6-18-91

MRID No. 411062-01

DATA EVALUATION RECORD

JUN 1 6 1991

1. **CHEMICAL:** Sodium Methyldithiocarbamate. Shaughnessey No. 039003.

2. **TEST MATERIAL:** Metam-Sodium; Batch No. ZH 130 585; 42.2% active ingredient.

3. **STUDY TYPE:** Freshwater Fish Static Acute Toxicity Test. Species Tested: Bluegill Sunfish (Lepomis macrochirus).

4. **CITATION:** Gelbke, H.P. and R. Munk. 1986. Report on the Study of Acute Toxicity of METAM-Sodium in the Bluegill (Lepomis macrochirus Raf.). Registration Document No. 86/0512. Prepared by BASF Aktiengesellschaft, Department of Toxicology, Ludwigshafen, West Germany. Submitted by BASF Corporation Chemicals Division, Parsippany, NJ. EPA MRID No. 411062-01.

5. **REVIEWED BY:**

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

Signature: Louis M Rifici
Date: 5/1/91

6. **APPROVED BY:**

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

Signature: P. Kosalwat
Date: 5/6/91

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

Signature: Henry T. Craven
Date: 6/18/91

7. **CONCLUSIONS:** This study is not scientifically sound. The concentration of active ingredient greatly decreased during the exposure period in at least one test level indicating the actual concentrations the fish were exposed to are unknown. Under the conditions of the test, the 96-hour LC_{50} of Metam-Sodium for bluegill sunfish was 0.51 mg a.i./L (based on initial measured concentrations). Therefore Metam-Sodium is classified as highly toxic to bluegill sunfish. Mortality occurred at all test levels (excluding two levels which were tested after the definitive test) so the NOEC could not be determined in this study.

6 hrs

1

8. **RECOMMENDATIONS**: N/A

9. **BACKGROUND**:

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

11. **MATERIALS AND METHODS**:

A. **Test Animals**: Bluegill sunfish (Lepomis macrochirus) were obtained from a commercial supplier in Denver, PA, USA and held in flowing dechlorinated tap water for approximately four months. During holding, the temperature was 22°-25°C, the pH was approximately 7.5, the dissolved oxygen (D.O) was greater than 60% of saturation, the hardness was 2.5 mmol/L (1 mmol $CaCO_3$/L = 100 mg $CaCO_3$/L) and the alkalinity was 5.5 mmol/L. The fish were fed a commercially available fish food ad libitum with occasional supplements of live Daphnia, frozen Artemia, and midge larvae. Records of disease treatments were kept.

The fish were acclimated to test conditions for three to five days. Weight and length of the fish were 0.4 g and 3.3 (2.9-3.8) cm.

B. **Test System**: Vessels used in the test were glass aquaria with stainless steel frames (80 x 35 x 46 cm) containing 100 L of reconstituted water (control) or test solution. The reconstituted water was prepared to yield a total hardness of 2.5 mmol/L and an alkalinity of 0.8 mmol/L. A 16-hour light/8-hour dark photoperiod was used. The test temperature was 23°±1°C.

The test concentrations were prepared by adding appropriate amounts of a 10 g/L aqueous stock solution directly to the test chambers.

C. **Dosage**: Ninety-six-hour static test. Based on a preliminary test, six nominal concentrations (0.464, 1.000, 2.150, 4.640. 10.000, and 21.500 mg/L) and a dilution water control were used. Two additional concentrations, 0.100 and 0.125 mg/L, were tested two weeks after the initial study.

D. **Design**: Ten fish were distributed to each test chamber. Biomass loading rate in the aquaria was 0.04 g/L. All chambers were observed once at 1, 4, 24, 48, 72, and 96 hours for mortality and sublethal effects.

The D.O., pH, and temperature were monitored every 24 hours in the test aquaria containing live fish.

The concentrations of Metam-Sodium were measured in all test solutions at test initiation and in the lowest four concentrations at termination using HPLC.

E. **Statistics:** The 96-hour median lethal concentration (LC_{50}) was calculated using probit analysis.

12. **REPORTED RESULTS:** Measured concentrations are given in Table 1 (attached). At test initiation and termination, measured concentrations were 52 to 97.6% and 20.1 to 82% of nominal, respectively.

The mortality and behavioral responses of the bluegill are given in Table 2 (attached). The 96-hour LC_{50}, based on measured concentrations, was given as a confidence interval, 0.175-0.82 mg a.i./L. The no-observed-effect concentration (NOEC) was given as 0.215 mg/L (nominal) which was equivalent to 0.175 mg a.i./L (measured at 96 hours).

The D.O. of the test solutions ranged from 6.0 to 8.8 or 68 to 101% of saturation. The pH values ranged from 7.5 to 8.1. The temperature was 22°-23°C throughout the test.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**

The authors presented no conclusions.

A Quality Assurance Statement was included in the report. Another statement was included which stated that the study did not have to meet the Good Laboratory Practice requirements of 40 CFR 160.

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 as follows:

The results for the two lowest test concentrations were obtained using a separate test two weeks after the definitive test. All test levels should be initiated on the same day.

The presentation of the analytical results was very confusing. All test solutions were measured on day 0,

but only half were measured at the completion of the test.

The test material was 57.8% inert or carrier ingredients. A concurrent control containing the concentration of inert or carrier ingredients equal to that found in the highest test concentration should have been part of the test design.

The hardness of the dilution water, 2.5 mmol/L (250 mg/L), was higher than recommended (no greater than 200 mg/L).

Each nominal concentration was approximately 46% of the next highest concentration. The guidelines recommend that each concentration be at least 60% of the next highest concentration.

The period of time between test solution preparation and test initiation was not given in the report. Fish should be placed into the test solutions within 30 minutes of solution preparation.

A 30-minute dawn/dusk simulation is recommended in the SEP. No transition period between light and dark was used in the study.

The report does not state if the fish were fed during the test.

The system used to control temperature was not described in the report.

Temperature must be monitored continuously or at least every 6 hours if the test vessels are located in a water bath. Temperature in this study was probably monitored every 24 hours.

The acclimation period of the bluegill to the dilution water was approximately three days. The SEP recommends that the acclimation period to the test conditions be at least two weeks.

B. **Statistical Analysis:** The reviewer used EPA's Toxanal program to calculate the 96-hour LC_{50} value as 0.51 mg a.i./L with 95% confidence interval of 0.4-0.75 mg a.i./L (see attached printout). The initial measured concentrations and the highest six levels were used to determine the LC_{50}.

C. **Discussion/Results:** The presentation of the study results was somewhat confusing. The concentration of the active ingredient was measured in all solutions at test initiation but only in four of eight at termination. The authors used these four levels to determine the 96-hour LC_{50}. However, the lowest two levels were tested two weeks after the definitive test and should not have been included in the test results. In the summary of the report, the authors give the NOEC as 0.215 mg/L (nominal) which is one of the two levels tested after the definitive test.

This study is not scientifically sound. The concentration of active ingredient greatly decreased during the exposure period in at least one test level indicating the actual concentrations the fish were exposed to are unknown. Under the conditions of the test, the 96-hour LC_{50} of 0.51 mg a.i./L (based on initial measured concentrations) classifies Metam-Sodium as highly toxic to bluegill sunfish. Mortality occurred at all test levels so the NOEC could not be determined in this study.

D. **Adequacy of the Study:**

(1) **Classification:** Invalid.

(2) **Rationale:** The concentration of active ingredient greatly decreased during the exposure period in at least one test level indicating the actual concentrations the fish were exposed to are unknown.

(3) **Repairability:** No.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 03-20-91.

Table 1

85/232
BLUEGILL
(LEPOMIS MACROCHIRUS RAF.)

BASF AKTIENGESELLSCHAFT
DEPARTMENT OF TOXICOLOGY

RESULTS :

	NOMINAL CONC. (MG/L)	ANALYTICALLY DETECTED CONCENTRATIONS (MG/L) 1 H	4 H	24 H	48 H	72 H	96 H
Test 2	0.100	0.052					0.07
	0.215	0.194					0.175
Test 1	0.464	0.40					0.095
	1.000	0.75					0.82
	2.150	1.76					
	4.640	4.36					
	10.000	9.76					
	21.500	18.95					
	0.000						
	0.000						

Test 2 was conducted 2 weeks after test 1.

Table 2

85/232
BLUEGILL
(LEPOMIS MACROCHIRUS RAF.)

BASF AKTIENGESELLSCHAFT
DEPARTMENT OF TOXICOLOGY

RESULTS :

	NOMINAL CONC. (MG/L)	NUMBER OF FISH	DEAD FISH AFTER 1 H	4 H	24 H	48 H	72 H	96 H
Test 2	0.100	10	0	0	0	0	0	0
	0.215	10	0	0	0	0	0	0
Test 1	0.464	10	0	0	0	0	1	1
	1.000	10	0	0	0	6	10	10
	2.150	10	0	0	0	10	10	10
	4.640	10	0	0	0	9	10	10
	10.000	10	0	0*	0	10	10	10
	21.500	10	0	0	0	1	10	10
	0.000	10	0	0	0	0	0	0
	0.000	10	0	0	0	0	0	0

	NOMINAL CONC. (MG/L)	SYMPTOMS 1 H	4 H	24 H	48 H	72 H	96 H
Test 2	0.100						
	0.215						
Test 1	0.464						
	1.000						
	2.150						
	4.640						
	10.000						
	21.500				AY		
	0.000						
	0.000						

EXPLANATION OF SYMPTOMS:

A=APATHY
B=ABDOMINAL DISTENSION
E=EXOPHTHALMOS
F=ESCAPE REFLEX
H=HYPERREFLEXIA
K=CONVULSIONS
L=GASPING
N=NARCOTIC-LIKE STATE
T=TUMBLING
U=RESTLESSNESS
V=DISCOLORATION
W=HEADSTAND
X=ACCELERATED RESPIRATION
Y=ABNORMAL SWIMMING BEHAVIOUR

LOUIS M. RIFICI METAM-SODIUM LEPOMIS MACROCHIRUS 3-20-91

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
18.95	10	10	100	9.765625E-02
9.76	10	10	100	9.765625E-02
4.36	10	10	100	9.765625E-02
1.76	10	10	100	9.765625E-02
.75	10	10	100	9.765625E-02
.4	10	1	10	1.074219

THE BINOMIAL TEST SHOWS THAT .4 AND .75 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 .5125899

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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Shaughnessey No. 039003 Chemical Name Sodium Methyldithiocarbamate Chemical Class ____ Page (of)

Study/Species/Lab/ Accession	Chemical % a.i.	Results	Reviewer/ Date	Valida Stat
14-Day Single Dose Oral LD_{50}		LD50 = mg/kg (95% C.L.) Contr. Mort.(%)=		
Species	____	Slope= # Animals/Level= Age(Days)= Sex =	____	____
Lab		14-Day Dose Level mg/kg/(% Mortality) ( ), ( ), ( ), ( ), ( )		
Acc.		Comments:		
14-Day Single Dose Oral LD_{50}		LD50 = mg/kg. (95% C.L) Contr. Mort.(%)=		
Species	____	Slope= # Animals/Level= Age(Days)= Sex =	____	____
Lab		14-Day Dose Level mg/kg/(% Mortality) ( ), ( ), ( ), ( ), ( )		
Acc.		Comments:		
8-Day Dietary LC_{50}		LC50 = ppm (95% C.L.) Contr. Mort.(%)=		
Species		Slope= # Animals/Level= Age(Days)= Sex =		
Lab	____	8-Day Dose Level ppm/(%Mortality) ( ), ( ), ( ), ( ), ( )	____	____
Acc.		Comments:		
8-Day Dietary LC_{50}		LC50 = ppm (95% C.L) Contr. Mort.(%)=		
Species		Slope= # Animals/Level= Age(Days)= Sex =		
Lab	____	8-Day Dose Level ppm/(%Mortality) ( ), ( ), ( ), ( ), ( )	____	____
Acc.		Comments:		
48-Hour LC_{50}		LC50 = pp__ (95% C.L) Contr. Mort.(%)= Sol. Contr. Mort.(%)=		
Species		Slope= # Animals/Level= Temperature =		
Lab	____	48-Hour Dose Level pp /(%Mortality) ( ), ( ), ( ), ( ), ( )	____	____
Acc.		Comments:		
96-Hour LC_{50}		LC50 = 0.51 ppm (95% C.L. nonlinear interpolation 0.4 - 0.75) Con. Mor.(%)= 0 Sol. Con. Mor.(%)= N/A	LR 3/22/91	INVA
Species Lepomis macrochirus 42.2%		Slope= N/A # Animals/Level= 10 Temp.= 23°C		
Lab BASF, Dept of toxicology West Germany		96-Hour Dose Level ppm*/(%Mortality) 6.4 (10), 0.75 (60), 1.76 (100), 4.36 (100), 9.76 (100), 18.95 (100)		
Acc. MRID 411062-01		Comments: * Initial Measured Concentrations		
96-Hour LC_{50}		LC50 = pp__ (95% C.L) Con. Mort.(%)= Sol. Con. Mort.(%)=		
Species		Slope= # Animals/Level= Temp.=		
Lab	____	96-Hour Dose Level pp /(%Mortality) ( ), ( ), ( ), ( ), ( )	____	____
Acc.		Comments:		