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
   Mysisopsis bahia

4. CITATION: Cypermethrin: Determination of acute toxicity to
   mysid shrimp Mysisopsis 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.
1. **CHEMICAL:** Cypermethrin

2. **FORMULATION:** Technical grade, purity not given

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


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

6. **APPROVED BY:** Charles Lewis  
   Acting Section Head  
   EEB/EFED  
   **Signature:** [Signature]  
   **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 ≤ 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)


EPA Accession No. 070562

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 LC50s of cypermethrin for mysid shrimp were 44.7, 16.5, 9.27, and 14.75 ppt, respectively. The 28-day MATC for cypermethrin was between 0.44 and 0.64 ppt.

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 LC50 of 4.75 ppt, cypermethrin is very highly toxic to mysid shrimp. The 28-day MATC for cypermethrin falls between 0.44 and 0.64 ppt.
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

<table>
<thead>
<tr>
<th>Mean Measured Concentrations (ppt)</th>
<th>24 hrs</th>
<th>48 hrs</th>
<th>72 hrs</th>
<th>96 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>6/20</td>
<td>13/20</td>
<td>16/20</td>
<td>20/20</td>
</tr>
<tr>
<td>10</td>
<td>2/20</td>
<td>6/20</td>
<td>10/20</td>
<td>20/20</td>
</tr>
<tr>
<td>6.7</td>
<td>3/20</td>
<td>6/20</td>
<td>8/20</td>
<td>8/20</td>
</tr>
<tr>
<td>2.5</td>
<td>0/20</td>
<td>2/20</td>
<td>5/20</td>
<td>5/20</td>
</tr>
<tr>
<td>1.7</td>
<td>0/20</td>
<td>0/20</td>
<td>0/20</td>
<td>0/20</td>
</tr>
<tr>
<td>Solvent Control</td>
<td>0/10</td>
<td>0/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
<tr>
<td>Control</td>
<td>0/10</td>
<td>0/10</td>
<td>0/10</td>
<td>0/10</td>
</tr>
</tbody>
</table>

Acute flow-through test LC50s = >24 ppt 16.5 9.27 4.75
(8.44-42.5) (5.09-18.1) (4.01-5.67)

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

<table>
<thead>
<tr>
<th>Control</th>
<th>Solvent Control</th>
<th>Mean Measured Concentrations in ppt</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.44 0.64 1.5 2.8 5.6</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>70 70 90</td>
</tr>
</tbody>
</table>
### Production of offspring by mysid shrimp (chronic test)

<table>
<thead>
<tr>
<th>Mean Measured Concentration (pptr)</th>
<th>Total Offspring</th>
<th>Females With Brood Pouches</th>
<th>Offspring Per Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controla</td>
<td>26</td>
<td>8</td>
<td>3.2</td>
</tr>
<tr>
<td>Solvent Controla</td>
<td>34</td>
<td>10</td>
<td>3.4</td>
</tr>
<tr>
<td>0.44</td>
<td>48</td>
<td>14</td>
<td>3.4</td>
</tr>
<tr>
<td>0.64</td>
<td>52</td>
<td>13</td>
<td>4.0</td>
</tr>
<tr>
<td>1.5</td>
<td>72</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>2.8</td>
<td>10</td>
<td>4</td>
<td>2.5b</td>
</tr>
<tr>
<td>5.6</td>
<td>0</td>
<td>0</td>
<td>0b</td>
</tr>
</tbody>
</table>

*aOnly one vessel. All test concentrations ran duplicate vessels

*bSignificantly (p<0.05) less than solvent control

The MTC of cypermethrin for mysid shrimp was between 0.44 and 0.64 ppctr, based upon mortality in the F0 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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<table>
<thead>
<tr>
<th>CONC.</th>
<th>NUMBER EXPOSED</th>
<th>NUMBER DEAD</th>
<th>PERCENT DEAD</th>
<th>BINOMIAL PROB.(PERCENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>20</td>
<td>20</td>
<td>100</td>
<td>9.53674E-05</td>
</tr>
<tr>
<td>58</td>
<td>20</td>
<td>2</td>
<td>10</td>
<td>.0201225</td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>9.53674E-05</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>9.53674E-05</td>
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<tr>
<td>8.6</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>9.53674E-05</td>
</tr>
</tbody>
</table>

THE BINOMIAL TEST SHOWS THAT 58 AND 94 CAN BE USED AS STATISTIALLY 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 STATISTIALLY SOUND RESULTS.

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JOHNSTON CYPERMETHRIN STATIC ACUTE 96HR LC50 MYSID SHRIMP
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<table>
<thead>
<tr>
<th>CONC.</th>
<th>NUMBER EXPOSED</th>
<th>NUMBER DEAD</th>
<th>PERCENT DEAD</th>
<th>BINOMIAL PROB.(PERCENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>20</td>
<td>20</td>
<td>100</td>
<td>9.53674E-05</td>
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<td>10</td>
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<td>8</td>
<td>40</td>
<td>25.1722</td>
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<tr>
<td>2.5</td>
<td>20</td>
<td>5</td>
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<tr>
<td>1.7</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>9.53674E-05</td>
</tr>
</tbody>
</table>

THE BINOMIAL TEST SHOWS THAT 2.5 AND 10 CAN BE USED AS STATISTIALLY 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

<table>
<thead>
<tr>
<th>SPAN</th>
<th>G</th>
<th>LC50</th>
<th>95 PERCENT CONFIDENCE LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>.0554254</td>
<td>4.75164</td>
<td>4.01337</td>
</tr>
<tr>
<td>10</td>
<td>.15101</td>
<td>4.54775</td>
<td>3.43287E-03</td>
</tr>
</tbody>
</table>

RESULTS CALCULATED USING THE PROBIT METHOD

<table>
<thead>
<tr>
<th>ITERATIONS</th>
<th>G</th>
<th>H</th>
<th>GOODNESS OF FIT PROBABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.15101</td>
<td>4.54775</td>
<td>3.43287E-03</td>
</tr>
<tr>
<td>10</td>
<td>1.15101</td>
<td>4.54775</td>
<td>(CANNOT BE CALCULATED)</td>
</tr>
</tbody>
</table>

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 = -0.2721 AND 7.74228

LC50 = 5.13638
95 PERCENT CONFIDENCE LIMITS = 0 AND LINEARITY
JOHNSTON CYPERMETHRIN STATIC ACUTE 72HR LC50 MYSID SHRIMP
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<table>
<thead>
<tr>
<th>CONC.</th>
<th>NUMBER</th>
<th>NUMBER</th>
<th>PERCENT</th>
<th>BINOMIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPOSED</td>
<td>DEAD</td>
<td>ENDED</td>
<td>DEAD</td>
</tr>
<tr>
<td>24</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>10</td>
<td>50</td>
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</tr>
<tr>
<td>6.7</td>
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<td>40</td>
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</tr>
<tr>
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<td>2</td>
<td>10</td>
<td></td>
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<tr>
<td>1.7</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

THE BINOMIAL TEST SHOWS THAT 2.5 AND 24 CAN BE USED AS STATISTICALLY SOUN 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
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JOHNSTON CYPERMETHRIN STATIC ACUTE 48HR LC50 MYSID SHRIMP
**********************************************************************

<table>
<thead>
<tr>
<th>CONC.</th>
<th>NUMBER</th>
<th>NUMBER</th>
<th>PERCENT</th>
<th>BINOMIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPOSED</td>
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<td>DEAD</td>
</tr>
<tr>
<td>24</td>
<td>20</td>
<td>13</td>
<td>65</td>
<td></td>
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<tr>
<td>10</td>
<td>20</td>
<td>6</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>6.7</td>
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<td>20</td>
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<td>10</td>
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<tr>
<td>1.7</td>
<td>20</td>
<td>0</td>
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<td></td>
</tr>
</tbody>
</table>

THE BINOMIAL TEST SHOWS THAT 6.7 AND 0 CAN BE USED AS STATISTICALLY SOUN 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
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