To: Bill Burnam
Dick Mountfort

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1.0 INTRODUCTION

American Hoechst Corporation has applied for registration of a new product, Acclaim 1 EC, an emulsifiable concentrate formulation containing fenoxaprop-ethyl at 1 lb ai/gal. Fenoxaprop-ethyl is a selective herbicide intended for post-emergence annual and perennial grass control in turfgrass including sod farms, commercial and residential turf and rights-of-way. Fenoxaprop-ethyl is applied to home lawns at rates ranging from 0.003 to 0.008 lb ai/1000 ft^2 (0.12-0.35 lb ai/A), and is most commonly applied at 0.004 lb ai/1000 ft^2 (0.24 lb ai/A) (1).

EAB has been requested to provide an exposure estimate for a child who may be exposed to fenoxaprop-ethyl postapplication via contact with treated home lawns. Both daily and weekly exposures have been estimated. It should be noted that EAB has little experience with this type of exposure situation. While certain of the assumptions listed below appear very conservative from the standpoint of public safety (the assumption for dermal exposure, for example, is equivalent to an unclothed child playing on a home lawn), other assumptions (i.e., ingestion exposure) may not be as conservative. However, for either route of potential exposure, we cannot document the degree of conservatism based on either the results of actual studies or on our general experience. The following assumptions were used in this exposure assessment:

1. Respiratory exposure is insignificant compared to dermal or ingestion exposure.

2. A 70 cm tall, 9 kg, 1 year old child has a total body surface area of 0.46 m^2 (2).

3. An exposure period for a child on a treated home lawn of 3 hours per day for 7 consecutive days is assumed.

4. All dermal exposure values correspond to the amount of chemical impinging on the skin surface and are not corrected for dermal penetration.

5. Dermal exposure will occur as a result of contact with the treated grass. Contact will occur over the entire body surface area, and any dermal contact will result in a quantitative transfer of dislodgeable residues from the foliage to the surface of the skin.

6. Ingestion exposure will occur as a result of the child licking both himself and a toy. We assume that during the course of an exposure episode, the child will lick an area of his body equal to the surface area of one hand

and will lick the surface area of a 3-inch diameter ball. Licking is assumed to quantitatively remove residues from each respective surface. The surface residues on the ball are assumed to be equal to the dislodgeable residues on the grass.

7. The proportion of a child's total surface area accounted for by one hand is the same as for an adult.

2.0 FOLIAR DISSIPATION

O'Grodnick and Grande (3) measured dislodgeable residues of fenoxaprop-ethyl on turf grass. Field plots of perennial ryegrass were treated with fenoxaprop-ethyl (50 g ai/l EC) at 0.25 and 0.5 lb ai/A. At 0 (15 minutes and 3 hours), 1, and 3 days posttreatment, triplicate 1 ft^2 areas of turf were vigorously rubbed with dry gauze pads. Gauze pads were extracted, hydrolyzed, and acetylated with acetic anhydride. The acetylated oxazole derivative was quantified using GC with electron-capture detection. The detection limit was 0.5 ppm. Recovery values for spiked samples averaged 87%. Dislodgeable residues (average of both treatment rates) were 0.28, 0.037, 0.023, and 0.023 mg/m^2 at 15 minutes, 3 hours, 1 day, and 3 days post-treatment, respectively.

Although this study does not conform to the methodology required by Subdivision K, the data have been reviewed and are considered adequate for this exposure assessment. However, EAB has no data demonstrating whether dislodgeable residue data derived from dry gauze wipe tests on turf can be used to reliably estimate dermal exposure. In calculating exposures, the 15 minute value of 0.28 mg/m^2 was used for day 1. Since no dissipation of residues occurred between day 1 and day 3 posttreatment, the value of 0.023 mg/m^2 was used to calculate exposures for days 2-7.

3.0 EXPOSURE CALCULATIONS

3.1 Dermal Exposure

Total dermal exposure on day 1 posttreatment:

$$\frac{0.28\ mg}{m^2} \times \frac{0.46\ m^2}{child} \times \frac{1}{9\ kg} = 1.4 \times 10^{-2}\ mg/kg/day$$

Total dermal exposure on each of days 2-7 posttreatment:

$$\frac{0.023\ mg}{m^2} \times \frac{0.46\ m^2}{child} \times \frac{1}{9\ kg} = 1.2 \times 10^{-3}\ mg/kg/day$$

The weekly dermal exposure is therefore: 2.1×10^{-2} mg/kg/week

3.2 Ingestion Exposure

Ingestion exposure from licking a 3-inch diameter (7.6 cm) ball on day 1 posttreatment:

$$4\pi\,(7.6\text{ cm}/2)^2 \times \frac{10^{-4}\text{ m}^2}{\text{cm}^2} \times \frac{0.28\text{ mg}}{\text{m}^2} \times \frac{1}{9\text{ kg}} = 5.6 \times 10^{-4}\text{ mg/kg/day}$$

Ingestion exposure from licking a 3-inch diameter (7.6 cm) ball on each of days 2-7 posttreatment:

$$4\pi\,(7.6\text{ cm}/2)^2 \times \frac{10^{-4}\text{ m}^2}{\text{cm}^2} \times \frac{0.023\text{ mg}}{\text{m}^2} \times \frac{1}{9\text{ kg}} = 4.6 \times 10^{-5}\text{ mg/kg/day}$$

The weekly ingestion exposure from the ball is therefore:

$$8.4 \times 10^{-3}\text{ mg/kg/week}$$

Ingestion exposure from licking a body surface area equivalent to one hand on day 1 posttreatment:

Assume that the child's hand surface area is x, where:

$$\frac{x}{0.46} = \frac{0.041\text{ m}^2}{1.76\text{ m}^2}$$

(surface area of adult hand) (4)
(total surface area of adult) (5)

$$x = 0.011\text{ m}^2$$

$$0.011\text{ m}^2 \times \frac{0.28\text{ mg}}{\text{m}^2} \times \frac{1}{9\text{ kg}} = 3.4 \times 10^{-4}\text{ mg/kg/day}$$

Ingestion exposure from licking a body surface area equivalent to one hand on each of days 2-7 posttreatment:

$$0.011\text{ m}^2 \times \frac{0.023\text{ mg}}{\text{m}^2} \times \frac{1}{9\text{ kg}} = 2.8 \times 10^{-5}\text{ mg/kg/day}$$

The weekly ingestion exposure from the hand is therefore:

$$5.1 \times 10^{-4}\text{ mg/kg/week}$$

TOTAL weekly ingestion exposure: 8.9×10^{-3} mg/kg/week

4.0 CONCLUSIONS

Based on dislodgeable residue data, the weekly dermal exposure of a 9 kg child playing on a home lawn (3 hours per day for 7 consecutive days) after treatment with fenoxaprop-ethyl is estimated to be 2.1×10^{-2} mg/kg/week. Ingestion exposure resulting from the child licking both himself and a toy is estimated to be 8.9×10^{-3} mg/kg/week.

These estimates assume a quantitative transfer of dislodgeable residues from the foliage to the entire body and toy surface areas; licking is assumed to quantitatively remove residues from each respective surface. The estimates are not adjusted for dermal absorption.

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REFERENCES

1) Memorandum from G.W. Keitt, Jr. (BUD) to C. Lunchick (EAB) titled "Use Data for Exposure Analysis of Fenoxaprop-ethyl (Acclaim 1 EC) on Turf," dated May 30, 1986.

2) Anderson, E., N. Browne, S. Duletsky, J. Ramig, and T. Warn. 1985. Development of Statistical Distributions or Ranges of Standard Factors Used in Exposure Assessments. U.S. Environmental Protection Agency. Report No. EPA/600/8-85/010.

3) O'Grodnick, J. and J. Grande. 1984. Comparison of Total Extractable Versus Dislodgeable Pesticide Residues in Turf Grass After Application of HOE-33171. Report No. A30857. American Hoechst Corporation, Somerville, NJ.

4) Davis, J.E. 1980. Minimizing Occupational Exposure to Pesticides: Personal Monitoring. Residue Reviews, 75:33-49.

5) Meyer, F.H., E. Jawetz, and A. Goldfien. 1974. Review of Medical Pharmacology, 4th Ed., Lange Medical Publications, Los Altos, CA.

Lawn Application

WHIP (American Hoechst) ACCLAIM 1E

Applicator MOS Low

Kid rolling in grass

Dermal 100% absorption

NOEL - None 20 mg/kg dermal

Ag use application

Protective clothing

.05 mg/kg/day

March 18, 86 gloves ? used? (Harry Day memo)

+ other protective clothing

Harry Day Assessment

outside + inside

(i.e. no gloves assumed) impervious gloves - all exp to hands

Mixer/Loader Exposure to 2,4-D mg/operation

Body Part	Tank Mixer		Knapsack Loader	
	No Gloves	Gloves	No Gloves	Gloves
Front Torso	1.4	1.4	0.21	0.21
Back Torso	0.15	0.15	0.12	0.12
Arms	7.5	7.5	0.35	0.35
Hands	135	13.5	9.8	0.98
Thighs	1.8	1.8	0.22	0.22
Lower Legs	3.2	3.2	0.32	0.32
Total Exposure	149	27.6	11	2.2
a.i. handled	27	27	0.31	0.31
Exposure (mg/lb a.i.)	5.5	1.0	36	7.1
Reduction Ratio	55/1.0 = 5.5		36/7.1 = 5.1	

Applicator Exposure to 2,4-D

Body Part	Ground Boom		Knapsack	
	No Gloves	Gloves	No Gloves	Gloves
Head	0.041	0.041	2.3	2.3
Front Torso	0.059	0.059	1.4	1.4
Back Torso	0.030	0.030	2.2	2.2
Arms	0.34	0.34	2.0	2.0
Hands	3.2	0.32	44	4.4
Thighs	0.10	0.10	8.3	8.3
Lower legs	0.14	0.14	78	78
Total (μg/g a.i.)	3.96	1.08	138	99
Total (mg/lb a.i.)	1.8	0.49	63	45
Reduction Ratio	1.8/0.49 = 3.7		63/45 = 1.4	

Daily Exposures to ACCLAIM

	Without Gloves	With Gloves
Sod Farms		
Typical - M/L	0.44 mg/kg/day	0.08 mg/kg/day
Applicator	0.14 mg/kg/day	0.04 mg/kg/day
Combined	0.58 mg/kg/day	0.12 mg/kg/day
Maximum - M/L	1.3 mg/kg/day	0.24 mg/kg/day
Applicator	0.42 mg/kg/day	0.11 mg/kg/day
Combined	1.7 mg/kg/day	0.35 mg/kg/day
Commercial/Turf Large Acreage		
Typical - M/L	0.11 mg/kg/day	0.02 mg/kg/day
Applicator	1.3 mg/kg/day	0.93 mg/kg/day
Combined	1.4 mg/kg/day	0.95 mg/kg/day
Maximum - M/L	0.16 mg/kg/day	0.03 mg/kg/day
Applicator	1.8 mg/kg/day	1.3 mg/kg/day
Combined	2.0 mg/kg/day	1.3 mg/kg/day
Commercial/Turf Small Acreage		
Typical - M/L	0.019 mg/kg/day	0.004 mg/kg/day
- Applicator	0.033 mg/kg/day	0.024 mg/kg/day
- Combined	0.052 mg/kg/day	0.028 mg/kg/day
Maximum - M/L	0.066 mg/kg/day	0.013 mg/kg/day
Applicator	0.12 mg/kg/day	0.086 mg/kg/day
Combined	0.19 mg/kg/day	0.099 mg/kg/day

Rights of way

Typical - M/C	0.88 mg/kg/day	0.16 mg/kg/day
- Applicator	0.29 mg/kg/day	0.08 mg/kg/day
- Combined	1.2 mg/kg/day	0.24 mg/kg/day
Maximum - M/C	2.6 mg/kg/day	0.47 mg/kg/day
Applicator	0.84 mg/kg/day	0.23 mg/kg/day
Combined	3.4 mg/kg/day	0.70 mg/kg/day