6.000

REP

1.000	2.000

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	579.483	5	115.897	6.048	0.000
REP	0.145	1	0.145	0.008	0.931
TRT*REP	48.607	5	9.721	0.507	0.771
ERROR	7550.497	394	19.164		

LEAST SQUARES MEANS.

			MEAN	SD	(N)
TRT	=	1.000	14.057	3.902	68
TRT	=	2.000	14.251	5.582	65
TRT	=	3.000	14.236	4.209	63
TRT	=	4.000	12.506	5.517	69
TRT	=	5.000	11.374	3.341	70
TRT	=	6.000	11.791	3.039	71
TRT	=	1.000			
REP	=	1.000	13.759	3.292	34
TRT	=	1.000			
REP	=	2.000	14.356	4.460	34
TRT	=	2.000			
REP	=	1.000	14.275	4.446	32
TRT	=	2.000			
REP	=	2.000	14.227	6.571	33
TRT	=	3.000			
REP	=	1.000	14.181	2.847	31
TRT	=	3.000			
REP	=	2.000	14.291	5.252	32
TRT	=	4.000			
REP	=	1.000	12.945	5.084	33
TRT	=	4.000			
REP	=	2.000	12.067	5.927	36
TRT	=	5.000			
REP	=	1.000	11.703	2.527	35
TRT	=	5.000			
REP	=	2.000	11.046	4.005	35
TRT	=	6.000			
REP	=	1.000	11.239	3.266	36
TRT	=	6.000			
REP	=	2.000	12.343	2.721	35

post-hoc pairwise comparison of dry weight using Bonferroni

COL/ ROW	TRT
1	1.000
2	2.000
3	3.000
4	4.000
5	5.000
6	6.000

USING LEAST SQUARES MEANS.

POST HOC TEST OF DRY

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.000				
2	0.194	0.000			
3	0.178	-0.016	0.000		
4	-1.551	-1.745	-1.730	0.000	
5	-2.683	-2.877	-2.861	-1.132	0.000
6	-2.266	-2.460	-2.445	-0.715	0.417

	6
6	0.000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.000				
2	1.000	1.000			
3	1.000	1.000	1.000		
4	0.583	0.325	0.360	1.000	
5	0.005	0.002	0.003	1.000	1.000
6	0.037	0.017	0.020	1.000	1.000

	6
6	1.000

5,5-dimethylhydantoin: early life-stage test with the fathead minnow

ANOVA on Lengths
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.000	2.000	3.000	4.000	5.000	6.000

REP

1.000	2.000

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	54.959	5	10.992	2.525	0.029
REP	0.137	1	0.137	0.031	0.859
TRT*REP	17.876	5	3.575	0.821	0.535
ERROR	1715.335	394	4.354		

LEAST SQUARES MEANS.

			MEAN	SD	(N)
TRT	=	1.000	18.279	1.876	68
TRT	=	2.000	17.802	2.457	65
TRT	=	3.000	18.745	1.934	63
TRT	=	4.000	17.795	2.531	69
TRT	=	5.000	17.643	1.941	70
TRT	=	6.000	17.920	1.619	71
TRT	=	1.000			
REP	=	1.000	18.176	1.696	34
TRT	=	1.000			
REP	=	2.000	18.382	2.060	34
TRT	=	2.000			
REP	=	1.000	17.906	1.890	32
TRT	=	2.000			
REP	=	2.000	17.697	2.931	33
TRT	=	3.000			
REP	=	1.000	18.710	1.532	31
TRT	=	3.000			
REP	=	2.000	18.781	2.282	32
TRT	=	4.000			
REP	=	1.000	18.091	2.467	33
TRT	=	4.000			
REP	=	2.000	17.500	2.591	36
TRT	=	5.000			
REP	=	1.000	17.829	1.339	35
TRT	=	5.000			
REP	=	2.000	17.457	2.405	35
TRT	=	6.000			
REP	=	1.000	17.583	1.422	36
TRT	=	6.000			
REP	=	2.000	18.257	1.755	35

Post-hoc pairwise comparison of length/Bonferroni.

COL/ ROW	TRT
1	1.000
2	2.000
3	3.000
4	4.000
5	5.000
6	6.000

USING LEAST SQUARES MEANS.

POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.000				
2	-0.478	0.000			
3	0.466	0.944	0.000		
4	-0.484	-0.006	-0.950	0.000	
5	-0.637	-0.159	-1.103	-0.153	0.000
6	-0.359	0.119	-0.825	0.125	0.277

	6
6	0.000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.000				
2	1.000	1.000			
3	1.000	0.163	1.000		
4	1.000	1.000	0.140	1.000	
5	1.000	1.000	0.038	1.000	1.000
6	1.000	1.000	0.343	1.000	1.000

	6
6	1.000

5,5-dimethylhydantoin: early life-stage test with the fathead minnow

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.000

TOTAL OBSERVATIONS: 68

	REP	WET	DRY	LENGTH
N OF CASES	68	68	68	68
MINIMUM	1.000	32.000	6.400	14.000
MAXIMUM	2.000	120.400	26.500	23.000
MEAN	1.500	66.529	14.057	18.279
STANDARD DEV	0.504	19.078	3.902	1.876

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.000

TOTAL OBSERVATIONS: 65

	REP	WET	DRY	LENGTH
N OF CASES	65	65	65	65
MINIMUM	1.000	18.900	3.500	12.000
MAXIMUM	2.000	140.200	32.000	23.000
MEAN	1.508	67.745	14.251	17.800
STANDARD DEV	0.504	26.273	5.582	2.457

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.000

TOTAL OBSERVATIONS: 63

	REP	WET	DRY	LENGTH
N OF CASES	63	63	63	63
MINIMUM	1.000	38.400	5.600	14.000
MAXIMUM	2.000	124.500	27.400	23.000
MEAN	1.508	72.443	14.237	18.746
STANDARD DEV	0.504	18.279	4.209	1.934

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.000

TOTAL OBSERVATIONS: 69

	REP	WET	DRY	LENGTH
N OF CASES	69	69	69	69
MINIMUM	1.000	25.100	2.800	14.000
MAXIMUM	2.000	134.300	28.900	25.000
MEAN	1.522	65.620	12.487	17.783
STANDARD DEV	0.503	25.642	5.517	2.531

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.000

TOTAL OBSERVATIONS: 70

	REP	WET	DRY	LENGTH
N OF CASES	70	70	70	70
MINIMUM	1.000	19.100	3.000	11.000
MAXIMUM	2.000	111.100	22.300	23.000
MEAN	1.500	62.027	11.374	17.643
STANDARD DEV	0.504	15.210	3.341	1.941

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.000

TOTAL OBSERVATIONS: 71

	REP	WET	DRY	LENGTH
N OF CASES	71	71	71	71
MINIMUM	1.000	34.500	5.700	14.000
MAXIMUM	2.000	106.500	20.400	21.000
MEAN	1.493	65.477	11.783	17.915
STANDARD DEV	0.504	14.333	3.039	1.619

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
REP	406.000	0.841	0.000
LENGTH	406.000	1.000	0.000
WET	406.000	1.000	0.000
DRY	406.000	0.997	0.000

raw data

		TRT	REP	LENGTH	WET	DRY
CASE	1	1.000	1.000	19.000	64.500	13.900
CASE	2	1.000	1.000	19.000	72.000	15.900
CASE	3	1.000	1.000	20.000	78.900	15.900
CASE	4	1.000	1.000	17.000	57.400	12.900
CASE	5	1.000	1.000	18.000	52.000	11.700
CASE	6	1.000	1.000	17.000	57.500	11.700
CASE	7	1.000	1.000	17.000	43.300	9.800
CASE	8	1.000	1.000	18.000	63.900	14.000
CASE	9	1.000	1.000	19.000	69.100	13.100
CASE	10	1.000	1.000	18.000	78.400	16.300
CASE	11	1.000	1.000	20.000	73.900	14.100
CASE	12	1.000	1.000	19.000	68.700	15.100
CASE	13	1.000	1.000	19.000	71.000	14.400
CASE	14	1.000	1.000	18.000	68.600	13.500
CASE	15	1.000	1.000	17.000	39.600	7.500
CASE	16	1.000	1.000	23.000	118.400	22.500
CASE	17	1.000	1.000	16.000	48.800	11.000
CASE	18	1.000	1.000	16.000	42.200	9.200
CASE	19	1.000	1.000	18.000	69.400	15.700
CASE	20	1.000	1.000	18.000	64.500	14.400
CASE	21	1.000	1.000	18.000	69.700	13.700
CASE	22	1.000	1.000	18.000	59.800	12.500
CASE	23	1.000	1.000	19.000	76.000	15.400
CASE	24	1.000	1.000	21.000	73.800	17.200
CASE	25	1.000	1.000	17.000	50.800	11.000
CASE	26	1.000	1.000	16.000	47.200	9.500
CASE	27	1.000	1.000	19.000	66.200	19.900
CASE	28	1.000	1.000	14.000	48.300	11.900
CASE	29	1.000	1.000	17.000	52.800	11.000
CASE	30	1.000	1.000	19.000	64.700	12.600
CASE	31	1.000	1.000	18.000	68.800	15.200
CASE	32	1.000	1.000	20.000	85.200	17.100
CASE	33	1.000	1.000	20.000	93.400	19.600
CASE	34	1.000	1.000	16.000	40.100	8.600
CASE	35	1.000	2.000	15.000	42.800	9.100
CASE	36	1.000	2.000	17.000	59.600	13.200
CASE	37	1.000	2.000	18.000	46.100	10.000
CASE	38	1.000	2.000	17.000	58.000	12.500
CASE	39	1.000	2.000	18.000	53.800	11.500
CASE	40	1.000	2.000	18.000	53.500	12.200
CASE	41	1.000	2.000	21.000	79.600	14.200
CASE	42	1.000	2.000	18.000	64.400	13.700
CASE	43	1.000	2.000	18.000	53.200	11.100
CASE	44	1.000	2.000	16.000	40.700	9.200
CASE	45	1.000	2.000	22.000	93.200	20.000
CASE	46	1.000	2.000	18.000	59.000	13.300
CASE	47	1.000	2.000	16.000	32.000	6.400
CASE	48	1.000	2.000	22.000	94.100	19.700
CASE	49	1.000	2.000	20.000	84.400	15.500
CASE	50	1.000	2.000	18.000	71.500	15.700
CASE	51	1.000	2.000	19.000	70.600	14.700
CASE	52	1.000	2.000	17.000	47.600	9.600
CASE	53	1.000	2.000	19.000	75.300	15.800
CASE	54	1.000	2.000	20.000	78.800	15.500
CASE	55	1.000	2.000	15.000	47.200	10.700
CASE	56	1.000	2.000	22.000	119.200	26.500
CASE	57	1.000	2.000	21.000	110.600	22.100
CASE	58	1.000	2.000	21.000	85.000	16.600
CASE	59	1.000	2.000	15.000	49.600	13.300
CASE	60	1.000	2.000	18.000	64.700	13.700
CASE	61	1.000	2.000	18.000	72.400	13.400
CASE	62	1.000	2.000	19.000	67.400	13.500
CASE	63	1.000	2.000	17.000	61.100	13.500
CASE	64	1.000	2.000	18.000	87.400	18.200
CASE	65	1.000	2.000	22.000	120.400	25.800
CASE	66	1.000	2.000	18.000	56.900	11.100

CASE	67	1.000	2.000	16.000	51.900	10.900
CASE	68	1.000	2.000	18.000	73.100	15.900
CASE	69	2.000	1.000	15.000	39.800	7.900
CASE	70	2.000	1.000	15.000	38.100	6.900
CASE	71	2.000	1.000	18.000	55.500	11.200
CASE	72	2.000	1.000	19.000	99.000	19.200
CASE	73	2.000	1.000	18.000	56.600	12.100
CASE	74	2.000	1.000	19.000	62.900	12.900
CASE	75	2.000	1.000	18.000	69.300	14.000
CASE	76	2.000	1.000	20.000	92.000	19.100
CASE	77	2.000	1.000	17.000	42.400	8.600
CASE	78	2.000	1.000	18.000	84.100	15.900
CASE	79	2.000	1.000	19.000	92.100	18.500
CASE	80	2.000	1.000	22.000	103.900	20.100
CASE	81	2.000	1.000	16.000	46.600	9.300
CASE	82	2.000	1.000	20.000	103.600	19.800
CASE	83	2.000	1.000	18.000	77.600	15.600
CASE	84	2.000	1.000	14.000	33.000	7.100
CASE	85	2.000	1.000	19.000	93.800	19.200
CASE	86	2.000	1.000	16.000	53.700	11.100
CASE	87	2.000	1.000	18.000	61.500	17.700
CASE	88	2.000	1.000	18.000	68.100	13.500
CASE	89	2.000	1.000	15.000	41.600	9.200
CASE	90	2.000	1.000	19.000	70.600	15.500
CASE	91	2.000	1.000	20.000	99.400	20.300
CASE	92	2.000	1.000	15.000	40.200	8.800
CASE	93	2.000	1.000	19.000	78.600	16.300
CASE	94	2.000	1.000	19.000	58.200	15.500
CASE	95	2.000	1.000	17.000	63.000	13.500
CASE	96	2.000	1.000	19.000	88.300	18.200
CASE	97	2.000	1.000	20.000	81.800	17.800
CASE	98	2.000	1.000	17.000	53.700	11.400
CASE	99	2.000	1.000	16.000	44.000	9.200
CASE	100	2.000	1.000	20.000	116.400	21.400
CASE	101	2.000	2.000	14.000	35.400	7.100
CASE	102	2.000	2.000	18.000	44.600	7.500
CASE	103	2.000	2.000	18.000	72.600	15.000
CASE	104	2.000	2.000	14.000	40.900	8.500
CASE	105	2.000	2.000	17.000	45.800	12.300
CASE	106	2.000	2.000	21.000	103.300	22.600
CASE	107	2.000	2.000	14.000	37.600	7.900
CASE	108	2.000	2.000	16.000	53.200	11.500
CASE	109	2.000	2.000	19.000	73.900	11.300
CASE	110	2.000	2.000	16.000	49.300	9.900
CASE	111	2.000	2.000	12.000	22.700	4.500
CASE	112	2.000	2.000	17.000	45.100	10.100
CASE	113	2.000	2.000	18.000	69.700	16.800
CASE	114	2.000	2.000	19.000	61.900	11.800
CASE	115	2.000	2.000	23.000	140.200	32.000
CASE	116	2.000	2.000	18.000	81.900	18.300
CASE	117	2.000	2.000	14.000	39.900	8.300
CASE	118	2.000	2.000	17.000	56.700	12.300
CASE	119	2.000	2.000	18.000	84.900	20.200
CASE	120	2.000	2.000	13.000	18.900	3.500
CASE	121	2.000	2.000	18.000	63.600	13.800
CASE	122	2.000	2.000	21.000	94.900	20.200
CASE	123	2.000	2.000	18.000	55.800	11.800
CASE	124	2.000	2.000	14.000	37.700	8.100
CASE	125	2.000	2.000	19.000	62.500	13.800
CASE	126	2.000	2.000	22.000	124.000	24.800
CASE	127	2.000	2.000	15.000	37.800	7.700
CASE	128	2.000	2.000	18.000	75.600	18.600
CASE	129	2.000	2.000	19.000	79.800	16.900
CASE	130	2.000	2.000	20.000	94.900	20.900
CASE	131	2.000	2.000	23.000	108.500	23.100
CASE	132	2.000	2.000	18.000	70.500	15.700
CASE	133	2.000	2.000	23.000	109.900	22.700
CASE	134	3.000	1.000	18.000	55.700	10.200
CASE	135	3.000	1.000	21.000	93.200	19.600

CASE	136	3.000	1.000	19.000	67.500	12.700
CASE	137	3.000	1.000	19.000	63.100	11.700
CASE	138	3.000	1.000	14.000	49.700	10.400
CASE	139	3.000	1.000	20.000	71.400	14.800
CASE	140	3.000	1.000	19.000	76.700	15.500
CASE	141	3.000	1.000	20.000	98.800	20.600
CASE	142	3.000	1.000	17.000	54.600	11.100
CASE	143	3.000	1.000	19.000	78.000	15.300
CASE	144	3.000	1.000	19.000	70.900	14.300
CASE	145	3.000	1.000	20.000	74.100	15.400
CASE	146	3.000	1.000	19.000	71.700	14.800
CASE	147	3.000	1.000	16.000	53.600	9.800
CASE	148	3.000	1.000	21.000	75.100	14.300
CASE	149	3.000	1.000	18.000	73.000	14.500
CASE	150	3.000	1.000	17.000	60.200	10.500
CASE	151	3.000	1.000	21.000	70.500	15.600
CASE	152	3.000	1.000	19.000	78.000	15.400
CASE	153	3.000	1.000	19.000	75.800	15.500
CASE	154	3.000	1.000	18.000	60.800	11.600
CASE	155	3.000	1.000	20.000	81.800	16.800
CASE	156	3.000	1.000	20.000	77.000	15.300
CASE	157	3.000	1.000	19.000	71.000	12.300
CASE	158	3.000	1.000	17.000	55.000	14.100
CASE	159	3.000	1.000	17.000	57.700	11.100
CASE	160	3.000	1.000	18.000	81.900	17.200
CASE	161	3.000	1.000	19.000	74.100	15.200
CASE	162	3.000	1.000	18.000	59.700	9.400
CASE	163	3.000	1.000	20.000	85.300	16.600
CASE	164	3.000	1.000	19.000	84.300	18.000
CASE	165	3.000	2.000	14.000	41.300	5.600
CASE	166	3.000	2.000	18.000	65.600	13.800
CASE	167	3.000	2.000	19.000	85.500	15.700
CASE	168	3.000	2.000	22.000	107.100	20.400
CASE	169	3.000	2.000	18.000	59.600	9.700
CASE	170	3.000	2.000	15.000	38.400	6.900
CASE	171	3.000	2.000	18.000	63.600	12.500
CASE	172	3.000	2.000	17.000	61.900	10.900
CASE	173	3.000	2.000	17.000	60.200	10.800
CASE	174	3.000	2.000	18.000	67.300	13.500
CASE	175	3.000	2.000	21.000	78.300	16.100
CASE	176	3.000	2.000	20.000	69.100	14.600
CASE	177	3.000	2.000	16.000	44.300	6.800
CASE	178	3.000	2.000	22.000	94.500	19.400
CASE	179	3.000	2.000	23.000	124.500	27.400
CASE	180	3.000	2.000	21.000	112.900	22.300
CASE	181	3.000	2.000	18.000	57.300	9.300
CASE	182	3.000	2.000	19.000	80.200	14.600
CASE	183	3.000	2.000	18.000	74.900	15.000
CASE	184	3.000	2.000	17.000	70.800	14.000
CASE	185	3.000	2.000	21.000	80.400	14.600
CASE	186	3.000	2.000	22.000	110.900	22.700
CASE	187	3.000	2.000	16.000	62.300	13.200
CASE	188	3.000	2.000	17.000	50.800	10.100
CASE	189	3.000	2.000	17.000	45.100	8.000
CASE	190	3.000	2.000	21.000	93.500	18.700
CASE	191	3.000	2.000	17.000	52.600	10.500
CASE	192	3.000	2.000	22.000	118.400	24.400
CASE	193	3.000	2.000	21.000	93.600	18.100
CASE	194	3.000	2.000	19.000	65.800	12.700
CASE	195	3.000	2.000	19.000	67.100	11.800
CASE	196	3.000	2.000	18.000	65.900	13.200
CASE	197	4.000	1.000	14.000	32.300	6.600
CASE	198	4.000	1.000	19.000	86.000	18.100
CASE	199	4.000	1.000	18.000	88.000	17.900
CASE	200	4.000	1.000	19.000	91.200	18.700
CASE	201	4.000	1.000	23.000	110.700	23.300
CASE	202	4.000	1.000	18.000	50.900	11.000
CASE	203	4.000	1.000	19.000	70.500	13.700
CASE	204	4.000	1.000	17.000	51.100	8.600

CASE	205	4.000	1.000	17.000	57.500	11.500
CASE	206	4.000	1.000	16.000	39.900	6.000
CASE	207	4.000	1.000	16.000	36.300	6.500
CASE	208	4.000	1.000	20.000	87.300	16.600
CASE	209	4.000	1.000	14.000	32.800	7.900
CASE	210	4.000	1.000	17.000	44.700	11.800
CASE	211	4.000	1.000	16.000	49.500	8.300
CASE	212	4.000	1.000	19.000	88.800	17.400
CASE	213	4.000	1.000	17.000	55.100	12.300
CASE	214	4.000	1.000	15.000	37.100	7.000
CASE	215	4.000	1.000	18.000	84.100	15.900
CASE	216	4.000	1.000	15.000	46.700	9.600
CASE	217	4.000	1.000	21.000	92.100	19.500
CASE	218	4.000	1.000	22.000	82.600	16.400
CASE	219	4.000	1.000	20.000	88.000	16.500
CASE	220	4.000	1.000	17.000	55.000	10.900
CASE	221	4.000	1.000	21.000	91.900	17.200
CASE	222	4.000	1.000	16.000	43.500	8.000
CASE	223	4.000	1.000	20.000	88.100	18.300
CASE	224	4.000	1.000	17.000	43.200	6.700
CASE	225	4.000	1.000	21.000	99.900	18.000
CASE	226	4.000	1.000	20.000	70.700	5.200
CASE	227	4.000	1.000	23.000	105.600	18.800
CASE	228	4.000	1.000	15.000	39.100	7.200
CASE	229	4.000	1.000	17.000	86.300	15.800
CASE	230	4.000	2.000	16.000	48.100	8.600
CASE	231	4.000	2.000	15.000	37.900	7.700
CASE	232	4.000	2.000	19.000	71.800	21.400
CASE	233	4.000	2.000	17.000	52.600	10.800
CASE	234	4.000	2.000	17.000	79.800	9.400
CASE	235	4.000	2.000	14.000	25.100	2.800
CASE	236	4.000	2.000	15.000	39.000	8.300
CASE	237	4.000	2.000	14.000	33.300	5.000
CASE	238	4.000	2.000	18.000	65.000	13.100
CASE	239	4.000	2.000	17.000	60.600	10.100
CASE	240	4.000	2.000	17.000	57.100	10.700
CASE	241	4.000	2.000	17.000	55.400	9.700
CASE	242	4.000	2.000	18.000	67.700	11.300
CASE	243	4.000	2.000	19.000	70.100	13.900
CASE	244	4.000	2.000	17.000	52.300	10.300
CASE	245	4.000	2.000	20.000	104.900	21.200
CASE	246	4.000	2.000	16.000	40.500	8.300
CASE	247	4.000	2.000	14.000	27.400	5.600
CASE	248	4.000	2.000	15.000	40.200	8.000
CASE	249	4.000	2.000	17.000	59.100	5.800
CASE	250	4.000	2.000	15.000	49.000	6.800
CASE	251	4.000	2.000	17.000	47.100	8.600
CASE	252	4.000	2.000	19.000	66.200	12.500
CASE	253	4.000	2.000	15.000	43.800	9.000
CASE	254	4.000	2.000	18.000	61.200	10.900
CASE	255	4.000	2.000	23.000	115.500	24.200
CASE	256	4.000	2.000	18.000	91.000	18.500
CASE	257	4.000	2.000	17.000	48.700	9.300
CASE	258	4.000	2.000	18.000	81.800	17.300
CASE	259	4.000	2.000	21.000	96.200	20.300
CASE	260	4.000	2.000	14.000	28.700	5.800
CASE	261	4.000	2.000	19.000	88.200	17.900
CASE	262	4.000	2.000	23.000	123.500	17.100
CASE	263	4.000	2.000	17.000	52.800	10.100
CASE	264	4.000	2.000	19.000	85.400	15.200
CASE	265	4.000	2.000	25.000	134.300	28.900
CASE	266	5.000	1.000	20.000	73.700	15.300
CASE	267	5.000	1.000	18.000	68.400	14.000
CASE	268	5.000	1.000	18.000	61.400	12.500
CASE	269	5.000	1.000	18.000	77.900	14.400
CASE	270	5.000	1.000	21.000	79.000	15.800
CASE	271	5.000	1.000	15.000	50.700	8.900
CASE	272	5.000	1.000	18.000	65.300	11.700
CASE	273	5.000	1.000	17.000	53.600	9.400

CASE	274	5.000	1.000	18.000	73.800	12.600
CASE	275	5.000	1.000	20.000	77.800	15.300
CASE	276	5.000	1.000	19.000	73.100	14.200
CASE	277	5.000	1.000	18.000	64.400	10.900
CASE	278	5.000	1.000	18.000	57.300	9.600
CASE	279	5.000	1.000	18.000	62.500	12.000
CASE	280	5.000	1.000	19.000	73.600	13.600
CASE	281	5.000	1.000	17.000	67.500	12.500
CASE	282	5.000	1.000	19.000	61.700	12.200
CASE	283	5.000	1.000	19.000	75.800	15.700
CASE	284	5.000	1.000	19.000	76.600	14.500
CASE	285	5.000	1.000	15.000	38.300	6.600
CASE	286	5.000	1.000	18.000	53.700	11.300
CASE	287	5.000	1.000	17.000	43.700	7.800
CASE	288	5.000	1.000	17.000	59.600	10.200
CASE	289	5.000	1.000	17.000	64.200	12.200
CASE	290	5.000	1.000	18.000	51.500	8.500
CASE	291	5.000	1.000	18.000	58.100	10.800
CASE	292	5.000	1.000	16.000	56.900	10.700
CASE	293	5.000	1.000	18.000	64.600	11.600
CASE	294	5.000	1.000	18.000	61.700	11.700
CASE	295	5.000	1.000	19.000	79.000	14.100
CASE	296	5.000	1.000	16.000	46.100	8.500
CASE	297	5.000	1.000	16.000	52.200	9.400
CASE	298	5.000	1.000	18.000	71.600	12.700
CASE	299	5.000	1.000	18.000	60.300	12.100
CASE	300	5.000	1.000	16.000	57.200	6.300
CASE	301	5.000	2.000	20.000	67.200	11.400
CASE	302	5.000	2.000	17.000	47.500	8.200
CASE	303	5.000	2.000	21.000	100.300	18.700
CASE	304	5.000	2.000	19.000	64.000	10.200
CASE	305	5.000	2.000	19.000	71.800	14.800
CASE	306	5.000	2.000	16.000	49.000	7.600
CASE	307	5.000	2.000	23.000	111.100	22.300
CASE	308	5.000	2.000	18.000	63.100	11.300
CASE	309	5.000	2.000	16.000	50.200	9.200
CASE	310	5.000	2.000	20.000	76.100	14.400
CASE	311	5.000	2.000	17.000	66.000	12.800
CASE	312	5.000	2.000	16.000	44.300	8.500
CASE	313	5.000	2.000	18.000	42.200	7.300
CASE	314	5.000	2.000	17.000	50.100	8.400
CASE	315	5.000	2.000	16.000	55.300	9.900
CASE	316	5.000	2.000	15.000	50.300	7.600
CASE	317	5.000	2.000	18.000	72.700	14.200
CASE	318	5.000	2.000	14.000	42.000	7.600
CASE	319	5.000	2.000	19.000	77.900	14.700
CASE	320	5.000	2.000	19.000	76.700	15.200
CASE	321	5.000	2.000	20.000	68.600	11.500
CASE	322	5.000	2.000	18.000	71.900	13.000
CASE	323	5.000	2.000	14.000	32.700	4.600
CASE	324	5.000	2.000	16.000	41.000	7.800
CASE	325	5.000	2.000	11.000	19.100	3.000
CASE	326	5.000	2.000	16.000	50.300	9.600
CASE	327	5.000	2.000	15.000	44.200	7.200
CASE	328	5.000	2.000	14.000	44.500	7.700
CASE	329	5.000	2.000	20.000	72.300	13.500
CASE	330	5.000	2.000	16.000	47.800	7.900
CASE	331	5.000	2.000	19.000	72.900	14.900
CASE	332	5.000	2.000	19.000	69.700	11.800
CASE	333	5.000	2.000	20.000	77.200	14.700
CASE	334	5.000	2.000	18.000	83.900	15.400
CASE	335	5.000	2.000	17.000	55.200	9.700
CASE	336	6.000	1.000	18.000	97.400	16.200
CASE	337	6.000	1.000	19.000	106.500	20.400
CASE	338	6.000	1.000	18.000	62.400	11.300
CASE	339	6.000	1.000	18.000	58.400	9.400
CASE	340	6.000	1.000	14.000	34.500	5.700
CASE	341	6.000	1.000	18.000	62.100	11.900
CASE	342	6.000	1.000	15.000	41.200	6.500

CASE	343	6.000	1.000	19.000	68.600	13.000
CASE	344	6.000	1.000	16.000	47.300	9.700
CASE	345	6.000	1.000	18.000	65.100	12.100
CASE	346	6.000	1.000	17.000	51.900	7.800
CASE	347	6.000	1.000	21.000	88.600	17.700
CASE	348	6.000	1.000	19.000	71.400	13.000
CASE	349	6.000	1.000	16.000	46.800	9.000
CASE	350	6.000	1.000	18.000	61.400	11.500
CASE	351	6.000	1.000	17.000	63.000	10.900
CASE	352	6.000	1.000	16.000	44.500	7.100
CASE	353	6.000	1.000	17.000	57.000	9.200
CASE	354	6.000	1.000	20.000	72.700	14.100
CASE	355	6.000	1.000	18.000	54.600	9.300
CASE	356	6.000	1.000	17.000	59.700	10.900
CASE	357	6.000	1.000	16.000	51.500	8.700
CASE	358	6.000	1.000	17.000	72.700	13.000
CASE	359	6.000	1.000	17.000	52.100	8.600
CASE	360	6.000	1.000	18.000	61.900	13.200
CASE	361	6.000	1.000	18.000	65.500	12.100
CASE	362	6.000	1.000	19.000	86.600	14.000
CASE	363	6.000	1.000	17.000	50.100	9.000
CASE	364	6.000	1.000	18.000	55.200	10.200
CASE	365	6.000	1.000	18.000	67.200	13.100
CASE	366	6.000	1.000	17.000	55.300	9.600
CASE	367	6.000	1.000	17.000	53.700	8.100
CASE	368	6.000	1.000	16.000	47.900	7.700
CASE	369	6.000	1.000	17.000	60.200	10.700
CASE	370	6.000	1.000	20.000	86.300	17.700
CASE	371	6.000	1.000	19.000	60.900	12.200
CASE	372	6.000	2.000	19.000	55.900	10.400
CASE	373	6.000	2.000	19.000	90.500	15.600
CASE	374	6.000	2.000	17.000	58.900	10.300
CASE	375	6.000	2.000	18.000	75.200	14.100
CASE	376	6.000	2.000	19.000	73.400	12.300
CASE	377	6.000	2.000	18.000	65.300	11.900
CASE	378	6.000	2.000	18.000	70.000	13.100
CASE	379	6.000	2.000	17.000	72.900	12.700
CASE	380	6.000	2.000	15.000	56.100	10.600
CASE	381	6.000	2.000	19.000	64.600	11.100
CASE	382	6.000	2.000	17.000	62.800	10.500
CASE	383	6.000	2.000	21.000	83.500	14.100
CASE	384	6.000	2.000	19.000	78.500	13.300
CASE	385	6.000	2.000	17.000	63.900	11.300
CASE	386	6.000	2.000	15.000	47.100	7.800
CASE	387	6.000	2.000	19.000	59.500	10.000
CASE	388	6.000	2.000	18.000	75.800	13.300
CASE	389	6.000	2.000	17.000	74.400	12.400
CASE	390	6.000	2.000	15.000	51.300	9.000
CASE	391	6.000	2.000	16.000	64.300	11.600
CASE	392	6.000	2.000	16.000	48.600	7.400
CASE	393	6.000	2.000	19.000	75.700	19.200
CASE	394	6.000	2.000	20.000	77.700	14.200
CASE	395	6.000	2.000	20.000	78.200	13.300
CASE	396	6.000	2.000	21.000	91.400	16.700
CASE	397	6.000	2.000	18.000	60.200	11.300
CASE	398	6.000	2.000	21.000	83.800	14.000
CASE	399	6.000	2.000	19.000	59.300	10.500
CASE	400	6.000	2.000	18.000	59.100	9.900
CASE	401	6.000	2.000	20.000	80.000	15.700
CASE	402	6.000	2.000	21.000	85.700	17.100
CASE	403	6.000	2.000	18.000	75.300	13.400
CASE	404	6.000	2.000	17.000	52.600	8.500
CASE	405	6.000	2.000	21.000	84.300	15.800
CASE	406	6.000	2.000	17.000	50.900	9.600

Ecological Effects Branch One-Liner Data Entry Form

Chemical Hydantoin Shaughnessy No. 006315 Pesticide Use _____

AQUATIC VERTEBRATE TOX.	% AI	LC_{50} (95%CL) SLOPE	HRS/ TYPE	NOEC	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1.								
2.								
3.								
4.								
5.								
6.								
7.								

CHRONIC TOX.	% AI	MATC * ~~LC_{50}~~	DAYS	AFFECTED PARA.	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1. Pimephales promelas	7999	>14 ppm <29 ppm	33	Dry Weight	1992/1993	427217-02 Core	WIL	LMR
2.								
3.								

COMMENTS: * mean measured concentration