1-10-91

**AMENDMENT TO DER BY T. JOHNSTON, 4/12/82**

1. CHEMICAL: Cypermethrin

2. FORMULATION: Technical grade, purity > 97%, 14-C labeled compound

3. STUDY/ACTION TYPE: Estuarine invertebrate acute toxicity *Mysidopsis bahia*

4. CITATION: Cypermethrin: Determination of acute toxicity to mysid shrimp *Mysidopsis bahia.* Summary report submitted by ICI Americas for Phase 4 List B review. MRID 92027-021.

5. REVIEWED BY: Ann Stavola
Aquatic Biologist
EEB/EFED
Signature: Ann Stavola
Date: 1/8/91

6. APPROVED BY: Charles Lewis
Acting Section Head
EEB/EFED
Signature: Charles Lewis
Date: 1/10/91

7. CONCLUSIONS: Based upon the summary report this study is found not to be scientifically sound, and it does not meet guideline requirements for an estuarine invertebrate acute toxicity study for the following reasons: Although a flow-through design was used the correct measured concentrations are not given. The report contains contradictions because it states they were measured but it gives the same range of concentrations and same LC50 values for both measured and nominal concentrations. Additionally, the mysids were 6 to 8 days old at the start of the 96-hr exposure period, not ≤ 24-hr old as required. The age difference is a significant factor in determining the study is not acceptable.

8. RECOMMENDATIONS: A new mysid acute toxicity test is required.

**AMENDMENT TO DER BY T. JOHNSTON, 4/12/82**

1. CHEMICAL: Cypermethrin

2. FORMULATION: Technical grade, purity not given

3. STUDY/ACTION TYPE: Estuarine invertebrate chronic toxicity Mysidopsis bahia

4. CITATION: Cypermethrin: Invertebrate life-cycle test in mysid shrimp Mysidopsis bahia. Summary report submitted by ICI Americas for Phase 4 List B review. MRID 92027-024.

5. REVIEWED BY: Ann Stavola
Aquatic Biologist
EEB/EFED
Signature: Ann Stavola
Date: 1/8/91

6. APPROVED BY: Charles Lewis
Acting Section Head
EEB/EFED
Signature: Charles Lewis
Date: 1/10/91

7. CONCLUSIONS: Based upon the summary report this study was reevaluated and found to be scientifically sound, but it does not meet current EPA guideline requirements for an estuarine invertebrate chronic toxicity study for the following reasons: 1) mysids were 24- to 48-hr old not $\leq$ 24-hr old as required; 2) only 20 mysids per concentration instead of 60 individuals at the beginning of exposure and then 20 randomly selected pairs per treatment when the mysids are sexually mature (day 10 to 14); 3) biological endpoints of live young produced daily by each pair; survival, dry weight total body length of each individual first-generation mysid alive at the end of the test are required; only mortality and offspring per replicate of 10 individuals were recorded. The study design and the data generated were inadequate to accurately assess chronic toxicity.

8. RECOMMENDATIONS: A new mysid chronic toxicity test is required. The registrant should refer to ASTM standard guide E 1191-90 for guidance.

DATA EVALUATION

CHEMICAL: Cypermethrin

FORMULATION: >97 % active ingredient (14C-labeled technical)

CITATION: Jaber, M.J. 1981 The acute and chronic toxicity of cypermethrin to mysid shrimp (Mysidopsis bahia). Unpublished report by EG&G Bionomics, submitted 12/28/81 by ICI Americas Inc., Wilmington, Delaware.

EPA Accession No. 070562 MRID 00079044

REVIEWED BY: Thomas B. Johnston
Biologist, EEB/HED

REVIEW DATE: April 12, 1982

TEST TYPE: 96-hr flow-through toxicity test and chronic (full life-cycle) study

REPORTED RESULTS: The reported 24, 48, 72, and 96-hr $LC_{50}$s of cypermethrin for mysid shrimp were 44.7, 16.5, 9.27, and 14.75 pptr, respectively. The 28-day MATC for cypermethrin was between 0.44 and 0.64 pptr.

REVIEWER'S CONCLUSIONS: This study is scientifically sound, and fulfills USEPA guideline requirements for acute and chronic toxicity tests using a marine invertebrate. With a 96-hr acute $LC_{50}$ of 4.75 pptr, cypermethrin is very highly toxic to mysid shrimp. The 28-day MATC for cypermethrin falls between 0.44 and 0.64 pptr.

MATERIALS/METHODS

Methods used generally followed USEPA guidelines. Tests were run at 25°C, with salinity of 28 ppt. Duplicate test chambers were run for each concentration, using a total of 20 shrimp per concentration.

STATISTICAL ANALYSES

Data were analyzed according to the methods of Stephan (USEDA Duluth laboratory analysis program).

RESULTS

| Mean Measured Concentrations (pptr) | No. Dead/No Exposed 24 hrs | 48 hrs | 72 hrs | 96 hrs |
|---|---|---|---|---|
| 24 | 6/20 | 13/20 | 16/20 | 20/20 |
| 10 | 2/20 | 6/20 | 10/20 | 20/20 |
| 6.7 | 3/20 | 6/20 | 8/20 | 8/20 |
| 2.5 | 0/20 | 2/20 | 5/20 | 5/20 |
| 1.7 | 0/20 | 0/20 | 0/20 | 0/20 |
| Solvent Control | 0/10 | 0/10 | 0/10 | 0/10 |
| Control | 0/10 | 0/10 | 0/10 | 0/10 |
| Acute flow-through test $LC_{50}$s = | >24 pptr | 16.5 (8.44-42.5) | 9.27 (5.09-18.1) | 4.75 (4.01-5.67) |

Percent mortality of mysid shrimp exposed for 28 days under flow-through conditions

| Control | Solvent Control | Mean Measured Concentrations in pptr 0.44 | 0.64 | 1.5 | 2.8 | 5.6 |
|---|---|---|---|---|---|---|
| 0 | 0 | 5 | 50 | 70 | 70 | 90 |

Production of offspring by mysid shrimp (chronic test)

| Mean Measured Concentration (pptr) | Total Offspring | Females With Brood Ponches | Offspring Per Female |
|---|---|---|---|
| Control[a] | 26 | 8 | 3.2 |
| Solvent Control[a] | 34 | 10 | 3.4 |
| 0.44 | 48 | 14 | 3.4 |
| 0.64 | 52 | 13 | 4.0 |
| 1.5 | 72 | 7 | 3.1 |
| 2.8 | 10 | 4 | 2.5[b] |
| 5.6 | 0 | 0 | 0[b] |

[a]Only one vessel. All test concentrations ran duplicate vessels

[b]Significantly ($p<0.05$) less than solvent control

The MATC of cypermethrin for mysid shrimp was between 0.44 and 0.64 pptr, based upon mortality in the $F_0$ mysid shrimp.

CONCLUSIONS:

Validation Category: Core

Category Rationale: N/A

Category Repairability: N/A

JOHNSTON CYPERMETHRIN STATIC ACUTE 24HR LC50 PINK SHRIMP
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|---|---|---|---|---|
| 94 | 20 | 20 | 100 | 9.53674E-05 |
| 58 | 20 | 2 | 10 | .0201225 |
| 25 | 20 | 0 | 0 | 9.53674E-05 |
| 12 | 20 | 0 | 0 | 9.53674E-05 |
| 8.6 | 20 | 0 | 0 | 9.53674E-05 |

THE BINOMIAL TEST SHOWS THAT 58 AND 94 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 70.0725

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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JOHNSTON CYPERMETHRIN STATIC ACUTE 96HR LC50 MYSID SHRIMP
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|---|---|---|---|---|
| 24 | 20 | 20 | 100 | 9.53674E-05 |
| 10 | 20 | 20 | 100 | 9.53674E-05 |
| 6.7 | 20 | 8 | 40 | 25.1722 |
| 2.5 | 20 | 5 | 25 | 2.06947 |
| 1.7 | 20 | 0 | 0 | 9.53674E-05 |

THE BINOMIAL TEST SHOWS THAT 2.5 AND 10 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 7.04218

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|---|---|---|---|---|
| 3 | .0554254 | 4.75164 | 4.01337 | 5.72334 |

RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|---|---|---|---|
| 10 | 1.15101 | 4.54775 | 3.43287E-03 |
| ~~10~~ | ~~1.15101~~ | ~~4.54775~~ | ~~(CANNOT BE CALCULATED)~~ |

~~SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED~~
~~USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.~~

SLOPE = 3.73509
95 PERCENT CONFIDENCE LIMITS =-.2721 AND 7.74228

LC50 = 5.13638
95 PERCENT CONFIDENCE LIMITS = 0 AND +INFINITY

6

JOHNSTON CYPERMETHRIN STATIC ACUTE 72HR LC50 MYSID SHRIMP

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|---|---|---|---|---|
| 24 | 20 | 16 | 80 | .590897 |
| 10 | 20 | 10 | 50 | 58.8098 |
| 6.7 | 20 | 8 | 40 | 25.1722 |
| 2.5 | 20 | 2 | 10 | .0201225 |
| 1.7 | 20 | 0 | 0 | 9.53674E-05 |

THE BINOMIAL TEST SHOWS THAT 2.5 AND 24 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.

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|---|---|---|---|---|
| 3 | .222195 | 9.44641 | 6.3109 | 15.1819 |

RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|---|---|---|---|
| 7 | .124778 | 1 | .753632 |

SLOPE = 2.39976
95 PERCENT CONFIDENCE LIMITS = 1.55207 AND 3.24745

LC50 = 9.80523
95 PERCENT CONFIDENCE LIMITS = 7.36367 AND 13.9609

LC10 = 2.89894
95 PERCENT CONFIDENCE LIMITS = 1.52682 AND 4.15798

JOHNSTON CYPERMETHRIN STATIC ACUTE 48HR LC50 MYSID SHRIMP

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|---|---|---|---|---|
| 24 | 20 | 13 | 65 | 13.1588 |
| 10 | 20 | 6 | 30 | 5.76592 |
| 6.7 | 20 | 5 | 25 | 2.06947 |
| 2.5 | 20 | 2 | 10 | .0201225 |
| 1.7 | 20 | 0 | 0 | 9.53674E-05 |

THE BINOMIAL TEST SHOWS THAT 6.7 AND 0 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 16.533

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|---|---|---|---|---|
| 1 | .806982 | 16.533 | 8.43529 | 55.8184 |

RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|---|---|---|---|
| 6 | .180942 | 1 | .684094 |

SLOPE = 1.95958
95 PERCENT CONFIDENCE LIMITS = 1.12603 AND 2.79313

LC50 = 15.8959
95 PERCENT CONFIDENCE LIMITS = 11.0197 AND 29.8774

LC10 = 3.57427
95 PERCENT CONFIDENCE LIMITS = 1.60075 AND 5.37824