The Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis, but may not exist for other toxic effects such as carcinogenicity. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Oral RfD Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of compounds which are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in the Carcinogenicity Assessment Section of this file when a review of that evaluation is completed.

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**RfD ASSESSMENT SUMMARY TABLE**

<table>
<thead>
<tr>
<th>Crit. Dose:</th>
<th>5 mg/kg-day [Study 1 NOAEL(adj)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF:</td>
<td>100 MF: 1</td>
</tr>
<tr>
<td>RfD:</td>
<td>5E-2 mg/kg-day</td>
</tr>
<tr>
<td>Confidence:</td>
<td>High</td>
</tr>
</tbody>
</table>

**Crit Effect:** (1) Increased liver weights

<table>
<thead>
<tr>
<th>NOAEL (Study 1)</th>
<th>LOAEL (Study 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ppm (diet)</td>
<td>500 ppm (diet)</td>
</tr>
<tr>
<td>5 mg/kg-day</td>
<td>25 mg/kg-day</td>
</tr>
</tbody>
</table>

**Study Type:** 2-Year Rat Feeding Study

**Reference:** FMC Corp., 1977

1) FMC Corp., 1977
2-Year Rat Feeding Study

**Critical Effect:** Increased liver weights

**Defined Dose Levels:**

- NOAEL = 100 ppm (diet)
- NOAEL(ADJ) = 5 mg/kg-day
- LOAEL = 500 ppm (diet)
- LOAEL(ADJ) = 25 mg/kg/day

**Conversion Factors:** 1 ppm = 0.05 mg/kg/day (assumed rat food consumption)

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**DISCUSSION OF PRINCIPAL AND SUPPORTING STUDIES**


Four groups of 60 male and 60 female Long-Evans rats were dosed at either 0, 20, 100 or 500 ppm (0, 1, 5 or 25 mg/kg/day) for 104 weeks. No effects were
noted at 1 mg/kg/day, but slight liver weight increases were seen at 5 mg/kg/day; this increase is considered below the level of toxicological significance. A definite effect level for liver weight increases was observed at 25 mg/kg/day.

---------UNCERTAINTY AND MODIFYING FACTORS---------

UNCERTAINTY FACTORS:

Based on a chronic exposure study, an uncertainty factor of 100 was used to account for interspecies differences.

---------ADDITIONAL COMMENTS / STUDIES---------

Data Considered for Establishing the RfD:

1) 2-Year Feeding (oncogenic) - rat: Principal study - see previous description; core grade minimum

2) 1-Year Feeding - dog: NOEL=5 mg/kg/day; LEL=100 mg/kg/day (increased alkaline phosphatase, increased liver weights and hepatocellular swelling); core grade guideline (ICI Americas, Inc., 1982)

3) 3-Generation Reproduction - rat: NOEL=none; LEL=500 ppm (25 mg/kg/day) (offspring show centrilobular hepatocyte hypertrophy and cytoplasmic eosinophilia and buphthalmos with persistent pupillary membranes; body tremors in parents at 1000 ppm and 2500 ppm and in offspring at 2500 ppm); core grade guideline (FMC Corp., 1978)

4) Teratology - rat: Not teratogenic at 200 mg/kg; no definite maternal or fetotoxic effects evident; core grade minimum (FMC Corp., 1976a)

5) Teratology - rabbit: Not teratogenic at 400 mg/kg; no definite maternal or fetotoxic effects evident; core grade minimum (FMC Corp., 1976b)

Other Data Reviewed:

1) 2-Year Feeding (oncogenic) - mice: Systemic NOEL=20 ppm (3 mg/kg/day); Systemic LEL=2500 ppm (375 mg/kg/day) in females (liver and lung weight increases); 500 ppm (75 mg/kg/day) in males (testis weight depression deaths); no core grade (FMC Corp., 1979)

Data Gap(s): None

---------CONFIDENCE IN THE RfD---------

Study: High Data Base: High RfD: High

The critical study is of good quality and is given a high confidence rating. Additional studies are very supportive; therefore, the data base is given a high confidence rating. High confidence in the RfD follows.
Permethrin

REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (Rfd)  

EPA DOCUMENTATION AND REVIEW

Source Document: This assessment is not presented in any existing U.S. EPA document.

Other EPA Documentation: Pesticide Registration Files

Agency Work Group Review: 10/28/86

Verification Date: 10/28/86

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BIBLIOGRAPHY


REVISION HISTORY

01/92 Rfd Add Com: Citations added