



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
PESTICIDES AND TOXIC
SUBSTANCES

MEMORANDUM

SUBJECT: POST-APPLICATION EXPOSURES OF RESIDENTS TO PROPOXUR
APPLIED AS AN AEROSOL SPRAY

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1.0 INTRODUCTION

In November 1989 OREB/NDEB provided a review of a study estimating the dermal and respiratory exposures of residents of homes to the insecticide propoxur following crack and crevice treatment (1). The study was conducted by Mobay Corporation in response to a Data-Call-In Notice (DCI) which was issued in December 1987. Daily and annual exposures, both dermal and respiratory, were calculated for three classes of individuals; an infant, a 12 year old child, and an adult. Dermal exposures were estimated using transfer coefficients derived by the registrant for carpet, fabric and vinyl tile. In order to extrapolate the results for the post-application study submitted by the registrant for crack and crevice treatments to encompass exposures from the use of aerosol products, a number of assumptions were required. Many of these assumptions are the same as those used in the exposure assessment for residents following crack and crevice treatment.

2.0 CONCLUSIONS

OREB has provided estimates for the exposures of residents of homes treated with propoxur applied as an aerosol spray containing 1 percent active ingredient. Estimates of dermal exposure have been provided using both the assumptions of stable residue levels and using dissipation data derived from a study found in the scientific literature. The dermal exposure values are summarized in Table 1. The respiratory exposure estimates are presented in Table 2. It must be emphasized that the relationships between air concentrations, transfer to skin, and total amount applied may not be linear and may be more closely related to the specific physicochemical properties of the formulation. The lack of supporting information regarding a linear relationship between amount applied and air concentration should be considered in the evaluation of any risks from this use.

3.0 ASSUMPTIONS

- 1) The body weights of an infant, 12 year old child and adult are 7.5, 40.5, and 70 kg, respectively. The corresponding respiratory volumes are 0.5, 0.9, and 1.0 m³ per hour, respectively.
- 2) Infant, 12 year old, and adult exposure times were assumed to be 24, 15, and 15 hours per day, respectively. Exposure occurs for 365 days per year.
- 3) The maximum geometric mean of all of the measured surface residues, from wipe samples taken between 6 and 48 hours, for a given material was used to represent that material. Residue levels from different rooms were pooled for each material.
- 4) Dermal exposures during active periods were assumed to occur at a rate equal to the average of those for three different materials; vinyl tile, carpet, and upholstery material.
- 5) During periods when the individual was assumed to be asleep levels found on upholstery were used to calculate dermal exposures. These intervals were 12 hours, 8 hours and 8 hours for infants, 12 year old children, and adults, respectively.
- 6) Dermal exposures are not corrected for dermal absorption.
- 7) The distribution of propoxur from aerosol application is the same as that observed after crack and crevice treatment.

Table 1. Summary of Dermal Exposures of Residents to Propoxur Following Treatment of Homes with a 1 Percent Aerosol Product.

Age Category	Body Weight (kg)	No Dissipation			Dermal Exposure			With Dissipation ¹		
		mg/day	mg/yr	mg/kg/day	mg/kg/yr	mg/day	mg/yr	mg/kg/day	mg/kg/yr	mg/kg/yr
Infant	7.5	0.022	8.03	0.0029	1.071	0.009	3.29	0.0012	0.438	
		0.127	46.36	0.0169	6.181	0.051	18.62	0.0068	2.482	
12 Year Old	40.5	0.025	9.13	0.0006	0.225	0.010	3.65	0.0002	0.090	
		0.087	31.76	0.0021	0.784	0.035	12.78	0.0009	0.315	
Adult	70	0.033	12.05	0.0005	0.172	0.013	4.75	0.0002	0.068	
		0.096	35.04	0.0014	0.501	0.038	13.87	0.0005	0.198	

¹ The product is assumed to be applied once a month, 12 times per year.

Table 2. Estimated Respiratory Exposures of Residents to Propoxur Following Treatment of Homes with a 1 Percent Aerosol.

Age Category	Respiratory Volume (m ³ /hr)	Air Concentration (µg/m ³)		Respiratory Exposure			
		Crack & Crevice ¹	Aerosol ²	mg/day	mg/yr	mg/kg/day	mg/kg/yr
Infant	0.5	5.1	0.18	0.0022	0.80	0.0003	0.11
12 Year child	0.9	5.1	0.18	0.0025	0.91	0.225	8.2
Adult	1.0	5.1	0.18	0.0028	1.02	0.0146	5.4

¹ Grand mean of all samples collected during crack and crevice study.

² Adjusted by a factor of 0.036, based on difference in total amount of material applied.

- 8) The dissipation of propoxur from indoor surfaces after aerosol treatment follows the same kinetics as that resulting from crack and crevice treatment.
- 9) The amount of material deposited is dependent on the total amount of material applied and observed surface and air residues can be adjusted by the amount of total product used. The mean quantity of active ingredient applied during the crack and crevice study was 4.5 ounces of active ingredient per treatment. Application of a complete aerosol can of propoxur would dispense 0.16 ounces of active ingredient. The conversion factor to adjust surface and air residues would therefore be:

$$\begin{aligned} \text{Estimated residues for aerosol } (\mu\text{g}/\text{ft}^2) &= \frac{0.16 \text{ oz ai (aerosol)}}{4.5 \text{ oz ai (crck \& crev)}} \times \text{Observed residues} \\ &= 0.036 \times \text{Observed residues } (\mu\text{g}/\text{ft}^2) \end{aligned}$$

- 10) The previous study measured the transfer coefficients for the movement of propoxur from treated media to human skin. While it is possible that these coefficients are dependent on the existing residue levels on these surfaces, there are insufficient data to examine this parameter. OREB assumes that the transfer of propoxur from indoor surfaces to skin is the same for both aerosol products and the crack and crevice formulation.
- 11) All other assumptions, such as body surface areas and weights, areas contacted, type of media, and exposure times are the same as those used in the previous review (1).
- 12) OREB has provided estimates of exposure assuming that residue levels remain stable and that propoxur dissipates over time. Dissipation of the propoxur is assumed to decrease daily exposure by 60 percent. This value was derived from a literature study and has been provided by OREB previously (2).

4.0 CALCULATION OF RESIDUE LEVELS OF PROPOXUR ON INDOOR SURFACES AND EXPOSURES OF RESIDENTS

The geometric mean residue levels from the previous review and the adjusted values to account for differences in amount of material applied are presented in Table 3. The interpolated transfer coefficients for infants, 12 year old children, and adults for propoxur on vinyl tile, carpet, and upholstery are presented in Table 4.

Respiratory exposures were calculated from the previous assessment in a similar manner to the dermal exposures. It must

to the total amount applied and may be more closely related to the physicochemical properties of the formulation. The estimated respiratory exposures are presented in Table 2.

Dermal exposure for a given interval was estimated using the following equation:

$$\text{Exposure (ug/kg)} = \frac{\text{SR} \times \text{TC} \times \text{SA} \times \text{T}}{\text{BW} \times 4}$$

where:

SR = Surface residues in ug/ft² as measured by wipe sample and adjusted for an application of 0.16 oz ai

TC = Transfer Coefficient, from previous review

SA = Surface area Contacted in a 4 hour period in ft², either 5 ft² or 50 ft²

T = Hours exposed

BW = Body weight in kg; 7.5 for infants, 40.5 for a 12 year old child, and 70 for adults

Daily dermal exposures were calculated separately for active and sleep periods and were summed to yield daily exposures. Individuals were assumed to be in contact with upholstery only during the sleep periods and have equal contact with all three media during active periods. The estimated dermal exposures for infants, 12 year old children, and adults assuming stable residues and considering dissipation, are presented in Tables 5 and 6, respectively.

Table 3. Surface residues of Propoxur on Indoor Surfaces and Adjusted for an Application of 0.16 ounces of Active Ingredient. The adjustment factor, derived from the ratio of the mean application amount in reference 1 and 0.16 oz ai is 0.036.

Material Sampled	Sampling Interval	Geometric Mean Residues ¹ ($\mu\text{g}/\text{ft}^2$)	Adjusted Mean Residues ($\mu\text{g}/\text{ft}^2$)
Vinyl Tile	Immediately After Application	288	10.368
	6 Hours	57	2.052
	12 Hours	41	1.476
	24 Hours	165	5.940
	48 Hours	101	3.636
Carpet	Immediately After Application	7.6	0.274
	6 Hours	3.1	0.112
	12 Hours	3.6	0.130
	24 Hours	1.3	0.047
	48 Hours	0.66	0.024
Upholstery	Immediately After Application	0.96	0.035
	6 Hours	0.64	0.023
	12 Hours	0.79	0.028
	24 Hours	0.48	0.017
	48 Hours	0.52	0.019

¹ From Crack and Crevice Study (Reference 1).

Table 4. Interpolated Transfer Coefficients for Individuals in Contact with Surfaces Following Treatment with Propoxur. This table was taken directly from the previous review (Table 5).

Age Category	Area (ft ²)		Skin/cont Ratio	Transfer Coefficient (Interpolated)	
	Skin ¹	Contacted		Vinyl Tile	Carpet Upholstery
Infant (6-9 months)	4.80	5	0.48	0.57	1.63
		50	0.048	0.39	0.32
12 Year old Child	14.80	5	1.48	0.98	4.66
		50	0.15	0.43	0.63
Adult	21.00	5	2.10	1.24	6.53
		50	0.21	0.46	0.81

¹ Exposure is assumed to occur over 50 percent of this area.

Table 5. Estimated Dermal Exposures of Residents to Propoxur Following Treatment of Homes with a 16 Ounce Aerosol Can Containing 1 Percent Active Ingredient.

Age Category	BW (kg)	Contact Area ft ²	Hours/day		mg/hr		Dermal Exposure			
			Active	Sleeping ²	Active	Sleeping	Daily (mg)	Annual mg/yr	mg/kg/day	mg/kg/yr
Infant	7.5	5	12	12	0.019	0.003	0.022	8.03	0.0029	1.071
	7.5	50	12	12	0.12	0.007	0.127	46.35	0.0169	6.181
12 Year Old	40.5	5	7	8	0.02	0.005	0.025	9.13	0.0006	0.225
	40.5	50	7	8	0.079	0.008	0.087	31.76	0.0021	0.784
Adult	70	5	7	8	0.026	0.007	0.033	12.05	0.0005	0.172
	70	50	7	8	0.086	0.01	0.096	35.04	0.0014	0.501

Table 6. Estimated Dermal Exposures of Residents to Propoxur Following Treatment of Homes with a 16 Ounce Aerosol Can Containing 1 Percent Active Ingredient. Residues on indoor surfaces are assumed to dissipate at the same rate as residues on stainless steel plates as determined in Reference 2. Dissipation results in a mean daily residue level of 40 percent of undissipated material.

Age Category	BW (kg)	Contact Area ft ²	Hours/day		mg/hr		Dermal Exposure			
			Active	Sleeping ²	Active	Sleeping	Daily (mg)	Annual mg/kg/day	mg/kg/yr	
Infant	7.5	5	12	12	0.0076	0.0012	0.009	3.29	0.0012	0.438
	7.5	50	12	12	0.0480	0.0028	0.051	18.62	0.0068	2.482
12 Year Old	40.5	5	7	8	0.0080	0.0020	0.010	3.65	0.0002	0.090
	40.5	50	7	8	0.0316	0.0032	0.035	12.78	0.0009	0.315
Adult	70	5	7	8	0.0104	0.0028	0.013	4.755	0.0002	0.068
	70	50	7	8	0.0344	0.0038	0.038	13.87	0.0005	0.198

REFERENCES

- 1) Memorandum from D. Jaquith (NDEB) to D. Edwards (RD) titled "Review of Study Estimating Resident Exposure to Propoxur Following Crack and Crevice Treatment", dated November 15, 1989.
- 2) Memorandum from D. Jaquith (OREB) to J. Gallagher (SRB) titled "Adjustments to Post Application Exposure Assessment for Residents of Homes Treated with Propoxur (HED Project No. 1-0222)", dated February 27, 1991.

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