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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM:

SUBJECT: Review Three Exposure Assessments for Permethrin

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THRU: Mark Dow, Ph.D., Section Head
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The Occupational and Residential Exposure Branch (OREB) has been requested by Special Review and Reregistration Division (SRRD) to review three exposure/risk assessments submitted by the Permethrin Task Force (c/o FMC Corporation). The three documents addressed worker exposure and reentry data for permethrin. All three assessments were based on the Agency's upper bound cancer endpoint (Q_1^* of $0.0184 \text{ (mg/kg/day)}^{-1}$).

DP Barcode: D207490, D206915

Pesticide Chemical Code: 109701

EPA Reg. No.: 279-3051, 3083, 3014, 3059

I. INTRODUCTION:

A. Background:

The synthetic pyrethroid permethrin is registered for agricultural, termiticide, and residential uses. A Phase 4 data call in (DCI) was issued for Subdivision U, Applicator Exposure data and Subdivision K, Rentry Exposure data. Permethrin has been classified by the HED Peer Review Committee as a Group C Carcinogen with a Q* of $1.84 \times 10^{-2} \text{ (mg/kg/day)}^{-1}$, based on the FMC mouse study for lung and liver tumors.

B. Purpose:

SRRD requests that the following submitted studies be reviewed by OREB which address worker exposure and reentry data:

Krieger, R. 1994. First Tier Estimation of Permethrin Exposure and Risk Resulting from Entry of Treated Crops within 24 Hours of Application. Jellinek, Schwartz, and Connolly, Inc., Arlington, VA. MRID No. 43342601.

Lunchick, C. 1994. Assessment of Handler Exposure and Risk for Permethrin. Jellinek, Schwartz, and Connolly, Inc. Arlington, VA. MRID No. 43324801.

The third study was submitted addressing guidelines 132, 133, 231 and 232 for permethrin:

Lunchick, C. 1994. Assessment of Residential Application and Post Application Exposure and Risk for Permethrin. Jellinek, Schwartz, and Connolly, Inc., Arlington, VA. MRID No. 43355501.

II. DETAILED CONSIDERATIONS:

A. First Tier Estimation of Permethrin Exposure and Risk Resulting from Entry of Crops within 24 Hours of Application:

1. Permethrin application rates vary from 0.025 to 0.5 lb ai/A.

2. Initial dislodgeable leaf deposits of permethrin (within first day of application) were low, and were reported to be 0.06-0.10 ug/cm² on peach leaves and 0.135-0.435 ug/cm² on cotton leaves. The half-lives of permethrin dislodgeable foliar residues were 6.3-12.6 days in peaches and 1.5-3.0 days in cotton.

3. The estimates were "worse" case because of the conservative assumptions used:

a). Dislodgeable foliar residue measurements were made during the first 24 hours after application.

b). The transfer factor (TF) was calculated as: $\text{TF (cm}^2/\text{hr)} = \text{potential exposure (ug/hr)} \div \text{DFR}$, (work task related and

considered to be 4000 cm²/hr for low crops and 8000 cm²/hr for high crops including tree fruits to give dose transferred to whole body (19,400 cm²) and time = 7 hr of work (plant contact) per day).

c). Dislodgeable Foliar Residue (DFR, ug/cm²) = foliar surface residue removed by aqueous surfactant wash, so that the adjusted Potential Dermal Exposure (PDE)=DFR x TF x 7 hr.

4. To convert the estimate of PDE to Absorbed Daily Dosage, additional factors such as clothing permeation, dermal absorption, body weight, and duration of exposure were used. All calculations were completed using various data from the open literature and California Department of Pesticides Regulation reports. A dermal penetration factor of 2% was used as well as a clothing penetration factor of 0.1.

B. The exposure data utilized in the "Assessment of Residential Application and Postapplication and Risk for Permethrin" were taken from four sources:

1. A Subdivision U study of termiticide application exposure.
2. A postapplication termiticide residential exposure study.
3. The residential air levels in permethrin monitored during Nonoccupational Pesticide Exposure Study (NOPES).
4. The potential exposure and risk resulting from dermal postapplication contact with treated carpets was estimated using methodologies and assumptions developed by the California Department of Pesticide Regulation (CDPR).

C. Assessment of Handler Exposure and Risk for Permethrin addressed agricultural uses of permethrin. The exposure data used in the assessment were from the following three sources:

1. The Pesticide Handlers Exposure Database (PHED 1.0),
2. The Predictive Operator Exposure Model, and
3. Appropriate exposure studies previously conducted by Task Force members but not included in the previous two sources.

III. CONCLUSIONS:

A. First Tier Estimation of Permethrin Exposure and Risk Resulting from Entry of Crops within 24 Hours of Application:

1. The estimation of permethrin exposure and risk from entry of treated crops within 24 hours of application resulted in a calculated lifetime cancer risk of 4.5×10^{-8} for low crops, and for high crops the lifetime cancer risk was $1.2-2.2 \times 10^{-8}$.
2. The conclusions stated that the current 48-hour worker reentry interval can justifiably be reduced to 24 hours based upon the calculated low additional lifetime risk. It is to be noted that in a 13 December 1994 Memo (DP Barcode D209761, D209762, D209763, and D209764) that because of the Tox

Category of III or IV for all routes of exposure for the technical permethrin, that the appropriate REI for the four products listed in that Memo was 12 hours.

3. OREB accepts the estimation of exposure since it appears to be an extremely conservative estimate and does not exceed any exposure concerns.

B. The Assessment of Residential Application and Postapplication Exposure and Risk for Permethrin:

1. The upper bound cancer risk estimates ranged from 1×10^{-6} for dermal postapplication exposure during an entire 70 year lifespan to 2×10^{-9} for residential inhalation exposure to permethrin.

2). Professional application of permethrin resulted in high risk estimates ranging from 3×10^{-6} to 2×10^{-7} . Homeowner exposure and risk from the application of permethrin around the home would be less than the risk estimated for professional applicators that handle at least 100 times the amount of permethrin annually that a homeowner is likely to handle.

3). The Permethrin Task Force concluded that all residential uses of permethrin are acceptable and that additional data are not necessary. This conclusion was based on the low levels of risks and that the low risk estimates are overestimating the actual risk, and a considered apparent adequate exposure database. Based on these assumptions OREB accepts these risk estimates as being conservative and not exceeding cancer risk concerns.

C. The Assessment of Handler Exposure and Risk for Permethrin:

1). The potential permethrin upper-bound cancer risk estimates based on the Q^* value of $0.018 \text{ (mg/kg/day)}^{-1}$ ranged from 3×10^{-6} for growers mixing/loading and applying permethrin to tree crops by open-cab airblast application to 3×10^{-9} for flaggers involved in the aerial application of the granular formulation of permethrin.

2). However, these values were derived from PHED 1.0 and not from PHED 1.1, which is the preferred program to be used in the calculations of exposure. Since the cancer risk estimates are below 1×10^{-6} , OREB does not believe that recalculating the risk estimates by using the PHED 1.1 program is necessary in this case. OREB is accepting the cancer risk estimates provided in this study for applicators and flaggers.

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